DEVELOPING A FOUNDATION FOR A GLOBALLY COORDINATED APPROACH TO THE TAXATION OF CRYPTO-ASSET TRANSACTIONS

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ABSTRACT

Crypto-assets and blockchain technology have created much uncertainty within the field of taxation. While some jurisdictions have attempted to formulate responses, others have yet to meaningfully engage with the topic. In contrast to the taxation of the digitalised economy, a coordinated global approach to the taxation of crypto-asset transactions is notably lacking.

Rather than focusing on individual jurisdictions, this study addresses the consequences of crypto-asset transactions within the international tax system. It begins by applying an adapted form of the constant comparison method traditionally employed in grounded theory research to a selection of crypto-assets white papers to inductively identify possible taxable events, and from these to develop ten transaction categories, each with definitive characteristics. These categories then form the basis of a doctrinal analysis of the nature within the international tax system of the income arising and its classification within the text of the articles of the model tax conventions. Finally, the study considers the potential future impact of measures to tax the digitalised economy.

The study finds that while it is possible to classify each of the identified transaction categories within the articles of the model tax conventions, alternative constructions within treaties and existing differences in interpretation may still significantly impact the allocation of taxing rights. In addition, crypto-asset transactions may further challenge the role of the permanent establishment concept in determining taxing rights and contribute to base erosion. While such transactions may fall within the measures to tax the digitalised economy, the pseudonymous, decentralised nature of blockchain technology may frustrate the application of these measures.

This study may inform individual jurisdictions in designing the scope and outcomes of a comprehensive response to crypto-asset transactions. It may also provide a basis for the classification of these transactions within the international tax system, and support the

development of a globally coordinated response to the taxation of crypto-assets. Finally, it may contribute to the broader development of the taxation of the digitalised economy, in which crypto-asset transactions may play an increasingly significant role in the future.

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LIST OF ABBREVIATIONS

ADS	Automated digital services
AICPA	American Institute of CPAs
AML	anti-money laundering
ATM	Automated teller machine
ATO	Australian Tax Authority
AUS	Australia
BEPS	Base erosion and profit shifting
BFT	Byzantine Fault Tolerance
BMF	Bundesministerium Für Finanzen
CAQDAS	Computer assisted qualitative data analysis software
CBDC	Central bank digital currency
CD	Compact disc
CDP	Collateralised Debt Position
CFB	Consumer Facing Businesses
CGT	Capital gains tax
CPA	Certified Public Accountant
CRA	Canada Revenue Agency
DAO	Decentralised autonomous organisation
DApps	Decentralised Applications
DLT	Digital ledger technology
DPoS	Delegated proof-of-stake
DSR	DAI Savings Rate
ECB	European Central Bank
ECJ	European Court of Justice
ERC	Ethereum Request for Comments
EU	European Union
EUR	Euro
FAQ	Frequently asked questions
FBA	Federated Byzantine agreement
FIFO	First-in-first-out

GST	Goods and services tax
HMRC	Her Majesty's Revenue and Customs
HST	Harmonised sales tax
IBFD	International Bureau of Fiscal Documentation
ICF	Interchain Foundation
ICO	Initial coin offering
ICS	industrial, commercial, or scientific
IEO	Initial exchange offering
IFRS	International Financial Reporting Standards
IIR	Income inclusion rule
IOU	I owe you
IP	Internet protocol
IPO	Initial public offering
IRS	Internal Revenue Service
ITA	Israeli Tax Authorities
ITO	Initial token offering
KAS	Krajowa Administracja Skarbowa
KYC	Know-your-customer
MNE	multinational enterprise
NEM	New Economy Movement
NOK	Norwegian Krona
NTA	National Tax Authority (of Japan)
OECD	Organisation for Economic Co-operation and Development
P2P	Peer-to-peer
PCC	Podatek od czynności cywilnoprawnych
PE	Permanent establishment
POI	Proof of importance
POW	Proof-of-work
SARS	South African Revenue Service
SCP	Stellar Consensus Protocol
SEC	Securities Exchange Commission

SIM	Subscriber identity module
SLA	Service level agreement
SMS	Short message service
SOR	Switch-over rule
STTR	Subject to tax rule
SWIFT	Society for Worldwide Interbank Financial Telecommunication
UK	United Kingdom
US	United States
USA	United States of America
USD	United States Dollar
UTPR	Undertaxed payments rule
VAT	Value-added tax

LIST OF CRYPTO-ASSET TOKENS AND SYMBOLS

ADA	Cardano
ATOM	Cosmos
BCH	Bitcoin Cash
BNB	Binance Coin
BP	Bandwidth Points
BSV	Bitcoin SV (Satoshi's Vision)
BTC	Bitcoin
BTT	BitTorrent
CRO	Crypto.com Chain
DAI	DAI
DASH	Dash
DIGIX	Digix
DOT	Polkadot/DOT
EOS	EOS
ETC	Ethereum Classic
ETH	Ether/Ethereum
GAS	GAS
IOTA	IOTA
LEO	Unus Sed Leo
LINK	Chainlink
LTC	Litecoin
MCO	Monaco
MKR	Maker
NEO	Neo
TRX	Tron
USDC	USD Coin
USDT	Tether
XEM	NEM
XLM	Stellar
XMR	Monero
XRP	Ripple/XRP
XTZ	Tezos

1. INTRODUCTION

1.1. Crypto-assets, the digitalised economy and the international tax system

Since the advent of Bitcoin in 2009, thousands of crypto-assets based on cryptography, blockchain technology and decentralised networks have emerged. Trading volumes have skyrocketed, and market prices have been extremely volatile. In their exuberant analysis of the future of this technology, Tapscott and Tapscott single out taxation among the regulatory challenges that it presents.[1] Yet while national tax authorities have attempted in varying degrees to respond to this phenomenon, "confusion reigns" over the tax treatment of crypto-assets.[2]

The crypto-asset phenomenon forms part of the larger technological revolution that has given birth to the digitalised economy.[3] Attempting to address the challenges that the digitalised economy present to an international tax system, the development of which has remained largely unchanged for over a century[4] has led to "unprecedented levels of international tax coordination around the world".[5] However, although crypto-assets are a significant contributor to financial globalisation,[6] the tax consequences of crypto-asset transactions remain at an early stage of development and continue to be determined by individual jurisdictions rather than through a globally coordinated

[1] Don Tapscott and Alex Tapscott, *Blockchain Revolution*, Paperback (London: Penguin Random House, 2018).
[2] EY, "Confusion Reigns over Cryptocurrency Tax Treatment," EY Tax Insights, 2018, https://taxinsights.ey.com/archive/archive-articles/confusion-reigns-over-cryptocurrency-tax-treatment.aspx?utm_source=Newsletter&utm_medium=October 2018.
[3] While the initial focus was on the 'digital economy', it became accepted that a 'digital economy' cannot be addressed in isolation, and that digitalisation potentially impacts all aspects of the economy. See *OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar One Blueprint: Inclusive Framework on BEPS" (Paris, 2020), https://doi.org/10.1787/beba0634-en.*
[4] OECD.
[5] Yariv Brauner and Pasquale Pistone, "Some Comments on the Attribution of Profits to the Digital Permanent Establishment," *Bulletin for International Taxation, Journal Articles & Opinion Pieces IBFD* 72, no. No. 4a/Special Issue (2018), at 1, https://research.ibfd.org/#/doc?url=/document/bit_2018_4a_int_2.
[6] Jill Carlson, "Cryptocurrency and Capital Controls," *SSRN Electronic Journal*, 2016, http://dx.doi.org/10.2139/ssrn.3046954.

approach. As a result, there is a lack of consensus about what those tax consequences should be.[7] The international tax literature has to date focused primarily on the gains and losses from crypto-asset sales in terms of domestic legislation, indirect tax consequences (particularly in the European Union (EU)), and the role of blockchain technology in value creation.[8]

1.2. The creation of Bitcoin

Bitcoin was created in 2009 by an anonymous individual or group identified as 'Satoshi Nakamoto' and represents the first "broad market based cryptocurrency".[9] The timing of Bitcoin's introduction is significant: it followed shortly after the global economic crisis, at a time when trust in the traditional financial system was at historic lows.[10] The objective of Bitcoin was and remains the facilitation of online payments using cryptographic proof to protect against the possibility of double-spending, thus eliminating the need for a trusted third-party intermediary.[11]

Blockchain technology allows Bitcoin users to transact directly with each other without the use of an intermediary.[12] Blockchain refers to the public ledger that is shared between all participants in

[7] Nexia International, "Lack of International Tax Consensus on Cryptocurrency," Global Insight – October 2018, 2018, https://nexia.com/insights/global-insight/lack-of-international-tax-consensus-on-cryptocurrency/; Danish Mehboob, "OECD Report Moves Crypto-Assets Closer to a Uniform Tax Framework," *International Tax Review*, 2020, https://search-ebscohost-com.ezproxy.uct.ac.za/login.aspx?direct=true&db=buh&AN=147027752&site=ehost-live.

[8] Louise Fjord Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings," *Intertax* 48, no. 10 (2020): 879–903, https://kluwerlawonline.com/JournalArticle/Intertax/48.10/TAXI2020088.

[9] Mitsuru Iwamura, Tsutomu Matsumoto, and Yukinobu Kitamura, "Is Bitcoin the Only Cryptocurrency in the Town? Economics of Cryptocurrency and Friedrich A.Hayek," 2014, at 1, http://ssrn.com/abstract=2405790.

[10] World Bank, "Cryptocurrencies and Blockchain Europe and Central Asia Economic Update" (Washington, DC: World Bank, 2018), https://openknowledge.worldbank.org/handle/10986/29763; Marsh & McLennan Companies, FireEye, and Circle, "Crypto-Assets and Blockchain Technology: On the Brink of Legitimacy?," 2019, https://www.familyoffice.com/system/files/industry_publications/MARSH Crypto-Assets and Blockchain Technology_On Brink of Legitimacy.pdf.

[11] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 2009, www.bitcoin.org.

[12] Marco Iansiti and Karim R. Lakhani, "The Truth About Blockchain," *Harvard Business Review*, 2017, https://hbr.org/2017/01/the-truth-about-blockchain.

the blockchain network,[13] which consists of interlinked computer nodes.[14] Each node has access to the entire history of all bitcoins in existence.[15]

Each Bitcoin user has a public and a private cryptographic key. The user's public key is shared, while the private key is kept secret.[16] Users' personal details are not linked to these keys. For this reason, Bitcoin use is often referred to as 'pseudonymous'.[17] Bitcoins are exchanged by means of the transfer of an electronic file directly between users using these keys, which may be thought of as the addresses from which and to which the file is sent. A useful analogy is that of the public key as the user's bank account number, and the private key as their pin number.[18]

A bitcoin is "a chain of digital signatures".[19] When a token is transferred from sender to recipient, the sender adds to the existing chain the recipient's public key, a hash[20] of the previous transaction and the sender's digital signature.[21]

As a decentralised crypto-asset with no central authority, Bitcoin uses a peer-to-peer network of computers to record and validate transactions.[22] Every transaction is broadcast to nodes in the

[13] Garrick Hileman and Michel Rauchs, "Global Cryptocurrency Benchmarking Study," 2017, https://doi.org/10.2139/ssrn.2965436.
[14] Aleksandra Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market," *Finance and Capital Markets, Journal Articles & Opinion Pieces IBFD* 20, no. 2 (2018), https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/dfi_2018_02_int_1.
[15] Noelle Acheson, "How Bitcoin Mining Works," 2018, https://www.coindesk.com/information/how-bitcoin-mining-works; Unocoin, "Bitcoin Miners vs Bitcoin Nodes," Unocoin, 2018, https://blog.unocoin.com/bitcoin-miners-vs-bitcoin-nodes-6a4d35be9712.
[16] Marsh & McLennan Companies, FireEye, and Circle, "Crypto-Assets and Blockchain Technology: On the Brink of Legitimacy?"
[17] Iansiti and Lakhani, "The Truth About Blockchain."
[18] Jeff Herbert and Martin Stabauer, "Bitcoin & Co: An Ontology for Categorising Cryptocurrencies," *International Journal of Multidisciplinarity in Business and Science* 3, no. 3 (2017): 29–37, https://www.researchgate.net/publication/328191994_Bitcoin_Co_An_Ontology_for_Categorising_Cryptocurrencies.
[19] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System." At 2.
[20] "a hash function is a mathematical process that takes input data of any size, performs an operation on it, and returns output data of a fixed size." See Corin Faife, "Bitcoin Hash Functions Explained," 2017, https://www.coindesk.com/bitcoin-hash-functions-explained.
[21] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."
[22] Nicholas A Plassaras, "Regulating Digital Currencies: Bringing Bitcoin within the Reach of the IMF," *Chicago Journal of International Law* 14, no. 1 (2013): 377–407, http://chicagounbound.uchicago.edu/cjil/vol14/iss1/12.

Bitcoin network,[23] which relay transaction information to all other nodes in the network, enforce the Bitcoin protocol, and store a record of the entire Bitcoin blockchain.[24]

For a transaction to be completed, it must be included by the network in a block that is added to the blockchain. A single block has a maximum size (and therefore can contain a maximum number of transactions), and a sender can include a transaction fee in order for the transaction to be prioritised for inclusion in a block.[25]

Bitcoin miners perform the function of creating validated blocks of transactions.[26] Miners download software that allows them to use their computing power to try to solve complex mathematical problems or consensus algorithms. The 'problem' is based on a hashing algorithm incorporating information on the previous block, the transactions in the block, the time, and other inputs.[27] It can only be solved by trial and error and is therefore a function of miners' computing power. The solution is referred to as 'proof-of-work' (PoW) and serves to verify the transactions within the block as valid. The problem should take around ten minutes to solve, which is maintained by adjusting its complexity over time as computing power increases.[28]

While the mathematical problem is difficult to solve, it is easy to verify.[29] The first miner to find the solution broadcasts it to all the nodes in the network, which verify that it is indeed correct.[30]

[23] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System"; Benjamin W. Akins, Jennifer L. Chapman, and Jason M. Gordon, "A Whole New World: Income Tax Considerations of the Bitcoin Economy," *Pittsburgh Tax Review* 12, no. 1 (2015): 24–56, https://doi.org/10.5195/TAXREVIEW.2014.32.
[24] Acheson, "How Bitcoin Mining Works"; Unocoin, "Bitcoin Miners vs Bitcoin Nodes."
[25] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System"; Bitcoin Wiki, "Miner Fees," 2019, https://en.bitcoin.it/wiki/Miner_fees.
[26] Acheson, "How Bitcoin Mining Works."
[27] Bitcoin Wiki, "Block Hashing Algorithm," 2019, https://en.bitcoin.it/wiki/Block_hashing_algorithm.
[28] World Bank, "Cryptocurrencies and Blockchain Europe and Central Asia Economic Update"; Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market"; Acheson, "How Bitcoin Mining Works."
[29] World Bank, "Cryptocurrencies and Blockchain Europe and Central Asia Economic Update."
[30] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."

The validated block then gets added to the blockchain,[31] and all nodes update their record of the blockchain accordingly.[32] The process means that transactions are irreversible, as the validated block will itself form part of later blocks that get added to it.[33] As a reward for finding the solution and adding the block, the successful miner receives new bitcoins, as well as any transaction fees included by the sender.[34] The current reward for the successful miner is 6.25 bitcoins, having halved on 11 May 2020. Previous 'halving' occurred in 2012 and 2016.[35]

1.3. The global proliferation of crypto-assets

In the time since its introduction, the growth of Bitcoin has resulted in the creation of a multitude of crypto-assets. Some are offshoots and derivatives of Bitcoin, while others are wholly separate. While some have anonymous or collective origins, others have been created by identified entities. While all make use of blockchain technology, significant differences may exist. Some (for, example, Litecoin or Bitcoin Cash) employ different parameters for block sizes and algorithmic difficulty in order to address the limitations of Bitcoin transaction processing times.[36] Others (for example, NEO or EOS) address the computer processing power and cost associated with mining and producing a proof of work by employing an alternative process called 'proof-of-stake' (PoS, or DPoS in respect of delegated proof-of-stake processes), where the validation process is not completed in competition by the fastest miner, but is allocated to miners for completion according

[31] Hileman and Rauchs, "Global Cryptocurrency Benchmarking Study"; Florian Glaser et al., "Bitcoin - Asset or Currency? Revealing Users' Hidden Intentions," in *European Conference on Information Systems* (Tel Aviv, 2014), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2425247.
[32] World Bank, "Cryptocurrencies and Blockchain Europe and Central Asia Economic Update."
[33] Iansiti and Lakhani, "The Truth About Blockchain"; Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."
[34] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."
[35] Wolfie Zhao, "Bitcoin Halving Arrives: Mining Rewards Drop for Third Time in History," 2020, https://www.coindesk.com/bitcoin-halving-arrives-mining-rewards-drop-for-third-time-in-history.
[36] Litecoin Project, "Litecoin - Open Source P2P Digital Currency," 2020, https://litecoin.org/; BitcoinCash, "Bitcoin Cash," 2020, https://www.bitcoincash.org/index.html.

to how much of that crypto-asset they hold at that time.[37] In some instances, the model of a decentralised network is abandoned in favour of centralised recording and validation (such as that employed by Ripple), where the crypto-asset originator also fulfils the function of administrator,[38] representing a somewhat ironic resurrection of the role of trusted intermediary.[39]

The use cases of crypto-assets have also expanded beyond the payment facilitation use case of Bitcoin. These include the facilitation of global currency exchange (Ripple), smart contracts (Ethereum), social media (Steemit) or of other applications (EOS).[40] While sceptics argue that the potential use cases may be exaggerated, "the trends toward decentralization and P2P [peer-to-peer] transactions are unmistakable".[41]

The manner in which the number of tokens in a crypto-asset ecosystem is increased also varies. While many are issued to reward transaction validation (Bitcoin), others are issued to reward development teams (EOS), or in return for production of creative content (Steemit), or even the production of solar energy (SolarCoin).[42] Some are sold to fund initial development in so-called 'Initial Coin Offerings' (ICO) (Ethereum) or are held for sale by their creators over time (Ripple).[43] In some cases, the tokens of newly-created crypto-assets are given to holders of existing crypto-

[37] Herbert and Stabauer, "Bitcoin & Co: An Ontology for Categorising Cryptocurrencies"; Neo, "NEO White Paper," 2020, https://docs.neo.org/docs/en-us/basic/whitepaper.html; block.one, "EOS.IO Technical White Paper V2," 2018, https://github.com/EOSIO/Documentation/blob/master/TechnicalWhitePaper.md.
[38] European Central Bank, "Virtual Currency Schemes - a Further Analysis" (Frankfurt, 2015), https://doi.org/10.2866/662172.
[39] World Bank, "Cryptocurrencies and Blockchain Europe and Central Asia Economic Update."
[40] Ripple, "Ripple - One Frictionless Experience To Send Money Globally," 2019, https://ripple.com/; Vitalik Buterin, "Ethereum White Paper," *Ethereum*, 2014, https://doi.org/10.5663/aps.v1i1.10138; block.one, "EOS.IO Technical White Paper V2"; Steem, "Steem White Paper," 2017, https://steem.io/steem-whitepaper.pdf.
[41] World Bank, "Cryptocurrencies and Blockchain Europe and Central Asia Economic Update." At 23.
[42] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System"; block.one, "EOS.IO Technical White Paper V2"; Steem, "Steem White Paper"; "SolarCoin," 2020, https://solarcoin.org/.
[43] Buterin, "Ethereum White Paper"; Ripple, "XRP Ledger Concepts," XRP Ledger Project, 2019, https://xrpl.org/concepts.html.

assets at the point that the new crypto-asset splits or 'hard forks' from its parent (Bitcoin Cash).[44] While many crypto-assets have no inherent value (Bitcoin), others are pegged or linked directly to the price of fiat currency (USD Tether) or commodities (DigixDAO).[45] In 2021 the Bahamas became the first jurisdiction to launch a central bank digital currency (CBDC). Many other central banks, including those of the EU and China, are actively developing or testing CBDCs.[46]

In early 2018, the market capitalisation of all crypto-assets increased to "a tenth of the value of all gold in the world".[47] This was, however, as measured shortly before a crash in crypto-asset prices that was more pronounced in price fluctuation than the Dot-com bubble of 2000.[48] Nonetheless, in the same year, USD 1 trillion in Bitcoin transactions was processed.[49]

The market capitalisation of over 2,300 crypto-assets on 21 August 2019 was USD 267 billion.[50] Although still priced below its 2018 peak at that time, Bitcoin had enjoyed significant price increases in 2019, and represented 68% of the total market capitalisation on this date.[51] In the same

[44] Nick Webb, "A Fork in the Blockchain: Income Tax and the Bitcoin/Bitcoin Cash Hard Fork," *North Carolina Journal of Law and Technology* 19, no. 4 (2018): 283–311, https://scholarship.law.unc.edu/cgi/viewcontent.cgi?article=1361&context=ncjolt.

[45] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System"; DIGIX, "DGX the Finest Gold Tokenised," 2019, https://digix.global/dgx/; Tether Limited, "Tether: Fiat Currencies on the Bitcoin Blockchain," 2016, https://doi.org/10.31826/9781463240134-toc.

[46] Raphael Auer, Giulio Cornelli, and Jon Frost, "Rise of the Central Bank Digital Currencies: Drivers, Approaches and Technologies," 2020, https://www.bis.org/publ/work880.pdf; Bank for International Settlements, "Annual Economic Report 2021: III. CBDCs: An Opportunity for the Monetary System," 2021, https://www.bis.org/publ/arpdf/ar2021e3.htm; PwC, "PwC CBDC Global Index 1st Edition," 2021, https://www.pwc.com/gx/en/industries/financial-services/assets/pwc-cbdc-global-index-1st-edition-april-2021.pdf; Fabio Panetta, "Preparing for the Euro's Digital Future," The ECB Blog, 2021, https://www.ecb.europa.eu/press/blog/date/2021/html/ecb.blog210714~6bfc156386.en.html.

[47] Marsh & McLennan Companies, FireEye, and Circle, "Crypto-Assets and Blockchain Technology: On the Brink of Legitimacy?" at 5.

[48] ECB Crypto-Assets Task Force, "Crypto-Assets: Implications for Financial Stability, Monetary Policy, and Payments and Market Infrastructures" (Frankfurt, 2019), https://doi.org/10.2866/162.

[49] Marsh & McLennan Companies, FireEye, and Circle, "Crypto-Assets and Blockchain Technology: On the Brink of Legitimacy?"

[50] This was the date on which the sample was selected for the purposes of this study. In the intervening period the crypto-asset market has continued to grow dramatically. At 30 June 2021, crypto-assets in issue had a combined market capitalisation of USD 1.42 trillion. Bitcoin represented 46% of this amount.

[51] CoinMarketCap, "CoinMarketCap," 2019, https://coinmarketcap.com.

year the ECB Crypto-Assets Task Force estimated that the crypto-asset market is equivalent to 1.2% of the M1 or 0.8% of the M3 Euro-area money supply.[52]

1.4. Overview of this study

The central proposition of this study is that the international tax system would be well-served by a globally coordinated response to the taxation of crypto-asset transactions based on a systematic analysis of crypto-asset transactions, taking into account the individual nature of different types of crypto-assets and the transactions they might facilitate. This would contribute not only to the establishment of how the allocation of jurisdictional taxing rights over those transactions should be determined but might also serve as a common point of reference for individual jurisdictions as they formulate or further develop their domestic responses.

This study proceeds as follows. Chapter 2 presents the research objective, research paradigm and methodology. Chapter 3 provides an overview of the state of the taxation of crypto-asset transactions as represented by the published responses of individual jurisdictions. Chapter 4 presents the outcomes of an analysis of selected crypto-asset white papers.[53] It begins with the identification of transactions representing possible taxable events. It then uses these in developing transaction categories, where each transaction category represents those transactions that are substantially similar in nature to all other transactions within that category, and distinct from every other transaction category.

Chapter 5 then seeks to establish the direct tax consequences of each transaction category with specific reference to the text of the articles of the model tax conventions. The chapter also presents

[52] ECB Crypto-Assets Task Force, "Crypto-Assets: Implications for Financial Stability, Monetary Policy, and Payments and Market Infrastructures."

[53] The sample covers 93.6% of crypto-asset tokens by market capitalisation on 29 August 2019. This is discussed further in 2.1 *Research Objective*, while the sample is presented in

Table 2: Crypto-asset selection of Chapter 4.

limited observations on indirect tax consequences. Chapter 6 compares the direct tax consequences proposed in the preceding chapter as well as the observations on indirect tax consequences to the findings of the 2020 OECD on current practice in various jurisdictions as reported in *Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues*.

Chapter 7 considers the current allocation of taxing rights arising from crypto-asset transactions based on their proposed classification with reference to the text of the articles of the model tax conventions and explores the challenges that such allocations may present to the existing tax system. It then considers how the jurisdictional taxing rights over such crypto-assets might be impacted by either the OECD's Pillar One and Two or the United Nations' (UN) Article 12B proposals as at 30 June 2021.

Chapter 8 firstly reminds the reader of the limitations to the present study before concluding, presenting the significant recommendations of the study, and suggesting areas for future research.

2. RESEARCH OBJECTIVE AND METHODOLOGY

2.1. Research Objective

The objective of this study is to determine the taxable events arising from the range of transactions identified within a sample of the 25 largest crypto-asset tokens by market capitalisation at 21 August 2019, which represents 93.6% of the total market capitalisation at that date, and the appropriate classification of the income arising from those transactions within the parameters of the text of the articles of the model tax conventions. This study seeks to establish an explicit basis for the allocation of taxing rights over crypto-asset transactions within the context of the international tax system, as well as providing a point of reference for individual jurisdictions to support the development of their comprehensive domestic responses to crypto-asset transactions, and to promote greater consistency in the scope and outcomes of those responses.

The study focuses primarily on direct taxation, although some brief observations on indirect taxation will be drawn from the analysis performed.

The development of a globally coordinated approach to the taxation of crypto-asset transactions would continue the emerging trend of global cooperation and coordination in tax policymaking. This trend is evident both in the OECD's Base Erosion and Profit Shifting (BEPS) Project and in current attempts to formulate a globally coordinated approach to the taxation of the digitalised economy.[54] The outcomes of this study will also contribute to the wider global discussion on appropriate responses to the taxation of the digitalised economy, which to date have given

[54] OECD, "Public Consultation Document: Secretariat Proposal for a 'Unified Approach' under Pillar One," 2019, http://www.oecd.org/tax/beps/public-consultation-document-secretariat-proposal-unified-approach-pillar-one.pdf; OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar One Blueprint: Inclusive Framework on BEPS"; OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar Two Blueprint: Inclusive Framework on BEPS" (Paris, 2020), https://doi.org/10.1787/abb4c3d1-en; OECD, "Addressing the Tax Challenges of the Digitalisation of the Economy – Policy Note," 2019, http://www.oecd.org/tax/beps/policy-note-beps-inclusive-framework-addressing-tax-challenges-digitalisation.pdf.

relatively little attention to crypto-asset transactions,[55] which are likely to form an increasingly significant contributor to the digitalised economy in the future.

The significant contributions of this study are intended to be:

- The identification of the possible taxable events arising from selected crypto-assets (Chapter 4);
- The development of a limited number of transaction categories from those events that reflect their distinct and similar characteristics, and which may be used to inform the scope of a comprehensive response to the taxation of crypto-asset transactions (Chapter 4);
- The determination of the direct tax consequences arising from each transaction category, and its classification within the text of the articles of the model tax conventions (Chapter 5);
- The identification of challenges to the determination of direct tax consequences or the classification thereof that may need to be addressed either within the model conventions or domestic legislation (Chapter 5);
- The determination of the current allocation of jurisdictional taxing rights that arise from the proposed classifications within the text of the articles of the model tax conventions and the identification of any challenges to existing tax bases that may result from the interaction between those classifications and the nature of the crypto-asset transaction categories developed (Chapter 7); and

[55] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."

- Consideration of how the current jurisdictional taxing rights over crypto-asset transactions as determined by this study might be impacted by responses within the international tax system to the digitalised economy in the form of either the OECD's Pillar One and Pillar Two or the UN's Article 12B proposals as at 30 June 2021 (Chapter 7).

2.2. Research paradigm

2.2.1. The legal research paradigm

This study seeks to both critique and contribute to international and domestic tax responses to crypto-asset transactions. It is therefore an exercise in legal research. Legal research may be viewed either as positioned somewhere on the continuum between the positivist and interpretivist research paradigms, or alternatively as a distinct paradigm in its own right,[56] and may be divided broadly into doctrinal and non-doctrinal research.[57]

This study engages in elements of both doctrinal and non-doctrinal research (in the form of reform-oriented research).

2.2.1.1. *Doctrinal research and comparative analysis*

Doctrinal research is the dominant and "most accepted methodology in the discipline of law" that presences itself in most other forms of legal research,[58] and is sometimes referred to as 'black-letter law'.[59] It follows a "systematic process of identifying, analysing, organising and synthesizing

[56] Margaret McKerchar, "Philosophical Paradigms, Inquiry Strategies and Knowledge Claims: Applying the Principles of Research Design and Conduct to Taxation," *EJournal of Tax Research* 6, no. 1 (2008): 5–22, http://www.austlii.edu.au/au/journals/eJlTaxR/2008/1.html.
[57] Terry Hutchinson and Nigel Duncan, "Defining and Describing What We Do: Doctrinal Legal Research," *Deakin Law Review* 17 (2012), https://heinonline.org/HOL/Page?handle=hein.journals/deakin17&id=91&div=8&collection=journals.
[58] Hutchinson and Duncan. At 102.
[59] Sanne Taekema, "Theoretical and Normative Frameworks for Legal Research: Putting Theory into Practice," *Law and Method*, 2018, 1–17, https://doi.org/10.5553/REM/.000031.

statutes, judicial decisions and commentary".[60] Although closely associated with positivism, doctrine must be evaluated on the basis of its source, being legislation or case law, rather than merely being observed as occurring in nature.[61] There is an expectation that current doctrinal research will incorporate some element of comparative analysis,[62] which may involve comparison of legislation between jurisdictions or over time.[63]

This study employs comparative analysis in drawing conclusions as to the sufficiency in breadth and depth of engagement with the taxation of crypto-asset transactions among the jurisdictions considered and in developing overall conclusions as to the current state of the approach to the taxation of crypto-asset transactions in totality. Doctrinal analysis is then employed to determine the tax consequences of the transaction categories developed and the classification thereof within the text of the articles of the model tax conventions.

2.2.1.2. ***Reform-oriented research***

While doctrinal research focuses on analysing the current law, reform-oriented research aims to effect changes in the law [64] and is sometimes referred to as '*de lege ferenda*' (meaning 'the future law' and implying 'the law as it should be').[65]

This study engages in reform-oriented research to the extent that it proposes specific additions or amendments to either the model tax conventions and their commentaries or to domestic legislation

[60] McKerchar, "Philosophical Paradigms, Inquiry Strategies and Knowledge Claims: Applying the Principles of Research Design and Conduct to Taxation." At 19.
[61] Hutchinson and Duncan, "Defining and Describing What We Do: Doctrinal Legal Research."
[62] Terry Hutchinson, "The Doctrinal Method: Incorporating Interdisciplinary Methods in Reforming the Law," ed. Sanne Taekema, *Erasmus Law Review* 8, no. 3 (2015): 130–38, https://doi.org/10.5553/ELR.000055.
[63] Martha Minow, "Archetypal Legal Scholarship: A Field Guide," *Journal of Legal Education* 63, no. 1 (2013): 65–69 at 68, https://jle.aals.org/home/vol63/iss1/4.
[64] McKerchar, "Philosophical Paradigms, Inquiry Strategies and Knowledge Claims: Applying the Principles of Research Design and Conduct to Taxation."
[65] Aleksandra Bal, "Taxation of Virtual Currency" (Institute of Tax Law and Economics, Faculty of Law, 2014), https://openaccess.leidenuniv.nl/handle/1887/29963.

in response to the analysis performed, as well as in using the outcomes of the analysis to advocate for a globally coordinated approach to the taxation of crypto-asset transactions.

2.2.2. Normative frameworks applied

Underlying every research undertaking is a theoretical framework that provides the "underlying structure, the scaffolding or frame" for the study.[66] Taekema argues that what distinguishes the legal research paradigm is its use of normative frameworks. A normative framework provides the basis upon which solutions to the problem posed must be evaluated.[67]

This study employs two normative frameworks in seeking to establish the direct tax consequences of crypto-asset transactions within the context of the international tax system.

2.2.2.1. *The text of the articles of the model tax conventions*

2.2.2.1.1. *OECD Model Tax Convention*

The main purpose of the OECD Model Tax Convention ('the OECD Model Tax Convention' or 'the OECD Model'), most recently updated in 2017, is to provide a basis for resolving issues of double taxation in a consistent manner, through the alignment of tax treaties by contracting states with a standard model, and the interpretation of those treaties in accordance with the OECD Commentary thereto ('the OECD Commentary'). While contracting states are free to negotiate the terms of each treaty concluded, the model and main provisions of the OECD Model Tax Convention have been followed in most cases by OECD member countries, and have significant influence over the treaties of member and non-member countries, as well as over those between non-member countries. It has also served as the basis for the UN Model Double Taxation

[66] Sharan B Merriam and Elizabeth J Tisdell, *Qualitative Research : A Guide to Design and Implementation*, Fourth Edi (San Francisco: Jossey-Bass, 2016), https://web-a-ebscohost-com.ezproxy.uct.ac.za/ehost/ebookviewer/ebook/bmxlYmtfXzEwMjI1NjJfX0FO0?sid=d0cbe31c-a0dc-4b1f-9a81-03b74a400d9d@sessionmgr4007&vid=0&format=EB&rid=1. At 85.
[67] Taekema, "Theoretical and Normative Frameworks for Legal Research: Putting Theory into Practice."

Convention between Developed and Developing Countries. The OECD Commentary in turn plays a significant role in the interpretation of treaties and is given "great weight" by those responsible for doing so.[68]

Although the OECD Model Tax Convention is "of special importance in the development of international fiscal law" [69] it is not, however, law in and of itself. It is only the articles of a particular signed treaty, which may or may not adopt the articles of the Model Convention, that are binding, and then only in respect of cross-border transactions involving those two contracting states. The degree of authority of any interpretation in the OECD Commentary depends on the extent to which it relates to provisions of the OECD Model Tax Convention that were incorporated in a treaty, and whether the current interpretation reflected in the OECD Commentary was expressed at the time the treaty was entered into.[70] While some debate exists as to whether the use of the OECD Commentary is progressing towards a position of 'hard law', at present it remains a non-binding guide to interpretation or 'soft law'.[71]

Notwithstanding these caveats to overreach, the OECD Model Tax Convention occupies a unique and preeminent position within international taxation, and alignment with its basis of classification may therefore be instrumental in furthering a globally coordinated approach to the taxation of income arising from crypto-asset transactions.

[68] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)," Model Tax Convention on Income and on Capital (Full Version) (OECD Publishing, April 25, 2019), at I-12, https://doi.org/10.1787/g2g972ee-en.
[69] OECD. At I-11
[70] Michael Lang and Florian Brugger, "The Role of the OECD Commentary in Tax Treaty Interpretation," *Australian Tax Forum* 23 (2008), https://heinonline.org/HOL/Page?handle=hein.journals/austraxrum23&id=95&div=9&collection=journals.
[71] Craig West, "References to the OECD Commentaries in Tax Treaties: A Steady March from 'Soft' Law to 'Hard' Law?," *World Tax Journal, Journal Articles & Opinion Pieces IBFD* 9, no. 1 (2017), https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/wtj_2017_01_int_2.

2.2.2.1.2. *The UN Model Double Tax Convention between Developed and Developing Countries*

The UN Model Double Tax Convention between Developed and Developing Countries ('the UN Model Double Tax Convention or 'the UN Model'), also last updated in 2017, provides a second template for double tax agreements, the influence of which has increased in recent years. In particular, it supports the formulation of treaties between developed and developing countries and, while it is heavily reliant on the OECD Model, places greater emphasis on granting taxing rights to the source state than the OECD Model.[72] The UN Model's position is unique in being the product of "the only truly global forum to discuss tax matters".[73, 74]

In some instances, the UN Model reproduces the equivalent article of the OECD Model. In others, it presents an alternative construction to the equivalent OECD Model article. In further instances a deleted article of the OECD Model is retained within the UN Model (such as Article 14 on independent personal services), while others are original and unique to the UN Model (most notably Article 12A on fees for technical services and 12B on automated digital services).[75]

[72] David Orzechowski, "Chapter 1: The Relevance of the Commentaries on the OECD and UN Models for the Interpretation of the UN Model," in *The UN Model Convention and Its Relevance for the Global Tax Treaty Network*, ed. Michael Lang et al. (Books IBFD, 2017), https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/unm_c01.

[73] Michael Lennard, "The Purpose and Current Status of the United Nations Tax Work," *Asia-Pacific Tax Bulletin, Journal Articles & Opinion Pieces IBFD*, 2008, 23–30 at 30, https://www.taxjustice.net/cms/upload/pdf/Lennard_0802_Status_of_UN_Tax_Work.pdf.

[74] The relative merits of the determination of taxing rights according to residence and source are beyond the scope of this study. Such merits are debated by, among others, Klaus Vogel. See Klaus Vogel, "Worldwide vs. Source Taxation of Income - A Review and Re-Evaluation of Arguments," *Intertax* 16, no. 8/9 (1988): 216–29, https://kluwerlawonline.com/JournalArticle/Intertax/16.8/TAXI1988043.

[75] United Nations, "Model Double Taxation Convention between Developed and Developing Countries" (New York, 2017), https://www.un.org/development/desa/financing/sites/www.un.org.development.desa.financing/files/2020-03/UN Model_2017.pdf.

2.2.2.1.3. *The text of the articles of the model tax conventions*

In the first instance, the text of the articles of the model tax conventions ('the model conventions') will function as the normative framework for this study. This represents the first of the two types of normative frameworks existing within taxation, being the law itself.[76] The study will assess the extent to which the direct tax consequences of the income arising from the identified categories of crypto-asset transactions can be classified within the existing articles of the model conventions. Such classification would support the globally consistent treatment of that income in cross-border transactions and would provide a significant point of reference for the development and application of domestic legislation in a globally coordinated manner. Where the relevant provisions of an article are substantially similar between the OECD Model and the UN Model they will be considered together, with the default reference being to the OECD Model and OECD Commentary. To the extent that the provisions of an article differ between the two models, or where an article is unique to one of the models, classification within each model will be considered separately.

It is submitted that such an approach has the potential to overcome the practical difficulties of attempting to promote consistency through comparing and reconciling the approaches of individual jurisdictions and is consistent with the approach evident in the BEPS Project and current attempts to formulate a globally coordinated approach to addressing the taxation of the digitalised economy.

2.2.2.2. *The principles of good tax design*

It may occur that the particular characteristics of the identified transaction categories are not fully addressed by the model conventions. This may occur because: (i) no suitable classification exists or more than one classification may be possible; (ii) because the suitable classification does not

[76] Taekema, "Theoretical and Normative Frameworks for Legal Research: Putting Theory into Practice."

currently address all of the particular characteristics of the identified transaction category; or, (iii) because the model convention considers those characteristics a matter of domestic legislation. In such instances, how such transaction categories or characteristics might be accommodated either by amendments to the model conventions and commentaries or to domestic legislation will be considered. This will be guided by the principles of good tax design, which will act as a second normative framework for this study. This represents the second of the two types of normative frameworks existing within taxation, being a broader set of principles that underly the law.[77]

Tax law has a strong internal normative framework that traces back to the work of Adam Smith, which frequently serves as the framework against which tax policy is evaluated.[78] The original four 'maxims' of taxation are contained in Chapter 2 of Part 5 of Adam Smith's *An Inquiry into the Nature and Causes of the Wealth of Nations*, first published in 1776, and have shaped the understanding of public finance almost up to the Keynesian revolution in economics.[79, 80]

Although the original maxims have been subject to multiple expansions and reinterpretations since Smith's original propositions nearly 250 years ago, their central essence has remained largely intact. Most recently, a comprehensive review of the modern "features of a good tax policy",

[77] Taekema.
[78] Clinton Alley and Duncan Bentley, "A Remodelling of Adam Smith' s Tax Design Principles," *Australian Tax Forum* 20 (2005): 579–624, https://heinonline.org/HOL/Page?handle=hein.journals/austraxrum20&id=577&collection=journals&index=#; Pasquale Pistone et al., eds., "Chapter 2: Principles of Taxation," in *Fundamentals of Taxation: An Introduction to Tax Policy, Tax Law and Tax Administration* (IBFD, 2019), https://research.ibfd.org/#/doc?url=/document/pt_head.
[79] Arthur D. Jr. Lynn, "Adam Smith's Fiscal Ideas: An Eclectic Revisited," *National Tax Journal* 29, no. 4 (1976): 369–78, https://doi.org/10.2307/41863089.
[80] In the context of tax reform in South Africa, consideration of the maxims of taxation is evident in the work of both the Katz Commission, which led to significant tax reforms in South Africa, and the Davis Tax Committee, which recently published its findings. See *Joint Standing Committee on Finance, "Final Draft Report of the Joint Standing Committee on Finance on the Third Interim Report of the Katz Commission of Inquiry into Taxation," 1996, http://www.treasury.gov.za/publications/other/katz/3.pdf; Davis Tax Committee, "Report on the Efficiency of South Africa's Corporate Income Tax System," 2018, http://www.taxcom.org.za/docs/20180411 Final DTC CIT Report - to Minister.pdf.*

comprising 19 principles under four headings, was presented in *Fundamentals of Taxation.*[81] It is these modern principles of good tax policy that will form the normative framework of this study. In reviewing the literature, the term *principles* will be used to refer to the modern incarnations, while *maxims* will be used to refer to Smith's original ideas.

The first maxim proposed by Smith is that of *Equality*. "The subjects of every state ought to contribute towards the support of the government, as nearly as possible, in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the state".[82] The first maxim therefore speaks of fairness in treatment among taxpayers. This should not necessarily be taken to mean that all taxpayers should pay the same absolute amount, or that they should be taxed at the same rate; treatment may be perceived as fair where those who pay the most tax are those with the ability to do so.[83] The tax system should also treat similar economic activities similarly so as not to create economic distortions.[84] It should, however, be acknowledged that Pigouvian taxes such as those on alcohol and cigarettes aim to perform a useful social role in discouraging or reducing a particular activity, and are by nature a departure from the maxim of *Equality*.[85]

The second maxim is the maxim of *Certainty*. "The tax which each individual is bound to pay ought to be certain, and not arbitrary. The time of payment, the manner of payment, the quantity

[81] Pistone et al., "Chapter 2: Principles of Taxation."
[82] Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations (Volume 3)* (printed for Messrs. Whitestone, Chamberlaine, W. Watson, Potts, S. Watson [and 15 others in Dublin], 1776), at 208, https://link.gale.com/apps/doc/CW0104123247/ECCO?u=unict&sid=ECCO&xid=52dc21a4&pg=3.
[83] American Institute of CPAs (AICPA), "Tax Policy Concept Statement 1 Guiding Principles of Good Tax Policy: A Framework for Evaluating Tax Proposals," 2017, https://www.aicpa.org/content/dam/aicpa/advocacy/tax/downloadabledocuments/tax-policy-concept-statement-no-1-global.pdf.
[84] Sir James Mirrlees et al., *Tax by Design - the Mirrlees Review* (Oxford University Press, 2011), https://www.researchgate.net/profile/Richard_Blundell/publication/50876719_Dimensions_of_Tax_Design_The_Mirrlees_Review/links/00b4953a94b4a8b25d000000/Dimensions-of-Tax-Design-The-Mirrlees-Review.pdf.
[85] Edward Alsworth Ross, "A New Canon of Taxation," *Political Science Quarterly* 7, no. 4 (1892): 585–97, https://doi.org/10.2307/2139442.

to be paid, ought all to be clear and plain to the contributor, and to every other person".[86] The tax which a taxpayer is obliged to pay should be certain, both to the taxpayer and to the fiscus. In practice, this can be difficult to achieve given the complexity of modern tax legislation and the frequent changes thereto.[87]

The third maxim is that of *Convenience*. "Every tax ought to be levied at the time, or in the manner, in which it is most likely to be convenient for the contributor to pay it".[88] Taxes should be levied at the time when the income on which the tax is to be levied is received, in order that the taxpayer may have the means with which to pay the tax.[89]

The final of Smith's four original maxims is that of *Economy*. "Every tax ought to be so contrived as both to take out and to keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state".[90] Economy refers to the minimisation of compliance costs to the taxpayer and of administrative costs to the fiscus.[91] The costs to the taxpayer include not only financial costs, but also costs in time and emotional energy in the compliance process.[92] Complexity in tax legislation has a negative effect on *Economy*.[93]

The continued relevance of the maxims was confirmed in the *Electronic Commerce: Taxation Framework Conditions* report of the OECD.[94] At its ministerial conference in Ottawa in 1998, the

[86] Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations (Volume 3)*. At 208.
[87] Alley and Bentley, "A Remodelling of Adam Smith' s Tax Design Principles."
[88] Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations (Volume 3)*. At 209.
[89] Smith.
[90] Smith. At 209.
[91] Lynn, "Adam Smith's Fiscal Ideas: An Eclectic Revisited."
[92] Alley and Bentley, "A Remodelling of Adam Smith' s Tax Design Principles."
[93] American Institute of CPAs (AICPA), "Tax Policy Concept Statement 1 Guiding Principles of Good Tax Policy: A Framework for Evaluating Tax Proposals."
[94] OECD, "Electronic Commerce: Taxation Framework Conditions," 1998, http://www.oecd.org/tax/consumption/1923256.pdf.

OECD put forward five principles of tax design: *Neutrality*, *Efficiency*, *Certainty and Simplicity*, *Effectiveness and Fairness*, and *Flexibility*.[95]

Neutrality means that economically similar activities lead to similar tax consequences. The OECD suggests that businesses will make decisions for business rather than tax reasons where the principle of *Neutrality* is preserved.[96] *Neutrality* appears closely aligned to elements within Smith's original maxim of *Equality*, particularly as it relates to 'horizontal equity' between taxpayers with the same amount of income.[97]

The principle of *Efficiency* appears to be identical in nature to that expressed as the maxim of *Economy* by Smith.

To Smith's maxim of *Certainty* the OECD adds the requirement of *Simplicity*.[98] Elsewhere this has been suggested either as a stand-alone principle,[99] or as an extension of the maxim of *Economy*, since complicated taxes increase compliance costs.[100] Smith himself recognised that practical limitations had to be taken into account in assessing the desirability of imposing a particular tax.[101]

The OECD considers the timing and amount of tax charged as well as the minimisation of tax avoidance to be issues of *Effectiveness and Fairness*.[102] This is perhaps best aligned to Smith's maxim of *Convenience*, although Smith did not make specific reference to issues of avoidance. No

[95] OECD.
[96] OECD.
[97] Australia, "Commonwealth Taxation Review Committee. Full Report January 31 1975" (University of Sydney, 1975), https://adc.library.usyd.edu.au/view?docId=law/xml-main-texts/p00087.xml.
[98] OECD, "Electronic Commerce: Taxation Framework Conditions."
[99] TaxKenya, "Canons of Taxation," 2018, https://www.taxkenya.com/canons-of-taxation/.
[100] Alley and Bentley, "A Remodelling of Adam Smith' s Tax Design Principles."
[101] Lynn, "Adam Smith's Fiscal Ideas: An Eclectic Revisited"; Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations (Volume 3)*.
[102] OECD, "Electronic Commerce: Taxation Framework Conditions."

explicit reference is made by the OECD to fairness from the taxpayer's perspective, although this may perhaps be implied.[103]

Flexibility refers to the ability of a tax system to adapt to changes in technology and business.[104] This in concept might be considered an element of *Neutrality* (which itself appears aligned to Smith's maxim of *Equality*), since a tax system needs to be flexible in responding to new developments in order to maintain equitable tax consequences.

In their exposition of the modern principles of good tax policy, Pistone *et al.* return to the presentation of four overarching concepts – Equity, Economic Efficiency, Administrability and Coherence – under which they discuss 19 principles.[105] While many are consistent with or expand on concepts already discussed above, a number are significant to highlight in the context of a globally coordinated approach to the taxation of crypto-assets.

Within the principle of Equity, both horizontal and inter-nation equity are important considerations in the context of this study. Horizontal equity means that similar amounts of income should result in similar amounts of taxation.[106] In the context of crypto-assets, this means that the tax consequences of transactions effected using crypto-assets should be the same as economically similar transactions effected through traditional means. An element of inter-nation equity includes equity between states,[107] meaning that crypto-asset transactions should lead to similar tax consequences in different jurisdictions. The principles of vertical equity and legitimacy would appear to have less direct application to the taxation of crypto-asset transactions.

[103] Alley and Bentley, "A Remodelling of Adam Smith' s Tax Design Principles."
[104] OECD, "Glossary of Statistical Terms," 2005, https://stats.oecd.org/glossary/.
[105] Pistone et al., "Chapter 2: Principles of Taxation."
[106] Pistone et al.
[107] Pistone et al.

Under the heading of Economic Efficiency, neutrality (linked to principles within the concept of Equity[108]), productivity, stability and simplicity are all relevant considerations. The tax consequences of crypto-asset transactions should not distort economic behaviour or economic participation, should not be subject to frequent significant changes, and should be understandable. Sufficiency of tax revenues is a broader jurisdictional consideration with less direct application to crypto-assets in isolation.

Considering issues of Administrability, the tax consequences of crypto-asset transactions should be certain and enforceable. Account should also be taken of the cost of collection in comparison to the potential tax yield, and to simplicity of compliance (which in some respects may be interrelated with simplicity of the applicable legislation). Information security and confidentiality is primarily a consideration of tax administration.

Within the concept of Coherence, it is important that the approach to the taxation of crypto-assets be coherent within and between taxes, be adaptable (or flexible) in order to be able to respond to a rapidly-developing context, and contribute to international coherence. Considerations of tax base and tax mix are broader policy considerations.

In considering the application of the maxims or principles of tax policy design, it is important to emphasise that these principles are in no way legally binding upon the tax legislation, but rather are principles by which sound tax policy and legislation may be designed, and against which the soundness of existing legislation be evaluated. Furthermore, the various maxims or principles may in some instances compete with one another, and therefore an element of compromise may be necessary.[109] For example, legislation that is simple to understand may be less effective at

[108] Pistone et al.
[109] Alley and Bentley, "A Remodelling of Adam Smith' s Tax Design Principles"; Lynn, "Adam Smith's Fiscal Ideas: An Eclectic Revisited."

achieving horizontal equity than more complex legislation, while pursuing inter-nation equity and coherence may disrupt the stability or certainty of legislation within a particular nation at a particular point in time. A 'fair' tax system should attempt to acknowledge and balance these considerations.[110]

2.3. Research methodology

2.3.1. Selection of the constant comparison research method

In order to facilitate the determination of tax consequences and classification of income arising from crypto-asset transactions, this study will begin by identifying possible taxable events arising from selected crypto-assets and analysing their similarities and differences in order to develop a limited number of transaction categories. This analysis will be performed by applying an adapted form of the 'constant comparison method' traditionally employed in grounded theory research within the interpretivist paradigm[111] to each selected crypto-asset's *white paper*.[112]

In grounded theory research, the researcher seeks to formulate a "general, abstract theory of a process" as the data is analysed, rather than to test an existing hypothesis against the data.[113] Merriam and Tisdell caution that a grounded theory study is restricted to one which uses the constant comparison method to develop 'substantive theory', and that many studies are incorrectly described by their authors as 'grounded theory studies' when they employ this method without pursuing substantive theory development as their end goal. In the present context, the use of the constant comparison method in support of the development of a framework for taxation may perhaps not be described as developing 'substantive theory', and the research methodology

[110] Pistone et al., "Chapter 2: Principles of Taxation."
[111] Merriam and Tisdell, *Qualitative Research : A Guide to Design and Implementation*.
[112] The *white paper* is the concept paper put forward by the originators of a new crypto-asset at the inception phase.
[113] McKerchar, "Philosophical Paradigms, Inquiry Strategies and Knowledge Claims: Applying the Principles of Research Design and Conduct to Taxation."

employed might therefore be better described as borrowing from the techniques of grounded theory rather than conducting a grounded theory study. The study proposed might more accurately fit within the category that Merriam and Tisdell refer to as 'basic qualitative research'.[114]

Bernard describes the following six-step process for applying the constant comparison technique in the context of grounded theory: (1) engage with a section of data, (2) identify potential 'analytic categories' arising from the section, (3) move onto the next section, drawing together and comparing the analytic categories identified with those from previous sections analysed, (4) consider how the identified categories are linked together, (5) use the relationships identified to build 'theoretical models', continuing to compare the model against the data, and (6) use 'exemplars' from the data to demonstrate the validity of the theoretical models developed.[115]

Merriam and Tisdell describe a similar process in the broader context of data analysis. This process begins by identifying sections of data for analysis. A section of data is then analysed, and recurring themes are identified. This process is referred to as 'open coding', and the researcher is "open to anything possible at this point".[116] The themes identified are then grouped into possible categories, in a process referred to as 'axial coding' or 'analytical coding'. The next section of data is then analysed using the same process, comparing the outcomes to those of the preceding analysis and using the comparison to refine a single list of possible categories. Categories may come either from the researcher themselves, if the intention is the development of new theory, or from existing theory, depending on the context of the study. This process of analysis and comparison continues, beginning as one that is inductive and, as the iterations of data analysis continue, becoming one that is increasingly deductive as the analysis begins to confirm the now-stabilising categories, until

[114] Merriam and Tisdell, *Qualitative Research : A Guide to Design and Implementation*.
[115] H. Russell Bernard, *Research Methods in Anthropology*, 4th edition (Oxford: AltaMira Press, 2006). At 492
[116] Merriam and Tisdell, *Qualitative Research : A Guide to Design and Implementation*. At 143.

a point of saturation is reached where further analytical iterations cease to provide further insight. Various levels of analysis may then be pursued using the identified categories. These may range from using the categories merely to describe the data through to developing conceptual models to explain interrelationships between categories and ultimately the development of new theory.[117]

2.3.2. Application of the adapted constant comparison research method to this study

The white paper outlining the value proposition of the first selected crypto-asset will be reviewed section by section. In each section, themes that may represent taxable events will be identified. These will be separated from other content sometimes included in white papers, such as the value proposition of a blockchain application to which the crypto-asset may play a subsidiary role, technical cryptographic and processing information, and information supporting the credibility of the originator organisation. Where a white paper does not exist or fails to provide sufficient detail to support a meaningful analysis of the nature of the selected crypto-asset, supporting material published either by the crypto-asset's originator or by industry commentators will be examined to interrogate the nature of the crypto-asset and support the identification of possible taxable events.

Relevant content identified in each section of the white paper (or supporting material) reviewed will be compared and contrasted, resulting in a list of possible taxable events for the selected crypto-asset. While the taxable events addressed by tax jurisdictions in their pronouncements and guidance on the taxation of crypto-assets will be identified in Chapter 3 of this study, the objective of the white paper analysis will be to allow the description of the proposed crypto-asset to lead the identification of possible taxable events, rather than to seek evidence of currently-established taxable events within white papers.

[117] Merriam and Tisdell. At 141-156.

The process of analysis will continue with the white paper of the next selected crypto-asset. Each additional crypto-asset added to the sample will be allowed to add to, confirm or contradict the consolidated list of possible taxable events. Crypto-assets will continue to be added to the sample until a point is reached where either the consolidated list stabilises and the analysis of further crypto-assets ceases to contribute to further development of that list, or until the extension of the sample will not meaningfully further contribute to the coverage of the current market capitalisation of all publicly traded crypto-assets.

The identification of these possible taxable events will be the first significant contribution of this study.

The possible taxable events identified will then be compared and contrasted with one another in order to develop a limited number of transaction categories. Each transaction category will represent those transactions that are substantially similar in nature to all other transactions within that category, and distinct in nature from every other transaction category.

The transaction categories developed will be the second significant contribution of this study. In addition to their role in the remainder of the study, these transaction categories may serve as a framework for developers of domestic legislation and guidance as they seek to develop comprehensive responses to crypto-asset transactions.

The nature of each transaction category will then be analysed in order to determine the direct tax consequences arising and their classification within the first normative framework of this study, being the model conventions. Where this framework does not fully address all relevant considerations or gives rise to further considerations, these will be addressed with reference to the second normative framework of this study, being the principles of good tax design, and steps to address this either within the model tax conventions or domestic legislation will be proposed.

The robustness of the proposed transaction categories, direct tax consequences and classifications will then be tested through the analysis of an exemplar crypto-asset token selected from outside the original sample of the study.

The results of the analysis will then be compared to outcomes drawn from the OECD's 2020 report *Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues*. This comparison will serve to demonstrate the completeness of the study as well as the contribution that a globally coordinated approach can make in bringing consistency to the taxation of crypto-asset transactions in comparison to the fragmented outcomes of the jurisdiction-specific approach evident in the OECD's report.

The determination of direct tax consequences and classification within the model conventions, together with any proposed additions to the model conventions or to domestic legislation, will be the third and fourth significant contributions of this study, respectively.

The study will then consider the allocation of taxing rights arising from the proposed classifications within the text of the articles of the model tax conventions and any challenges to existing tax bases that may arise from the nature of the crypto-asset transaction categories developed. This will be the fifth significant contribution of this study.

Finally, the implications of possible future developments to the taxation of the digitalised economy, in the form of either Pillar One and Two of the OECD's BEPS Project or the UN's article 12B proposals as at 30 June 2021, for the allocation of taxing rights over crypto-asset transaction will be considered. This will be the sixth significant contribution of this study and will be of particular relevance to the wider debate on the taxation of the digitalised economy.

2.3.3. Use of computer assisted qualitative data analysis software

Literature on qualitative analysis highlights the benefits of using computer assisted qualitative data analysis software (or CAQDAS), with the caveat that while analysis software empowers the researcher, it does not 'do' the analysis.[118] In this study, the NVivo CAQDAS is used to support the organisation and analysis of the selected white papers.

In NVivo, each identified possible taxable event is coded to a node. As a new white paper is analysed, identified possible taxable events are compared to those coded to existing nodes. Where the identified item exhibits similar characteristics, it is coded to the same node. Where the item appears unique, it is coded to a new node. As the sample expands and defining characteristics develop further, nodes that prove to be similar may be combined, while a node that incorporates contrasting characteristics may be split. The outcomes of this stage of the analysis are discussed in Chapter 4.3, while a detailed analysis of each selected crypto-asset is presented in Appendix B. Summary NVivo outputs are included in Appendix D.

As the study progresses, nodes are compared to one another to determine the extent to which they can be grouped to represent transaction categories. Thus, sub-nodes representing a particular transaction are assigned to nodes representing transaction categories. This stage of the analysis is presented in Chapter 4.4. These transaction categories form the basis of the analysis of tax consequences arising from crypto-asset transactions.

[118] Merriam and Tisdell; Bernard, *Research Methods in Anthropology*.

3. REVIEW OF THE CURRENT STATE OF THE TAXATION OF CRYPTO-ASSETS

3.1. Introduction

As the universe of available crypto-assets expands, important questions need to be asked as to whether the distinctive elements of these products should result in unique tax consequences.[119] At present, the taxation of crypto-assets remains inconsistent, as individual jurisdictions have attempted to determine tax consequences for their jurisdictions.[120]

In addition to the United States of America (USA), the Law Library of Congress in 2018 identified a further 21 countries that had attempted to address tax consequences within their jurisdictions.[121] This list of 22 countries forms the basis of a review of positions, legislation, and guidance in issue around the world in respect of crypto-asset transactions. During the course of this review, further countries were identified that had issued positions, guidance or legislation between the date of the 2018 study and the date on which the review was completed (31 October 2019). The latest available guidance and legislation as at 31 October 2019 is used in the review, and the additional countries identified – Chile, France, Germany, Malta, Portugal, and Singapore – added to the sample, increasing it to 28 countries in total.[122]

3.2. Observations

A country-by-country review of the 28 countries identified as having issued guidelines or position statements or having amended legislation to address the taxation of crypto-asset transactions is

[119] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."
[120] Geneva Group International, "The Taxation of Income from Cryptocurrencies in Various Jurisdictions," *FYI International Taxation News*, 2019, http://press.ggi.com/itpg/se_01_cryptocurrencies/; Nexia International, "Lack of International Tax Consensus on Cryptocurrency."
[121] Law Library of Congress, "Regulation of Cryptocurrency Around the World," 2018, http://www.law.gov.
[122] It should be noted that in 2020 the OECD released its report titled *Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues*, in which it considered the collected survey responses from 53 jurisdictions outlining their approach to the taxation of crypto-assets. The findings of that report are considered in Chapter 6.

presented in full in Appendix A. In this section, the outcomes of that review are summarised in the following table and discussed. The table is sorted firstly between countries that had and had not issued detailed guidance at the date of the review, and secondly according to how many topics that country's guidance (or statement of position or legislative amendments) addresses.

The review performed reveals significant observations about the global development of the taxation of crypto-assets that will be explored in more detail.

Table 1: Summary of crypto-asset tax guidance and positions by country

Country	Latest guidance	Total issues addressed	Preferred terminology	Designation	Legal tender	Indirect tax	
						VAT legislation amended	VAT consequences addressed
Australia	2019	12	Cryptocurrency	Not stated	No	Yes	Yes
Finland	2019	12	Virtual currency	Property	No	No	Yes
UK	2018	12	Crypto-asset	Not stated	No	No	Yes
Malta	2018	11	Direct ledger technology	Not stated	No	No	Yes
Canada	2019	9	Cryptocurrency	Commodity	No	Yes	Yes
Norway	2019	9	Digital currency/virtual currency	Asset	No	No	Yes
Switzerland	2019	9	Cryptocurrency	Intangible/movable asset/derivative	No	No	No
USA	2019	9	Virtual currency	Property	No	No	No
Israel	2018	7	Digital token	Financial asset	No	No	Yes
South Africa	2018	7	Cryptocurrency	Financial instrument	No	Yes	Yes
Sweden	2015	7	Virtual currency	Asset	No	No	Yes
Austria	2017	5	Virtual currency	Intangible asset	No	No	Yes
Poland	2018	4	Cryptocurrency	Not stated	Not stated	No	Yes
Slovakia	2018	4	Virtual currency	Not stated	No	No	Unconfirmed, but EU member
Chile	2018	2	Cryptocurrency	Not stated	No	No	Yes
Singapore	(2020)	1	Virtual currency/cryptocurrency	Not stated	No	No	Yes
Spain	None	7	*Secondary source*	Intangible asset	No	No	Yes
France	None	6	Digital asset	Intangible property	No	No	Unconfirmed, but EU member
Italy	None	2	Virtual currency	Not stated	Not stated	No	Yes
Argentina	None	1	Digital currency	Not stated	No	No	No
Bulgaria	None	1	*Secondary source*	Financial asset	No	No	Unconfirmed, but EU member
Denmark	None	1	Bitcoin	Not stated	No	No	No
Germany	None	1	Virtual currency	Not stated	Not stated	Yes	Yes
Japan	None	1	*Secondary source*	Not stated by secondary sources	Not stated by secondary sources	No	No
Portugal	None	1	Cryptocurrency	Not stated	No	No	Yes
Romania	None	1	*Secondary source*	Not stated by secondary sources	Not stated by secondary sources	No	Unconfirmed, but EU member
Russia	None	1	Cryptocurrency	Property	No	No	No
Iceland	None	0	Bitcoin	Not stated	No	No	No
Yes					0	4	17
No					23	24	7
Other					5	0	4
Total					28	28	28

Table 1 (continued)

Country	Direct tax - holder																	Direct tax - issuer
	Income tax legislation amended	Profit or loss (general)	Payment for goods/ services	Sale for fiat currency	Mining - general/ proof-of-work	Exchange for other crypto-asset	Investment/ capital	Business/ revenue	Receipt as remuneration	Dispose of as gift	Forks and airdrops	Participation in ICO	Crypto exchange or ATM	Mining - Transaction fees	Other token categories	Loss or theft	Mining - Proof-of-stake	Income tax consequences addressed
Australia	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No	No
Finland	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	Yes	No
UK	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	No	No
Malta	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
Canada	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Yes	No	No	No	No
Norway	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	No
Switzerland	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	No	No	Yes	No	No	Yes
USA	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
Israel	No	No	No	No	Yes	No	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	Yes
South Africa	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Sweden	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Austria	No	No	No	No	Yes	No	Yes	Yes	No	No	No	No	Yes	No	No	No	No	No
Poland	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Slovakia	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Chile	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Singapore	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Spain	No	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	No	No	No	No	No
France	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Italy	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Argentina	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Bulgaria	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Denmark	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Germany	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Japan	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Portugal	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Romania	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Russia	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Iceland	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Yes	5	7	15	14	15	11	13	13	8	5	4	4	4	3	3	2	2	3
No	23	21	13	14	13	17	15	15	20	23	24	24	24	25	25	26	26	25
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28

3.2.1. Differences in terminology

There currently exists no universally accepted definition of either cryptocurrency[123] or crypto-assets.[124] This poses significant challenges to the determination of appropriate tax consequences.[125]

The various guidance documents, position statements and legislative amendments of the countries considered use at least eight different terms in reference to what may broadly be referred to as crypto-assets, and in many instances include jurisdiction-specific definitions of the terminology used. It is seldom clear whether those differences in terminology or definition are intended to distinguish their intended scope or meaning in that jurisdiction, or merely represent the preferred terminology of that jurisdiction.

If the review is expanded to include other significant regulatory pronouncements and literature on crypto-assets, an evolution in terminology seems evident, although there are (perhaps inevitably) outliers and conflicting perspectives at various points. Early engagement with the concept of crypto-assets typically involved comparisons to 'fiat currency', which is otherwise referred to as 'legal tender' or simply 'currency' (see for example the Financial Action Task Force's report on Virtual Currencies[126]). The fiat currency of a particular country exists in physical form (that is, notes or coins), is regulated by the central bank of that country, and must by law be accepted in settlement of a debt in that country.[127] Claims against a commercial bank for fiat currency (such

[123] Louise Fjord Kjaersgaard and Autilia Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives," *Intertax* 47, no. 6 & 7 (2019): 620–34, https://kluwerlawonline.com/journalarticle/Intertax/47.6/TAXI2019061.

[124] ECB Crypto-Assets Task Force, "Crypto-Assets: Implications for Financial Stability, Monetary Policy, and Payments and Market Infrastructures"; Republic of Serbia Securities Commission, "Consultation Paper on Regulation of Cryptoassets in the Republic of Serbia," 2019, http://www.sec.gov.rs/index.php/en/component/edocman/7115-cryptoassets-consultation-paper/viewdocument?Itemid=.

[125] Kjaersgaard and Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives."

[126] Financial Action Task Force, "Virtual Currencies - Key Definitions and Potential AML/CFT Risks," 2014, www.fatf-gafi.org.

[127] Kjaersgaard and Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives"; European Central Bank, "Virtual Currency Schemes - a Further Analysis"; Crypto Assets Regulatory Working Group,

as scriptural money, bank money or e-money) are not themselves fiat currency, meaning that they are accepted in transactions by choice rather than by law. Currency and claims are collectively defined as 'funds'.[128]

Earlier engagements with crypto-assets appear to favour the term 'virtual currency', which represents a specific subset of the larger concept of 'digital currency'. Digital currency encompasses both virtual currency and e-money. E-money is a "digital representation of fiat currency", while virtual currency fulfils at least one of the defining functions of money, but is not issued by a government and does not have the legal status of fiat currency.[129]

Virtual currency may then be subdivided into 'non-convertible' or 'convertible' virtual currency. Non-convertible (or 'closed') virtual currency cannot be exchanged for fiat currency, and is designed only for use in a particular environment, such as a video-game.[130] It therefore does not have any significant interaction with the real economy.[131] Convertible (or 'open') virtual currency, in contrast, has a value in fiat currency.[132] Convertible virtual currency may be either 'unidirectional' or 'bi-directional', meaning that it can either be bought, or both bought and sold, for fiat currency.[133] Within virtual currency, distinction may also be made between those that are part of either a decentralised or a centralised system.[134] Bitcoin was the original decentralised, bi-

"Consultation Paper on Policy Proposals for Crypto Assets," 2019, http://www.treasury.gov.za/comm_media/press/2019/CAR WG Consultation paper on crypto assets_final.pdf.
[128] European Central Bank, "Virtual Currency Schemes - a Further Analysis."
[129] Financial Action Task Force, "Virtual Currencies - Key Definitions and Potential AML/CFT Risks." At 4.
[130] Financial Action Task Force.
[131] European Central Bank, "Virtual Currency Schemes - a Further Analysis."
[132] Internal Revenue Service, "Notice 2014-21," 2014, https://www.irs.gov/pub/irs-drop/n-14-21.pdf.
[133] European Central Bank, "Virtual Currency Schemes - a Further Analysis"; Financial Action Task Force, "Virtual Currencies - Key Definitions and Potential AML/CFT Risks."
[134] European Central Bank, "Virtual Currency Schemes - a Further Analysis."

directional virtual currency, which was followed by a variety of 'altcoins'.[135] During this first period, literature on the topic often addressed Bitcoin directly.[136]

Bi-directional virtual currencies are considered synonymous with the term 'cryptocurrencies',[137] and it seems that a second period emerged where this became the dominant term in the literature.[138] Cryptocurrency is a "math-based, decentralized convertible virtual currency that is protected by cryptography.—i.e., it incorporates principles of cryptography to implement a distributed, decentralized, secure information economy".[139] The term is derived from the application of cryptography within the blockchain, together with its intended function as an alternative form of money to fiat currency.[140] However, while acknowledging this as the prevalent term at that time, questions were simultaneously raised within policy documents as to the true function of cryptocurrencies, since they did not all seem to be intended as a means of payment.[141]

As consideration of the topic progressed, acknowledgement began to be given to the reality that different use cases existed within the common application of blockchain technology. Cryptocurrency began to be thought of as encompassing both 'coins' (those applications used as alternative means of payment) and 'tokens' (being all other use cases).[142] Tokens could be further

[135] European Central Bank; Financial Action Task Force, "Virtual Currencies - Key Definitions and Potential AML/CFT Risks."
[136] See for example Aleksandra Bal, *Chapter 14 - How to Tax Bitcoin?*, ed. David LEE Kuo Chuen, *Handbook of Digital Currency: Bitcoin, Innovation, Financial Instruments and Big Data* (London: Elsevier Inc., 2015), https://doi.org/10.1016/B978-0-12-802117-0.00014-X; Scott A Wiseman, "Property or Currency? The Tax Dilemma Behind Bitcoin," *Utah Law Review*, no. 2 (2016): 417–40, https://doi.org/10.1525/sp.2007.54.1.23.
[137] European Central Bank, "Virtual Currency Schemes - a Further Analysis"; Financial Action Task Force, "Virtual Currencies - Key Definitions and Potential AML/CFT Risks."
[138] See for example Hileman and Rauchs, "Global Cryptocurrency Benchmarking Study"; Aleksandra Bal, "US Regulatory Framework for Cryptocurrency Transactions," *Finance and Capital Markets, Journal Articles & Opinion Pieces IBFD* 20, no. 5 (2018), https://research.ibfd.org/#/doc?url=/document/dfi_2018_05_us_2; Law Library of Congress, "Regulation of Cryptocurrency Around the World."
[139] Financial Action Task Force, "Virtual Currencies - Key Definitions and Potential AML/CFT Risks." At 5.
[140] Herbert and Stabauer, "Bitcoin & Co: An Ontology for Categorising Cryptocurrencies."
[141] See for example European Central Bank, "Virtual Currency Schemes - a Further Analysis."
[142] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."

deconstructed according to particular use cases into 'utility tokens' and 'security tokens'.[143] Security tokens have features akin to debt or equity, while utility tokens give access to or rights in respect of a particular network.[144] A fourth category, 'asset tokens', is sometimes included in respect of those tokens that represent ownership of physical assets that has been 'tokenised'.[145]

While cryptocurrency remains a prevalent term, most recently this has been substituted in some instances by the term 'crypto-assets'.[146] There appear to be two reasons for the adoption of the term 'crypto-assets', both stemming from the problematic use of the suffix -currency. Firstly, this creates a potentially misleading suggestion that cryptocurrency might be officially endorsed as representing fiat currency if used in official documentation.[147] Secondly, it may be somewhat circular to use a universal term that includes specific reference to a particular use case, while the term 'crypto-asset' could function as a term to incorporate multiple use cases.[148]

Among the varying definitions of 'crypto-asset' that have been proposed, references to blockchain and cryptography (or equivalent concepts) continue to be incorporated, while acknowledgement is given to a wider range of use cases than merely facilitating payment,[149] as in the description of a "digital representation of value or contractual rights".[150] To further distance these concepts from

[143] Stefan Stellato, "Is Finland the next Crypto Tax Super Power?," Kluwer International Tax Blog, 2019, http://kluwertaxblog.com/2019/06/21/is-finland-the-next-crypto-tax-super-power/.
[144] Thomas Euler, "The Token Classification Framework: A Multi-Dimensional Tool for Understanding and Classifying Crypto Tokens," 2018, http://www.untitled-inc.com/the-token-classification-framework-a-multi-dimensional-tool-for-understanding-and-classifying-crypto-tokens/.
[145] Kjaersgaard and Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives."
[146] See for example HMRC, "Cryptoassets for Individuals," 2018, https://www.gov.uk/government/publications/tax-on-cryptoassets/cryptoassets-for-individuals; Crypto Assets Regulatory Working Group, "Consultation Paper on Policy Proposals for Crypto Assets"; Financial Conduct Authority, "Guidance on Cryptoassets," 2019, https://www.fca.org.uk/publication/consultation/cp19-03.pdf.
[147] Crypto Assets Regulatory Working Group, "Consultation Paper on Policy Proposals for Crypto Assets."
[148] Financial Conduct Authority, "Guidance on Cryptoassets."
[149] HMRC, "Cryptoassets for Individuals."
[150] HMRC; Financial Conduct Authority, "Guidance on Cryptoassets." At 8.

fiat currency, references to ‘cryptocurrency’ as representing the particular use case of facilitating payment have in some instances been replaced by references to ‘exchange tokens’.[151]

The evolution of terminology may be summarised as follows:

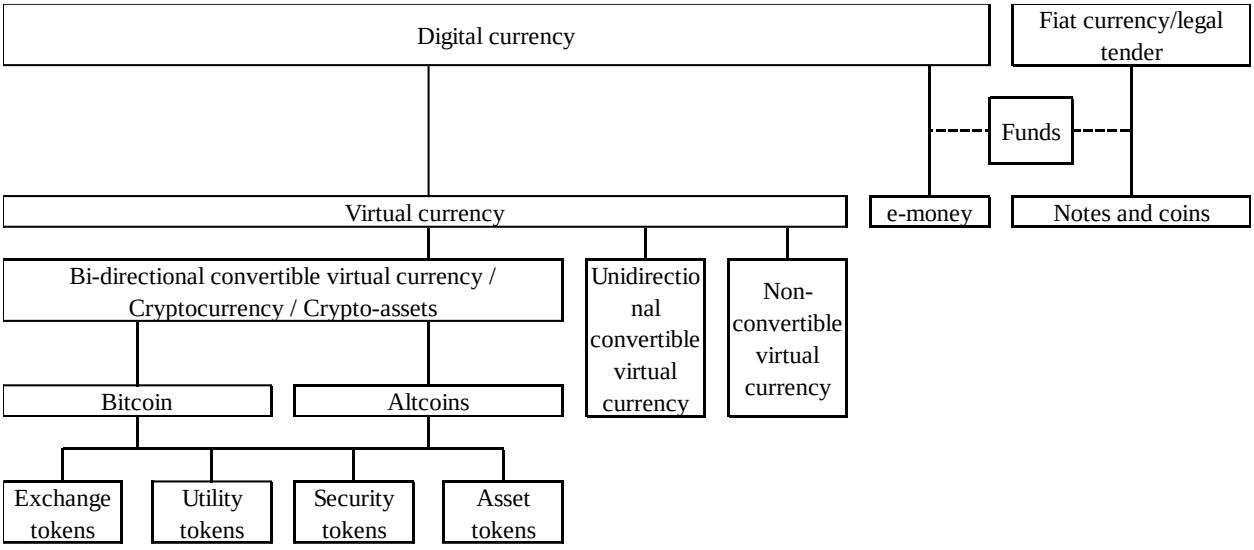

Figure 1: Evolution of the crypto-asset taxonomy

An orderly evolution might thus arrive at the use of either ‘cryptocurrency’ or ‘crypto-asset’ as the universal term, encompassing a range of specific use-case token categories, such as exchange, utility, security, and asset tokens, as illustrated in Figure 1 above. This conception would, however, suggest a somewhat artificially orderly and consistent process of refinement. As has already been observed in Table 1, a variety of terminology is in use in the context of taxation in the 28 jurisdictions examined. It is unclear the extent to which these terms should be viewed as interchangeable, or to represent important distinctions. Inconsistent terminology sometimes exists even within the same jurisdiction. For example, Canada’s tax guidance refers to ‘cryptocurrency’,

[151] See for example HMRC, “Cryptoassets for Individuals”; Financial Conduct Authority, “Guidance on Cryptoassets.”

while its proposed amendment to the Excise Tax Act refers to a 'virtual payment instrument'.[152] The UK's most recent guidance refers to 'crypto-assets', while its 2014 guidance (still in issue at the time of the review) refers to 'cryptocurrencies'.[153, 154] Australia's income tax guidance refers to 'cryptocurrency', while its GST guidance refers to 'digital currency'.[155] In South Africa, the Value-Added Tax Act as well as SARS guidance refers to 'cryptocurrency'[156] while the Income Tax Act (as of 2021) refers to 'crypto-assets'.[157] The significance of all these differences in terminology is far from clear.

While different terms may or may not reflect differences in conception of the topic, not every difference in conception has been reflected by a change in terminology. Across the 28 countries reviewed, 'cryptocurrency' is the dominant term in use. In the literature, early engagements use the term 'cryptocurrency' in addressing the single use case of payment facilitation, while later engagements address a variety of use cases using 'cryptocurrency' as a universal term. Yet in the Australian guidance, users are advised that 'cryptocurrency' should be understood to refer specifically to Bitcoin, or to "other crypto or digital currencies that have similar characteristics" to

[152] Canada Revenue Authority, "Guide for Cryptocurrency Users and Tax Professionals," 2019, https://www.canada.ca/en/revenue-agency/programs/about-canada-revenue-agency-cra/compliance/digital-currency/cryptocurrency-guide.html; Government of Canada, "Draft Legislation Relating to the Excise Tax Act" (2019), https://www.fin.gc.ca/drleg-apl/2019/gst-hst-tps-tvh-l-eng.asp.

[153] HMRC, "Cryptoassets for Individuals"; HMRC, "Revenue and Customs Brief 9 (2014): Bitcoin and Other Cryptocurrencies," 2014, https://www.gov.uk/government/publications/revenue-and-customs-brief-9-2014-bitcoin-and-other-cryptocurrencies/revenue-and-customs-brief-9-2014-bitcoin-and-other-cryptocurrencies.

[154] New guidance for businesses subsequently issued and replacing 2014 guidance refers to crypto-assets. See HMRC, "Cryptoassets Manual," 2021, https://www.gov.uk/hmrc-internal-manuals/cryptoassets-manual.

[155] Australian Taxation Office, "Tax Treatment of Cryptocurrencies," 2019, https://www.ato.gov.au/general/gen/tax-treatment-of-crypto-currencies-in-australia---specifically-bitcoin/; Australian Taxation Office, "GST and Digital Currency," 2017, https://www.ato.gov.au/business/gst/in-detail/your-industry/financial-services-and-insurance/gst-and-digital-currency/.

[156] South Africa, "Value-Added Tax Act," Pub. L. No. 89 (1991), http://sars.mylexisnexis.co.za; South African Revenue Service, "SARS's Stance on the Tax Treatment of Cryptocurrencies," 2018, http://www.sars.gov.za/Media/MediaReleases/Pages/6-April-2018---SARS-stance-on-the-tax-treatment-of-cryptocurrencies-.aspx.

[157] South Africa, "Income Tax Act," Pub. L. No. 58 (1962), http://sars.mylexisnexis.co.za.

Bitcoin.[158] It is therefore unclear whether pronouncements employing the term 'cryptocurrency' extend to all use cases or only to payment use cases. For example, in South Africa the buying or selling of 'cryptocurrency' is a VAT-exempt financial service.[159] The VAT Act does not include a definition of 'cryptocurrency'. Should this exemption be understood then to apply only to exchange tokens, or to all crypto-assets?

While 'crypto-asset' may represent the latest evolution in terminology, its meaning is not universally consistent in the literature. The UK guidance recognises 'crypto-assets' as encompassing exchange, utility, and security tokens.[160] Yet this guidance chooses to address only the use of exchange tokens, although confusingly continuing to refer to the tax consequences of 'crypto-assets' rather than specifically referring to 'exchange tokens' throughout.

Again looking beyond taxation to regulatory pronouncements, the UK's Financial Conduct Authority states its intended use of 'crypto-asset' as a broad term encompassing exchange, utility and security tokens, yet implicitly scopes out the tokens of centralised networks, such as Ripple, through its reference to the common application of distributed ledger technology.[161] South Africa's Crypto Assets Regulatory Working Group is more explicit, stating that crypto-assets are by definition issued by decentralised entities.[162] The ECB Crypto-Assets Task Force excludes from its definition of 'crypto-asset' any "financial claim on, or a liability of, any identifiable entity", thereby limiting its applicability to security tokens. It also excludes 'stablecoins' – tokens whose value is pegged to a fiat currency or commodity – on the basis of having an identifiable issuer.

[158] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[159] South Africa, Value-Added Tax Act.
[160] HMRC, "Cryptoassets for Individuals."
[161] Financial Conduct Authority, "Guidance on Cryptoassets."
[162] Crypto Assets Regulatory Working Group, "Consultation Paper on Policy Proposals for Crypto Assets."

Finally, it scopes out tokens issued by any central bank.[163] These restrictions result in a term of significantly narrower definition than when used in other contexts.

Within the countries reviewed, only the UK adopts the term 'crypto-asset', with 'cryptocurrency' being the most commonly-used term. France, Israel, and Malta are unique in their reference to 'digital asset', 'digital token' and 'DLT asset', respectively. While not every difference in terminology necessarily reflects a difference in scope of application, it is submitted that the use of different terminology with jurisdiction-specific definitions makes comparison between jurisdictions more difficult, and is evidence of a fragmented approach to the taxation of crypto-asset transactions.

3.2.2. Differences in identity or nature

Crypto-assets were ascribed or legislatively designated a particular identity or nature in 13 of the 28 countries reviewed. Within these 13 countries, eight different identities were noted. These range from the very generic (asset, commodity, or property), to more specific (movable asset, intangible asset, intangible property, to very particular designations that may result in the application of specific tax provisions (financial asset, financial instrument, derivative financial instrument).

While not every difference in identity or nature is evidence of different tax consequences, they do in some instances lead to contradictions between jurisdictions. For example, while South Africa has designated crypto-assets to be financial instruments,[164] Austria has stated that crypto-assets cannot be financial instruments.[165]

[163] ECB Crypto-Assets Task Force, "Crypto-Assets: Implications for Financial Stability, Monetary Policy, and Payments and Market Infrastructures."
[164] South Africa, "Taxation Laws Amendment Act" (2019), http://www.treasury.gov.za/legislation/acts/2018/Taxation Laws Amend Act 23 of 2018.pdf.
[165] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."

Such variety and potential contradiction give little clarity as to the 'correct' identity to apply within jurisdictions that have not made an explicit statement to this effect. The lack of a consistent basis for determining the identity or nature of a particular crypto-asset is likely to lead to different tax consequences of crypto-asset transactions in different jurisdictions, and may lead to difficulties in determining taxing rights in cross-border transactions involving countries applying different designations.

3.2.3. Limited number of legislative amendments

Attempts to address the tax consequences of crypto-assets have to date resulted in limited amendments to tax legislation. Only four countries have amended (or intend to amend) their indirect tax legislation, and five their income tax legislation. Often, these amendments are merely to clarify the taxability of such transactions, or to include crypto-assets within the scope of particular provisions in order to achieve desired tax outcomes.

The limited number of legislative amendments suggests that, in the main, countries within the sample are of the opinion that existing legislation is sufficient to govern the tax consequences of transactions involving this emerging technology, and that what primarily is required are statements or guidance in support of the correct application thereof.

3.2.4. Differences in scope of taxpayers addressed

Of the 17 countries that have issued detailed guidance, ten focus their income tax guidance primarily on holders of crypto-assets engaging in either investment (in most cases focusing on individuals) or business transactions. Three – Australia, Austria, and Malta – extend their guidance to include crypto-asset intermediary businesses or operators of crypto-asset automated telling

machines (ATMs).[166] Spain also addresses these businesses within its published binding rulings.[167] Such businesses are included more frequently within the scope of VAT guidance or position statements, since this was the context of the taxpayer's business in *Skatteverket v David Hedqvist*, the ruling which had significant influence on EU jurisdictions.[168]

The restricted scope of guidance in most instances to crypto-asset users and intermediaries suggests that a significant element of the crypto-asset industry, being crypto-asset issuers, remains largely unaddressed. The total value of ICOs in 2017 (the year in which ICOs gained prominence, with 1 253 in comparison to 29 in 2016) amounted to USD 6.2 billion, and in 2018 to USD 7.8 billion.[169] It is perhaps not surprising that the countries to consider income tax consequences for issuers of crypto-assets – Israel, Malta and Switzerland – seek to position themselves as preferred locations for the crypto-asset industry.[170] Beyond these jurisdictions, a lack of tax certainty for crypto-asset issuers seems prevalent.

3.2.5. Differences in depth and breadth of engagement

Of the 28 countries considered at October 2019, the engagement of 11 does not extend to the issuing of guidance for taxpayers in respect of the tax consequences of crypto-asset transactions.

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[166] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."; Bundesministerium Fur Finanzen, "Steuerliche Behandlung von Kryptowährungen (Virtuelle Währungen) [Tax Treatment of Cryptocurrencies (Virtual Currencies)]," 2017, https://perma.cc/BU4Z-3BFY; Office of the Commissioner for Revenue, "VAT Treatment of Transactions or Arrangements Involving DLT Assets," 2018, https://cfr.gov.mt/en/vat/guidelines_to_certain_VAT_Procedures/Documents/Guidelines - DLTs VAT.pdf

[167] Sergio Luis Náñez Alonso, "Activities and Operations with Cryptocurrencies and Their Taxation Implications: The Spanish Case," *Laws* 8, no. 16 (2019): 1–13, https://doi.org/10.3390/laws8030016.

[168] Case C-264/14, Skatteverket v David Hedqvist, ECLI:EU:C:2015:718 (2015).

[169] ICOdata, "ICO 2018 Statistics," 2019, https://www.icodata.io/stats/2018.

[170] Juanita Brockdorff, Justyna Bielik, and Katarzyna Bronzewska, "How Small Islands Are Setting the Tone for Crypto Regulation: Malta and Jersey's Approaches," *Finance and Capital Markets, Journal Articles & Opinion Pieces IBFD* 21, no. 1 (2019), https://research.ibfd.org/#/doc?url=/document/dfi_2019_01_mt_1; EY, "Israeli Tax Authorities Address Issues Regarding Issuance of Utility Tokens, Blockchain Technologies and Cryptocurrencies, Including Related Tax Benefits," 2018, https://www.ey.com/gl/en/services/tax/international-tax/alert--israeli-tax-authorities-address-issues-regarding-issuance-of-utility-tokens-blockchain-technologies-and-cryptocurrencies-including-related-tax-benefits; Markus Frank Huber, Silvan Guler, and Janine Dumont, "Switzerland By the Same Token: Swiss Tax Questions in the Context of Initial Coin Offerings," *Finance and Capital Markets, Journal Articles & Opinion Pieces IBFD* 20, no. 3 (2018), https://research.ibfd.org/#/doc?url=/document/dfi_2018_03_ch_1.

These countries have communicated that either all or specific crypto-asset transactions are taxable, or have addressed only indirect tax consequences of transactions. Limited statements on the taxability of crypto-asset transactions such as these may be insufficient, since they assume that taxpayers have the requisite knowledge and skill to determine those consequences. Detailed guidance for taxpayers is therefore considered preferable.[171]

The summary presented in Table 1 highlights significant differences in the scope of scenarios and transactions covered by guidance documents or position statements. Most guidance documents address indirect tax consequences together with the direct tax consequences of the more common crypto-asset transactions of mining, payment, sale, or exchange. They also at least raise the possibility of the proceeds being either capital or revenue in nature. However, for the most part only eight countries deal with more advanced crypto-asset transactions such as remuneration, disposals in the form of gifts, participation in ICOs, token receipts arising from hard forks and airdrops, mining transaction fees, tokens other than exchange tokens, whether loss or theft of tokens constitutes a disposal, and DPoS mining. No country's guidance addresses every scenario or transaction considered in the table.

There is also considerable distinction in the degree of depth to which each of the transactions summarised in Table 1 are considered. The guidance of countries near the top of the table is in most instances notably more comprehensive than that of those near the bottom. For example, Finland's guidance runs to 25 pages and includes 11 worked examples, while Chile's is limited to only three pages with no examples. Australia provides two-and-a-half pages of guidance on crypto-assets as investments and personal use assets, while South Africa merely states that the proceeds from crypto-asset transactions may be considered either as gross income or for capital gains,

[171] Bal, *Chapter 14 - How to Tax Bitcoin?*

leaving it to the taxpayer to determine the appropriate application of existing legislation and case law. The distinction between guidance and position statement is therefore somewhat blurred as one moves further down the table, and the assessment of 17 countries as having issued guidance might be viewed as a generous one.

Thus, of the 28 countries identified as having engaged with the tax consequences of crypto-asset transactions, only 17 at most have issued guidance on the subject at October 2019. Only eight jurisdictions might be considered as having issued comprehensive guidance, and no jurisdiction might be viewed as having issued 'complete' guidance. In short, guidance available to the majority of taxpayers engaging in more complex crypto-asset transactions is lacking.

3.2.6. Relative consistency in VAT treatment

Following the decision in *Skatteverket v David Hedqvist* it seems that jurisdictions both within the EU and beyond are converging towards the position that crypto-asset payment and sale transactions should be exempt from VAT, although there are still jurisdictions that have not yet confirmed their adoption of this position. The exemption of payments and crypto-asset sales attempts to create neutrality (or equity) between crypto-asset and fiat currency payments, and eliminates double taxation arising from payments made using crypto-assets (that is, the levying of indirect tax on both the supply of the crypto-asset and the counter-supply of the good or service).[172] Beyond the EU, where VAT legislation does not include provisions that may extend to payments in crypto-assets in order to achieve fiscal neutrality this may have necessitated amendment to

[172] Cecileen Greeff, "An Investigation into the Output Tax Consequences of Bitcoin Transactions for a South African Value-Added Tax Vendor," *South African Journal of Economic and Management Sciences* 22, no. 1 (2019): 1–9, https://doi.org/10.4102/sajems.v22i1.2162.

legislation, such as the specific exemption granted to crypto-asset transactions in amendments to South Africa's Value-Added Tax Act in 2019.[173]

Where the boundaries of the prescribed VAT treatment lie, however, is not always clear. The ruling in *Skatteverket v David Hedqvist* was based on an acceptance of the view that bitcoins serve no other purpose than as a means of payment,[174] the correctness of which was questioned at the time.[175] The ruling therefore applies to exchange tokens, and cannot be presumed to apply to transactions involving other types of tokens.[176] This was recognised in the VAT guidance issued by both Malta and Sweden in 2018 and by Norway in 2019, which explicitly restricted the VAT exemption to tokens that function as a means of payment.[177] Malta and Sweden stated that other tokens should be taxed as single- or multi-function vouchers, while Norway did not address the VAT consequences of other token transactions. Canada's proposed inclusion of 'virtual payment instrument' in its Excise Tax Act makes specific reference in its definition to 'medium of exchange', thus limiting its application. The UK in its 2014 VAT guidance refers to "Bitcoin and similar cryptocurrencies" rather than 'crypto-assets', being the preferred term in its 2018 guidance (although this may simply reflect a development in preferred terminology over time),[178] while Australia refers to 'digital currency' rather than its default 'cryptocurrency', and uses its definition

[173] South Africa, Taxation Laws Amendment Act.
[174] Case C-264/14, Skatteverket v David Hedqvist, ECLI:EU:C:2015:718.
[175] See Aleksandra Bal, "Bitcoin Transactions : Recent Tax Developments and Regulatory Responses," *Finance and Capital Markets, Journal Articles & Opinion Pieces IBFD* 17, no. 5 (2015), https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/dfi_2015_05_int_2.
[176] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."
[177] Office of the Commissioner for Revenue, "VAT Treatment of Transactions or Arrangements Involving DLT Assets," 2018; Skatteetaten, "Tax and VAT Relating to Bitcoin and Other Virtual Currencies," 2019, https://www.skatteetaten.no/en/business-and-organisation/reporting-and-industries/industries-special-regulations/internet/tax-and-vat-on-virtual-currencies/; Skatteverket, "Transaktioner Med Virtuella Valutor, Mervärdesskatt [Virtual Currency Transactions, Value Added Tax]," 2018, https://www4.skatteverket.se/rattsligvagledning/372981.html?date=2018-11-29&q=virtuella+valutor.
[178] HMRC, "Revenue and Customs Brief 9 (2014): Bitcoin and Other Cryptocurrencies."

to scope out tokens that confer rights or entitlement on holders.[179] However, not all VAT guidance or legislation makes reference to exclusions, and it is unclear in these instances whether or not these exclusions are intended and should be inferred. This suggests that, at best, there remains a lack of clarity as to the VAT consequences of a broad range of crypto-asset transactions, and at worst a lack of consistency in consequences between countries.

Similarly, the ECJ ruling explicitly addressed only the services of crypto-asset exchanges, and the exchange of fiat currency for crypto-assets, although the principles applied may reasonably be extended to payments in crypto-assets.[180] The VAT status of other crypto-asset transactions is less clear. Various jurisdictions have expressed the view that crypto-asset mining is exempt or otherwise excluded from VAT consequences, due to a lack of either an identifiable counterparty or a contractual relationship between mining activities and rewards earned. Where considered separately, this seems to apply both to mining and transaction fees. This however was not a specific outcome of the ECJ ruling, and may be open to alternative interpretations.[181] South Africa appears to have taken the most extreme position to the exemption of crypto-asset transactions from VAT, with the exemption of "the issue, acquisition, collection, buying or selling or transfer of ownership of any cryptocurrency".[182]

Israel and Singapore were the only two countries identified that currently take a different position to the majority on the VAT implications of crypto-asset transactions, although Singapore is contemplating an amended position that will more closely align with that of other countries.

[179] Australian Taxation Office, "GST and Digital Currency."
[180] Jasmin Kollmann, "The VAT Treatment of Cryptocurrencies," *EC Tax Review* 28, no. 3 (2019): 164–70, https://kluwerlawonline.com/journalarticle/EC+Tax+Review/28.3/ECTA2019019.
[181] Kollmann.
[182] South Africa, Value-Added Tax Act.

Canada has proposed amendments to its indirect tax legislation that will align its position with the majority stance.[183]

In 2020, the African Tax Administration Forum issued its *Value Added Tax Technical Note on Digital Financial Assets*. This report envisages a seemingly greater scope of application of VAT to crypto-asset transactions, suggesting that the levying of VAT should be considered in respect of the exchange of one crypto-asset for another or for fiat currency, and on utility tokens when such tokens are used.[184] These suggestions may be further evidence that consensus has not yet been reached on the indirect tax consequences of crypto-asset transactions.

3.2.7. Consensus on lack of fiat currency status

Of the 28 countries in the sample, no country has recognised crypto-assets as fiat currency. 23 countries have explicitly stated or made clear that they do not consider crypto-assets to be fiat currency, while no statement could be identified for five of the countries, although even in these instances the context often made it clear that those countries considered crypto-assets to be different in nature to fiat currency.

The closest any countries considered have come to recognising crypto-assets as fiat currency is reflected in the income tax approaches of Malta and Switzerland, which hold that crypto-asset transactions give rise to consequences similar to those of fiat currency transactions in some instances.[185] It is instructive to note that this appears to be based on the principle of neutrality as

[183] Government of Canada, Draft Legislation Relating to the Excise Tax Act.
[184] African Tax Administration Forum, "Value Added Tax Technical Note on Digital Financial Assets," 2020, https://events.ataftax.org/includes/preview.php?file_id=83&language=en_US.
[185] Office of the Commissioner for Revenue, "Guidelines on the Income Tax Treatment of Transactions or Arrangements Involving DLT Assets," 2018, https://cfr.gov.mt/en/inlandrevenue/legal-technical/Documents/Guidelines -DLTs Income tax.pdf; Schweizerische Eidgenossenschaft, "Kryptowährungen [Cryptocurrencies]," 2019, https://www.estv.admin.ch/estv/de/home/direkte-bundessteuer/direkte-bundessteuer/fachinformationen/kryptowaehrungen.html.

applied between fiat currency and crypto-assets serving as a means of payment. Consideration of neutrality is not raised by any of the other 26 countries. By contrast, neutrality features far more prominently in positions pertaining to VAT consequences (as discussed above).

Consideration of crypto-assets in facilitating payment in the literature engages with comparisons to fiat currency at two levels – as a legal concept, and as an economic concept. In this study, 'fiat currency' is used to refer to the former, while 'money' is used to refer to the latter. It is submitted that should any crypto-asset be granted fiat currency status in a particular country it would by definition be treated as fiat currency for tax purposes (at least within that country), while no crypto-asset could meet the definition of fiat currency without such status being conferred upon it by a particular country. Therefore, the relevant consideration here is whether crypto-assets that are not fiat currency fall within the broader concept of money.

Money is not something of inherent value, but rather is a "social convention", being accepted in transactions because of a commonly-held belief that it will continue to be accepted by others.[186] Money is accepted as such because it exhibits three characteristics – it is a medium of exchange, a store of value and a unit of account.[187]

While acknowledging that "within their user community, virtual currencies resemble money",[188] the ECB held that crypto-assets did not function as a medium of exchange due to their low levels of acceptance at the time that this view was expressed.[189] Years later, enthusiasm over crypto-asset adoption rates is mixed; while high-profile companies that accept crypto-asset payments are cited

[186] Crypto Assets Regulatory Working Group, "Consultation Paper on Policy Proposals for Crypto Assets." At 32.
[187] European Central Bank, "What Is Money?," 2015, https://www.ecb.europa.eu/explainers/tell-me-more/html/what_is_money.en.html; Crypto Assets Regulatory Working Group, "Consultation Paper on Policy Proposals for Crypto Assets"; Irena Asmundson and Ceyda Oner, "What Is Money?," *Finance & Development* 49, no. 3 (2012), https://www.imf.org/external/pubs/ft/fandd/2012/09/basics.htm.
[188] European Central Bank, "What Is Money?" At 6.
[189] European Central Bank, "Virtual Currency Schemes - a Further Analysis."

as evidence of increasing adoption rates,[190] so too the limited absolute number of such merchants is provided as evidence of low total levels of adoption.[191] Nonetheless, while opinions may vary as to the present rate of adoption, it seems possible that a point may be reached in the future where this first criteria will be generally recognised as met.

There is little debate that crypto-asset values are volatile; from January 2017 to January 2019 volatility exceeded that of both European share and bond markets, as well as of gold and oil prices.[192] There have also been a number of high-profile crypto-asset thefts[193] that negatively impact credibility and increase volatility, notwithstanding that these have related primarily to exchange platforms and protection of private keys rather than to the blockchain itself.[194] Price volatility in crypto-assets makes them an ineffective store of value,[195] and more attractive as an opportunity for speculation than as a means of payment.[196] One solution to the issue of crypto-asset volatility has been the creation of stablecoins, the value of which is directly linked either to the value of a fiat currency, as in the case of crypto-assets like USD Tether,[197] or to a commodity such as gold held in reserve, as in the case of Digix tokens.[198] Whether such tokens are considered 'crypto-assets' in every context is uncertain, as discussed in 3.2.1.

[190] See Marsh & McLennan Companies, FireEye, and Circle, "Crypto-Assets and Blockchain Technology: On the Brink of Legitimacy?"
[191] See Financial Conduct Authority, "Guidance on Cryptoassets"; Crypto Assets Regulatory Working Group, "Consultation Paper on Policy Proposals for Crypto Assets."
[192] ECB Crypto-Assets Task Force, "Crypto-Assets: Implications for Financial Stability, Monetary Policy, and Payments and Market Infrastructures."
[193] Bal, "Bitcoin Transactions : Recent Tax Developments and Regulatory Responses."
[194] Marsh & McLennan Companies, FireEye, and Circle, "Crypto-Assets and Blockchain Technology: On the Brink of Legitimacy?"
[195] Bal, *Chapter 14 - How to Tax Bitcoin?*
[196] World Bank, "Cryptocurrencies and Blockchain Europe and Central Asia Economic Update."
[197] Tether Limited, "Tether: Fiat Currencies on the Bitcoin Blockchain."
[198] DIGIX, "DGX the Finest Gold Tokenised."

Volatility in turn negatively affects the ability of crypto-assets to function as a unit of account (meaning that they can be used as a point of reference to express prices[199]). The fact that the value of a crypto-asset token is itself nearly always understood by quoting a current value in fiat currency suggests that it struggles to fulfil this role.[200]

The finer points of this analysis, as are frequently debated in the literature on crypto-assets,[201] may however be somewhat misleading. Money is accepted as a medium of exchange because it functions as a store of value and a unit of account to the satisfaction of the party accepting payment. It does not need to satisfy an absolute standard of these functions. As such, "[i]f it is accepted as money, it is money".[202] The only true relevant question is, *Were crypto-assets accepted as payment in a particular transaction?* If the answer is *Yes*, then those crypto-assets fulfilled the economic function of money in that transaction. This was the rationale applied by the ECJ in *Skatteverket v David Hedqvist* [203] in concluding that the VAT exemption applicable to fiat currency exchanges and payments should extend to crypto-asset exchanges and payments, and mirrored in amendments to indirect tax legislation. Yet in determining the income tax consequences of crypto-asset payments, willingness to consider the view that there should be neutrality in the income tax consequences between the disposal of crypto-assets in payment and fiat currency payments is noticeably rare.

[199] Asmundson and Oner, "What Is Money?"
[200] Bal, *Chapter 14 - How to Tax Bitcoin?*
[201] See for example Financial Action Task Force, "Virtual Currencies - Key Definitions and Potential AML/CFT Risks"; Crypto Assets Regulatory Working Group, "Consultation Paper on Policy Proposals for Crypto Assets"; Bal, *Chapter 14 - How to Tax Bitcoin?*
[202] Asmundson and Oner, "What Is Money?"
[203] Case C-264/14, Skatteverket v David Hedqvist, ECLI:EU:C:2015:718.

3.2.8. Contrasting positions on income tax consequences in different jurisdictions

When comparing the guidance and position statements issued by the countries considered, as well as the legislative amendments made, a number of examples of contrasting positions in income tax consequences may be identified.

Australia, Canada, Denmark, Norway, and Sweden contemplate the possibility that mining may be undertaken in a context other than as a trade. In such instances, tax consequences may arise only on disposal. Finland, France, Malta, Spain, and the USA take the view that mining is always a trade, while South Africa's position is potentially ambiguous. Only Norway and Finland consider income tax consequences of PoW and DPoS mining separately, and arrive at different conclusions on the income tax consequences of DPoS mining. While most countries tax the trading income from mining on receipt, Romania and Slovakia appear to tax them only on subsequent disposal. South Africa seems to view all mined crypto-assets as trading stock until disposal, whereas Finland, Norway and Sweden accept that in most cases they will be held as capital assets. Most countries allow the costs incurred in mining to be deducted or capitalised. However, the UK holds that where mining does not constitute a trade mining costs may be deducted for the purposes of determining miscellaneous income but cannot be added to the base cost of crypto-assets for capital gains tax purposes.

Most countries view the identification of disposal events consistently, being use in payment for goods and services, sale for fiat currency, or exchange for another crypto-asset. However, in 2019 France introduced provisions to defer the income tax consequences of the exchange of one crypto-asset for another, and a similar bill has been proposed in the USA. The UK does not regard the theft of crypto-assets or the loss of a private key as a disposal, whereas Australia accepts both as disposal events.

There seems to be varying degrees of maturation in guidance on the determination of the order of disposal of crypto-assets. Denmark, Finland, Norway, and the USA have recognised the significance of allowing the specific identification method as an alternative to the first-in-first-out (FIFO) or weighted average methods, while Spain requires the use of the FIFO method and Sweden the weighted average method, and many jurisdictions remain silent on the issue. HMRC allows cost pooling for similar capital crypto-assets, whereas South Africa excludes crypto-assets from similar provisions.

Australia allows a personal asset exclusion where crypto-assets are used for private payment for goods and services, but not for the disposal of crypto-asset investments.[204] Italy disregards capital disposals below a certain threshold consistent with its approach to foreign currency gains.[205] In contrast, the Swedish courts have ruled that the nature of crypto-assets (in this case, specifically bitcoins) is too closely linked to the nature of investment to allow for its recognition as a personal use asset in any circumstances.[206] South Africa expressly excludes disposals of crypto-assets from personal use asset concessions in all circumstances by virtue of their designation as financial instruments.[207]

Only four countries address the income tax consequences of hard forks and airdrops, and in each the consequences are different. Only the USA views the receipt of new coins in a hard fork as an immediate taxable event, being an "accession to wealth".[208] Finland views the new coins received

[204] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[205] Fabrizio Cancelliere and Armando Tardini, "The (Non-Public) Response to Request No. 956-39/2018: Tax Regime Applicable to Cryptocurrencies Held by Individuals Resident in Italy," Italian Private Equity, Venture Capital and Private Debt Association, 2018, https://www.aifi.it/en/regolamentazione/fiscalita.
[206] Kjaersgaard and Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives."
[207] South Africa, Income Tax Act.
[208] Internal Revenue Service, "Rev. Rul. 2019-24," 2019, https://www.irs.gov/pub/irs-drop/rr-19-24.pdf.

as having a cost of nil, and as potentially leading to income tax consequences on disposal.[209] The UK requires apportionment of the pre-existing crypto-asset's cost between the pre-existing and new crypto-asset tokens,[210] while Australia requires identification of the pre-existing and new crypto-asset according to which one continues the protocol of the pre-existing token rather merely continuing the pre-existing name, with the tokens received in respect of the new crypto-asset having a cost of nil.[211]

Only Israel, Malta and Switzerland address the income tax consequences of ICOs from the issuer's perspective. In Switzerland, income arises during or at the conclusion of the development phase,[212] while in Israel and Malta income may only arise when the promised goods or services are delivered.[213]

There are also numerous instances of unique jurisdiction-specific outcomes due to the applicability of jurisdiction-specific provisions. For instance, HMRC generously views crypto-assets as being within the scope of the UK's 'negligible value claims' provisions, which are otherwise reserved for shares and securities in limited circumstances.[214] Whereas South Africa prohibits write-downs of crypto-assets held as trading stock prior to sale, Australia's provisions allow for both profits and losses on trading stock to be recognised prior to realisation.[215] Designation as a hobby or suspect trade limits the deductibility of losses in some jurisdictions.

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[209] Vero Skatt, "Beskattning Av Virtuella Valutor [Taxation of Virtual Currencies]," 2019, https://www.vero.fi/sv/Detaljerade_skatteanvisningar/anvisningar/48411/beskattning-av-virtuella-valutor2/.
[210] HMRC, "Cryptoassets for Individuals."
[211] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[212] Schweizerische Eidgenossenschaft, "Kryptowährungen [Cryptocurrencies]."
[213] Office of the Commissioner for Revenue, "Guidelines on the Income Tax Treatment of Transactions or Arrangements Involving DLT Assets"; EY, "Israeli Tax Authorities Address Issues Regarding Issuance of Utility Tokens, Blockchain Technologies and Cryptocurrencies, Including Related Tax Benefits."
[214] HMRC, "Cryptoassets for Individuals."
[215] South Africa, Income Tax Act; Australian Taxation Office, "Tax Treatment of Cryptocurrencies."

The instances highlighted above are not necessarily evidence of one country's position being 'wrong' and another's 'right', but rather of the inconsistency in positions taken on the interpretation of new and potentially complex transactions. Thus, income tax consequences for taxpayers may vary according to the country in which they are to be taxed, while taxpayers in a country that has not explicitly addressed a particular transaction may struggle to obtain clarity by considering the positions of other countries. These inconsistencies are therefore evidence of the shortcomings of a jurisdiction-specific approach to the taxation of crypto-asset transactions.

3.3. Conclusion

A review of the responses of the 28 countries identified suggests that responses to the tax consequences of crypto-assets to date have been limited and inconsistent. Only 17 countries had issued specific guidance by the date of the conclusion of the review in October 2019, of which only eight might be described as detailed guidance. Taxpayers in many jurisdictions remain left to find their own way in determining the tax consequences of their crypto-asset activities.[216]

Across the 28 countries reviewed, eight different identities were ascribed to crypto-assets, ranging from generic identities such as 'asset' to specific ones such as 'financial instrument'. These suggest differences in understanding of the nature of crypto-assets, and may give rise both to differences in tax consequences between jurisdictions and difficulties in reconciling tax consequences in cross-border transactions.

The guidance available at the date of the review is in most cases far from comprehensive. In some instances, guidance is explicitly restricted in application to exchange tokens. In others, differences

[216] In a later survey study by the OECD, 30 out of 53 respondent countries indicated that they had issued guidance. See OECD, "Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues," 2020, https://www.oecd.org/tax/tax-policy/taxing-virtual-currencies-an-overview-of-tax-treatments-and-emerging-tax-policy-issues.htm.. This provides further evidence that many jurisdictions have yet to meaningfully address the tax consequences of crypto-asset transactions.

in the terminology used and the definition thereof often obscure the exact scope of application. Only three jurisdictions specifically address token categories other than exchange tokens. It is therefore often unclear whether the guidance provided extends to or is appropriate in addressing other types of crypto-assets. Where it does not extend this far, the tax consequences of such transactions remain unknown.

Available guidance tends to focus on the more basic and well-known crypto-asset transactions, such as crypto-asset trading, payment and PoW mining. Only three jurisdictions separately address the earning of transaction fees, and only two explicitly address DPoS mining. Only seven countries address remuneration in crypto-assets, five the transfer of crypto-assets as a gift, and two the theft or loss of crypto-assets. Only four countries consider the direct tax consequences of hard forks and airdrops, or of participation in ICOs. Guidance also focuses on the users of crypto-assets once in circulation; only two jurisdictions address the originators of crypto-assets. Thus, even those taxpayers operating in the few jurisdictions that have provided detailed guidance may find themselves alone and out of their depth once they venture beyond the shallow-end of crypto-asset use.

Where transactions are addressed within the available guidance, direct tax consequences may vary between jurisdictions. In some countries mining income is considered inherently revenue in nature; in others it may be either capital or revenue. The timing of the taxation of mining income may also differ. Some jurisdictions see fit to distinguish between the direct tax consequences of PoW and DPoS mining, while others do not. Whether the latter consider the consequences to be the same or have yet to consider the consequences of DPoS mining is unclear. Certain crypto-asset transactions may qualify for or be excluded from jurisdiction-specific exclusions and concessions, sometimes as a by-product of the identity ascribed to crypto-assets in that jurisdiction. Among the limited

number of jurisdictions that address hard forks and airdrops, both the direct tax consequences and the timing thereof varies. While individual jurisdictions are entitled to exercise their sovereignty in determining tax outcomes, such differences suggest potential differences in understanding of the nature of such transactions, and may challenge considerations of both inter-nation equity and coordination.

While there appears to be greater consensus as to the indirect tax consequences of crypto-asset transactions (that is, that there are none), uncertainty still remains. Eleven of the countries considered were silent on indirect tax consequences. Many of those that have reached a position have done so as EU member states following the ruling in *Skatteverket v David Hedqvist*. That ruling was based on the presumption that crypto-assets functioned as a means of payment.[217] This leaves the indirect tax consequences of a number of crypto-asset transactions and a number of types of crypto-assets unaddressed. It also seemingly entrenches contradictory bases for the determination of direct and indirect tax consequences. While a minority of countries outside the EU indicate that crypto-assets transactions will be subject to indirect tax, most appear to have followed the approach adopted within the EU, notwithstanding that their indirect tax legislation may differ. Some have extended beyond that initially envisaged, and in so doing may have strained or even severed the link to the underlying rationale.

Taken in total, it is clear that the collective response to the taxation of crypto-assets undertaken by individual jurisdictions is in the early stages of development. Although individual jurisdictions may have issued or updated guidance since the conclusion of this review, it is highly unlikely that this will have been sufficient or consistent enough to change the overall position. This diverse and inconsistent treatment fairs poorly when assessed against the principles of good tax design. It does

[217] Case C-264/14, Skatteverket v David Hedqvist, ECLI:EU:C:2015:718.

not consistently achieve horizontal equity between crypto-asset transactions and similar transactions undertaken by different means. It is not necessarily coherent within or between taxes. There is evidence of a lack of inter-nation equity where similar crypto-asset transactions give rise to different tax consequences in different tax jurisdictions. It is not inter-nationally coherent in its present state. Failures of both horizontal and inter-nation equity may distort economic behaviour.

The lack of guidance in many jurisdictions and the limited scope of guidance available means that the tax consequences of crypto-asset transactions are not easy for either taxpayers or tax authorities to interpret and apply. The available guidance is not yet stable and is likely to require future revision. Limitations in scope focusing primarily on exchange tokens bring into question the extent to which it is adaptable to future developments. Both taxpayers and tax authorities are in many instances likely to be left with a notable lack of certainty. This in turn makes both compliance by taxpayers and enforcement by authorities challenging.

The evidence of this review suggests that there is still much development needed in response by jurisdictions to the crypto-asset phenomenon. Guidance needs to be made available by more jurisdictions. Available guidance needs to be more comprehensive in both the types of crypto-assets and the types of transactions that it addresses, and the level of detail provided.

Perhaps most significantly, while tax consequences may differ in detail according to the particular nuances of domestic legislation, the position of individual jurisdictions as well as of the international tax system would be greatly strengthened if they were to represent a consistency in interpretation that flowed from and aligned with a globally coordinated approach to developing appropriate tax responses. The objective of this study is to support the development of such a globally coordinated approach.

4. CRYPTO-ASSET ANALYSIS

4.1. Introduction

For the purposes of performing the analysis outlined in Chapter 2.3.2, a sample of 25 crypto-assets was selected based on market capitalisation according to the website www.coinmarketcap.com on 21 August 2019. The 25 crypto-assets selected represented all those that contributed 0.15% or greater to the quoted total market capitalisation of crypto-assets on the site on that date, being USD 267 billion. Together, the sample represented 93.6% of the total market capitalisation of quoted crypto-assets on that date.[218]

[218] The sample at 21 August 2019 is compared to the market as at 30 June 2021 in Appendix C. While the total market capitalisation has increased significantly, the sample represents 85.1% of the total market capitalisation at that date.

Table 2: Crypto-asset selection

	Name	Symbol	Market capitalisation (USD)	Price (USD)	% of total market capitalisation	Cumulative market capitalisation
1	Bitcoin	BTC	181,949,863,822	10,171.25	68.0%	68.0%
2	Ethereum	ETH	20,175,741,536	187.84	7.5%	75.6%
3	XRP	XRP	11,353,587,254	0.26	4.2%	79.8%
4	Bitcoin Cash	BCH	5,410,087,364	301.24	2.0%	81.9%
5	Litecoin	LTC	4,545,150,198	72.05	1.7%	83.6%
6	Binance Coin	BNB	4,235,417,259	27.23	1.6%	85.1%
7	Tether	USDT	4,026,103,219	1.00	1.5%	86.7%
8	EOS	EOS	3,314,003,152	3.57	1.2%	87.9%
9	Bitcoin SV	BSV	2,380,057,940	133.30	0.9%	88.8%
10	Monero	XMR	1,391,343,884	81.05	0.5%	89.3%
11	Stellar	XLM	1,336,350,232	0.07	0.5%	89.8%
12	UNUS SED LEO	LEO	1,244,025,409	1.24	0.5%	90.3%
13	Cardano	ADA	1,214,772,298	0.05	0.5%	90.7%
14	TRON	TRX	1,131,981,664	0.02	0.4%	91.1%
15	Dash	DASH	802,759,966	89.28	0.3%	91.4%
16	Chainlink	LINK	785,013,804	2.24	0.3%	91.7%
17	Tezos	XTZ	750,611,150	1.14	0.3%	92.0%
18	Ethereum Classic	ETC	680,648,167	6.03	0.3%	92.3%
19	NEO	NEO	667,251,817	9.46	0.2%	92.5%
20	IOTA	MIOTA	664,924,820	0.24	0.2%	92.8%
21	Cosmos	ATOM	518,991,301	2.72	0.2%	93.0%
22	Maker	MKR	493,594,916	493.59	0.2%	93.1%
23	NEM	XEM	491,003,072	0.05	0.2%	93.3%
24	USD Coin	USDC	415,518,196	1.00	0.2%	93.49%
25	Crypto.com Chain	CRO	401,634,202	0.04	0.2%	93.6%

4.2. Proposed primary use cases

While the analysis seeks to identify and analyse possible taxable events rather than establish tax consequences based on use cases, it is nonetheless instructive to compare the proposed use cases of the largest 25 crypto-assets by market capitalisation, as represented in their white papers.

Eight crypto-assets focus primarily on creating an alternative to fiat currency. Bitcoin is the original of these, with Bitcoin Cash, Litecoin, Bitcoin SV and Dash all being the product of hard forks from the Bitcoin blockchain. Monero, NEM, and Crypto.com Chain all propose alternative

forms of money that exist on blockchains created independently of Bitcoin. In each case, the originators seek to differentiate these crypto-assets from one another, often on the basis of the degree of anonymity offered, transaction processing speed, and the potential to support increases in transaction volume commensurate with widespread adoption (referred to as 'scaling'). These eight crypto-assets propose no basis for the inherent value of their tokens beyond market supply and demand.

A further two crypto-assets in the sample may be considered alternatives to fiat currency. Tether's USD Tether and USD Coin are so-called 'stablecoins' that trade at a stable value in fiat currency due to the holding of equivalent value reserves by the originators (although the adequacy of Tether's reserves has been called into question[219]). These stablecoins can, at least in theory, be redeemed for fiat currency. A third crypto-asset in the sample – Maker – functions in the process of increasing or decreasing the reserves held in order to stabilise the value of the DAI token stablecoin (the seventieth-largest token by market capitalisation at the date the sample was selected).

Ripple's XRP and Stellar's Lumens are proposed to function specifically as 'bridge currencies', facilitating the exchange of fiat currencies. While Ripple focuses on the corporate and banking markets, Stellar (which was founded by a former Ripple co-founder) focuses on individuals and traditionally unbanked markets. Both crypto-assets extend to more general medium of exchange use cases.

Nine crypto-assets facilitate the functioning of blockchain networks with much wider use cases than merely payment ledgers. These blockchains typically offer a platform for the development of

[219] See, for example, Steven Hay, "What Is Tether USDT - A Beginner's Guide," 2019, https://99bitcoins.com/what-are-stablecoins/tether/.

decentralised applications. In much the same way as a local application uses the processing power and storage capacity of the device on which it is located, decentralised applications depend on the decentralised processing power and storage of the supporting network.[220] The largest of these is the Ethereum network, sometimes referred to as "the world computer".[221] Ether is the native token of the Ethereum blockchain. Ethereum Classic is the product of a hard fork from Ethereum, while Chainlink is an application-layer token within the Ethereum blockchain. EOS, Cardano, Tron, Tezos, NEO, IOTA and Cosmos have all been developed on independent blockchains that also facilitate the development of decentralised applications in various forms. Again, these alternatives all seek to differentiate themselves from one another, often through differences in transaction processing speed or the ability to scale. Within these networks, the associated crypto-asset tokens most frequently play a role in the reward system for transaction processing, although they sometimes play a subsidiary role as a medium of exchange.

Finally, the Binance Coin and (Unus Sed) Leo crypto-asset tokens exist to address transaction fees on specific crypto-asset exchanges. While Binance Coins are used to pay transaction fees at reduced rates on the Binance exchange, Leo token-holders qualify for reduced rates on the BitFinex exchange according to the size of their token holdings, but do not transfer tokens in payment of transaction fees.

What is evident from this brief overview is that, in order to achieve significant market capitalisation, a crypto-asset would seem to need to represent something that is accepted as fungible, and that the nature of the crypto-assets with market capitalisations sufficient to result in

[220] Eric Reed, "What Is EOS and How Does It Work?," 2019, https://www.thestreet.com/investing/cryptocurrency/what-is-eos-15035027.
[221] Bo, "Cracking the Ethereum White Paper," Medium, 2017, https://medium.com/@FolusoOgunlana/cracking-the-ethereum-white-paper-e0e60c44126.

inclusion in the sample suggests that broad recognition of a crypto-asset as a representation of value is restricted to a limited number of closely-related use cases. However, it is not these categorisations, but rather the various potential transactions within which each crypto-asset plays a role, that give rise to possible taxable events. It is the identification of these transactions that is the purpose of the constant comparison analysis undertaken in this study.

4.3. Identification of possible taxable events

For each of the 25 selected crypto-assets, the supporting white paper was obtained. Where no white paper existed, or where information in the white paper about the proposed crypto-asset was incomplete, additional information was sought from the crypto-asset's website or third-party sources such as crypto-asset blogs and commentaries.

The source information obtained for each crypto-asset was analysed using the NVivo software package to identify themes that may represent taxable events, in accordance with the constant comparison methodology outlined in Chapter 2. As each white paper was analysed, every theme identified was assigned to a 'node' in NVivo. Identified themes were broadly assignable to those relating directly to the proposed crypto-asset token and those relating to other considerations. Typically, these other considerations included the value proposition of the network or ecosystem of which the crypto-asset was a subsidiary part, technical and cryptographic information, governance issues and support for the credibility of the founding organisation. The latter were excluded from further analysis as they did not pertain to the identification of possible taxable events arising from transactions involving the proposed crypto-asset.

The possible taxable events arising from each selected crypto-asset are summarised in Table 3. A summary analysis of each crypto-asset and the transactions leading to possible taxable events identified therein is included in Appendix B. Summary NVivo outputs are included in Appendix D.

Using the constant comparison method to identify similarities and differences as the analysis progressed in order to assign observations, Table 3 has been arranged firstly according to the broad life cycle stages of origination, use and extinction, and secondly within those stages by the order in which the possible taxable events have been identified.

In some instances, white papers did not exist, or additional detail on specific elements was needed to support a meaningful analysis of the selected crypto-asset. In such instances supporting material published either by the crypto-asset's originator or by industry commentators was then examined. In instances where these additional sources address only isolated considerations the source documents were not added to the NVivo coding outputs but are manually recorded and added to the table of observations. The sources of these observations are however evident in Appendix B.

As is evident from Table 3, unique observations arise frequently from the crypto-assets first analysed and slow down as the study progresses. With the exception of *airdrop participation* in the analysis of Crypto.com Chain (CRO) (which is closely linked to the already-identified *future airdrop and hard fork participation*), the last new possible event is identified in the analysis of Maker (MKR), the 22nd crypto-asset token in the sample. Identification therefore reaches saturation within the sample of 25 tokens selected.

Table 3: Crypto-asset analysis summary

	Crypto-assets		Transactions representing possible taxable events																															
			Origination											Use												Extinction									
	Name	Symbol	Block rewards	ICOs and other market sales	Developer allocation	Remuneration and other incentives	Hard fork	Investor sale	Fiat currency deposit	Third-party developers	Retained	Recapitalisation (debt auction)	Airdrop participation	Speculation and investment	Payment solution	Payment of transaction fees	Future hard fork and airdrop participation	Payment of counterparty transaction fees	Inter-currency transfer	Minimum account balance	Network usage and delegation	DPoS candidacy and delegation	Theft	Transaction fee reduction	Incentivised hacking	Transaction fees	Non-existent accounts	Repurchases	Redemptions	DPOS candidacy	Penalties	Storage	Surplus auctions (supply reductions)	Lost access
1	Bitcoin	BTC	✓											✓	✓	✓	✓																	✓
2	Ethereum	ETH	✓	✓	✓									✓	✓	✓	✓																	✓
3	XRP	XRP		✓	✓									✓	✓			✓	✓	✓						✓	✓								✓
4	Bitcoin Cash	BCH	✓				✓							✓	✓	✓	✓																		✓
5	Litecoin	LTC	✓				✓							✓	✓	✓																			✓
6	Binance Coin	BNB		✓	✓	✓		✓						✓	✓	✓												✓							✓
7	Tether	USDT							✓					✓	✓														✓						✓
8	EOS	EOS	✓	✓						✓				✓							✓	✓	✓												✓
9	Bitcoin SV	BSV	✓				✓							✓	✓	✓																			✓
10	Monero	XMR	✓											✓	✓	✓	✓																		✓
11	Stellar	XLM		✓										✓		✓			✓	✓						✓									✓
12	UNUS SED LEO	LEO		✓										✓										✓				✓							✓
13	Cardano	ADA		✓										✓	✓	✓						✓													✓
14	TRON	TRX	✓	✓										✓	✓	✓	✓				✓	✓								✓					✓
15	Dash	DASH	✓				✓							✓	✓	✓						✓													✓
16	Chainlink	LINK		✓										✓				✓													✓				✓
17	Tezos	XTZ	✓	✓	✓					✓				✓		✓						✓										✓			✓
18	Ethereum Classic	ETC	✓	✓			✓							✓	✓	✓							✓												✓
19	NEO	NEO		✓	✓	✓				✓	✓			✓		✓	✓					✓													✓
20	IOTA	MIOTA		✓										✓	✓																				✓
21	Cosmos	ATOM	✓	✓	✓	✓		✓						✓		✓						✓			✓						✓				✓
22	Maker	MKR										✓		✓																			✓		✓
23	NEM	XEM	✓	✓	✓						✓			✓	✓	✓						✓	✓				✓								✓
24	USD Coin	USDC							✓					✓	✓														✓						✓
25	Crypto.com Chain	CRO	✓								✓		✓	✓	✓																				✓
	TOTAL		14	15	7	3	5	2	2	3	3	1	1	25	17	16	6	2	2	2	2	8	3	1	1	2	2	2	2	1	2	1	1	25

4.4. Development of transaction categories

In the preceding stage of the analysis, 32 transactions giving rise to possible taxable events were identified from the sample of 25 crypto-assets. These were grouped according to what might be considered the life cycle of a crypto-asset token – origination, use and (in some instances) extinction.

In the next stage of the analysis, the identified transactions representing possible taxable events continue to be compared and contrasted in order to arrive at transaction categories.[222] Each transaction category should represent those transactions that are substantially similar in nature to all other transactions within that category and should be distinct in nature from every other transaction category. These transaction categories will form the basis of the determination of tax consequences and income classification in Chapter 5.

4.4.1. Origination

The events that give rise to the origination of new crypto-asset tokens can be broadly grouped into two types: those that have an identifiable originator[223] that actively participates in the distribution of new tokens, and those that are originated through the protocols of the blockchain itself. In the case of the former, there is a direct and active transfer of the crypto-asset token from the originator to the recipient. In the case of the latter, no direct action by any originator occurs at the moment of origination. Rather, origination is the product of the actions of the recipient and the automated processes programmed into the protocols of the blockchain.

[222] As discussed in Chapter 2.3.2. While of necessity the analysis is presented here in distinct stages, in practice the constant comparison method is applied organically in such a way that the distinction between the conclusion of one stage and the commencement of the next is somewhat artificial.

[223] Not every crypto-asset has an identifiable originator (as for example acknowledged in the ECB Crypto-Assets Task Force's analysis – see ECB Crypto-Assets Task Force, "Crypto-Assets: Implications for Financial Stability, Monetary Policy, and Payments and Market Infrastructures.". The absence of a counterparty to a transaction is a concept somewhat unique to blockchain technology - See Akins, Chapman, and Gordon, "A Whole New World: Income Tax Considerations of the Bitcoin Economy."

4.4.1.1. *Fiat currency deposits*

Stablecoins represent a specific subcategory of origination. Originators issue new tokens in consequence of fiat currency receipts which function as reserves held to stabilise the price in fiat currency of each token in issue. The Tether network's USD Tether tokens were initially intended to be fully backed by fiat currency reserves, but this was later amended to include both fiat currency and "other assets and receivables from loans made by Tether to third parties, which may include affiliated entities" [224]. USD Tethers are redeemable for fiat currency in certain circumstances and at a cost, although the preference seems clearly to be that they should remain in circulation. The legal right of token holders to enforce redemption has also been called into question.[225] In contrast, Circle's USD Coin, which is also issued in exchange for fiat currency deposits, seems to support token redemption as a matter of course.[226] The origination of these two tokens have been classified as *Fiat currency deposits.*

4.4.1.2. *Sales of crypto-asset tokens by originators*

4.4.1.2.1. *ICO and other market sales*

In many instances, tokens are created at the inception of the blockchain by an identifiable originator. Frequently these are then sold – the origination of 15 crypto-assets in the sample include either limited-time ICOs (Ethereum, Binance, Cardano, EOS, LEO, Tron, Chainlink, Tezos, NEO, IOTA) or other market sales to willing buyers (such as Ripple, which periodically sells XRP tokens into the market to "provide liquidity",[227] and Stellar, which makes periodic sales of Lumens to "develop and promote Stellar"[228]). These were identified in the initial analysis as *ICO and other market sales*.

[224] Tether Limited, "Tether," 2020, https://tether.to/.
[225] see for example the criticisms of Hay, "What Is Tether USDT - A Beginner's Guide."
[226] Centre, "Centre Whitepaper," 2018, https://www.centre.io/.
[227] Ripple, "XRP Ledger Concepts."
[228] Stellar Development Foundation, "Stellar Lumens," 2020, https://www.stellar.org/lumens.

4.4.1.2.2. ***Investor sales***

In a limited number of instances sales are also made to selected investors (Binance Coins, Cosmos Atoms, and possibly the NEM network's XEM crypto-assets). These were identified in the initial analysis as *Investor sales*. Both *ICO and other market sales* and *Investor sales* involve the transfer at origination of crypto-asset tokens in exchange for either fiat currency or other crypto-asset tokens in circulation (of which Bitcoin is the most popular). The motivations for selling to selected investors appears to be to fund earlier stages of development prior to going to market, to signal the merit of the proposition to the market, to provide access to the purchase of crypto-asset tokens on preferential terms, or some combination of the three. There does not appear to be any distinction in the fundamental nature of the sales to identified investors and to the open market that suggests they could give rise to differing tax consequences. Both categories have therefore been grouped collectively as s*ales of crypto-asset tokens by originators*.

4.4.1.2.3. ***Recapitalisation (debt auction)***

The MakerDAO network incorporates two crypto-asset tokens, the first of which – the DAI (which falls outside the sample for this study) – is a stablecoin. DAI tokens are issued in exchange for collateral deposits of crypto-assets, which are later redeemed. The price of DAI tokens is held constant against the US Dollar, partly through the collateral deposits held, and partly through the management of reserves, which act as a buffer against fluctuations in collateral values. These reserves, which are accumulated through fees charged on DAI transactions, are managed through the sale or repurchase of DAI tokens at auction. DAI auctions must be settled using the MakerDAO network's second token, MKR (which falls within the sample). One million MKR tokens were created at inception. If DAI tokens in the reserve buffer are insufficient, DAI tokens are repurchased in the market using MKR tokens, thus increasing the supply of MKR tokens and decreasing their value. When DAI reserves

exceed the network requirements, they are auctioned to the highest bidder of MKR tokens, decreasing supply of the latter.[229] The MKR auction process suggests that MKR token transactions are solely a speculative (or perhaps in some instances long-term investment) purchase; they are purchased in the hope that they may be resold at auction for a higher value. MKR token origination was therefore added to the *Sale of crypto-asset tokens by originators* category, while (as will be noted in 4.4.2) the subsequent use was added to *Speculation and investment*. The repurchase of MKR tokens is discussed further in 4.4.3.

4.4.1.3. ***Remuneration or incentive***

4.4.1.3.1. ***Developer allocation***

The issuances of eight crypto-asset tokens within the sample (Ether, XRP, Binance Coins, Tezos, NEO, MIOTA, Cosmos Atoms and NEM) included allocations by originators to developers who participated in the creation of the network. These transactions were identified in the initial analysis as *Developer allocations*.

4.4.1.3.2. ***Remuneration and other incentives***

Four tokens have been or are given in remuneration and other incentives to employees of the originator (Ether, Binance Coins, Cosmos Atoms and NEO). Binance Coin allocations to team members vest annually over four years, while Cosmos Atom allocations vest one year after being granted.[230] These transactions were identified in the initial analysis as *Remuneration and other incentives*. However, since both these and *Developer allocations* relate to an exchange for employment or other services rendered, with the only noticeable difference relating to when they are granted (*Developer allocations* appear to function as a retrospective reward for the successful development of a crypto-asset network, whereas *Remuneration and other incentives*

[229] MakerDAO, "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System," 2020, https://makerdao.com/en/.
[230] Binance, "Binance Exchange Whitepaper v1.2," 2019, https://lexicoin.wiki/Whitepaper/Docs/BNB.pdf; Ethan Buchman and Christopher Goes, "Cosmos Genesis," 2019, https://github.com/cosmos/launch/blob/master/GENESIS.md#Fundraiser-Details.

appear to be issued more concurrently with performance), both have been grouped together as *Remuneration or incentive.*

4.4.1.3.3. ***Third-party developers***

Crypto-asset tokens held by the originator in reserve may also be offered as incentives to *Third-party developers*. EOS, Chainlink, and NEO, all networks that support decentralised applications, incentivise developers who add their own applications to blockchains and thereby increase the market penetration of those networks, through rewards in tokens. Since these also relate to the incentivisation of particular actions this category has been added to *Remuneration or incentive*. However, it is noted that further consideration may be necessary as to whether these are indeed transfers from an identifiable originator (as with other transactions in this category), or by consensus or automatic operation of the network.

4.4.1.3.4. ***Block rewards***

Fourteen crypto-assets introduce new tokens as incentive for participation in various forms of transaction validation and processing activities, and in a limited number of instances these are the only origination events for a particular crypto-asset (Bitcoin being the most notable). These incentives are commonly referred to as *Block rewards* and were coded as such in the initial analysis.

Within the Bitcoin network and other earlier crypto-asset ecosystems (Ethereum, Bitcoin Cash, Litecoin, Bitcoin SV, Monero, Dash and Ethereum Classic), transaction validation takes the form of competitive PoW mining. While an effective solution to validating the accuracy of the blockchain, PoW validation is criticised for its heavy electricity consumption and the competitive advantage it affords those who invest in specialised computer hardware.[231]

[231] Aggelos Kiayias et al., "Ouroboros: A Provably Secure Proof-of-Stake Blockchain Protocol," 2017, https://doi.org/10.1007/978-3-319-63688-7_12.

In order to eliminate the inefficiencies arising from PoW validation, various networks within the sample (EOS, Cardano, Tron, Tezos, NEO, Cosmos and Crypto.com Chain) instead employ DPoS validation, where the right to process a block of transactions is instead assigned to randomly selected validators. The chance of selection is in various ways dependent on the number of network crypto-asset tokens held by a candidate validator, referred to as their 'stake', or on the number of votes received from crypto-assets holders (which in turn is determined by the number of tokens held), creating an incentive to invest in the network's tokens rather than in specialised hardware. Some networks allow holders to delegate or combine their stakes in order to increase the chances of selection, in return for which the selected validator pays a share of the block reward earned (this is considered further in *Benefits through holding* within 4.4.2 below).

The NEM network employs a modified version of DPoS, which it refers to as 'proof of importance' (PoI), where selection is based not only on the balance of XEM tokens held but also the length of time held and the net usage of those tokens. Here too, a holder's PoI score can be delegated to another holder to increase the latter's chance of selection and the former's opportunity to share in the resultant block reward.

Of the fourteen networks identified as incorporating block rewards, in all but two cases the new tokens are originated in the process of transaction validation and block processing. The successful or selected validator creates new crypto-asset tokens in the record of the new block to be added to the blockchain, and those tokens are assigned to that validator in the updated ledger. It may therefore be conceptually inaccurate to refer to new tokens as having been 'issued' by the network; they are a product of the transaction validation process and there is no identifiable originator or transferring counterparty at the moment of origination. As Ethereum founder Vitalik Buterin describes it, "In order to compensate miners for this computational work, the miner of every block is entitled to include a transaction giving themselves 25 BTC

out of nowhere".[232] The two identified exceptions to this are the NEM and Crypto.com Chain networks, where block rewards appear to be paid from crypto-asset tokens already created and held in reserve.[233]

Block rewards may also be allocated to those who perform other functions within the network. For example, the Dash network allocates 45% of block rewards to validators, and 45% of block rewards to 'masternodes', which perform governance and other functions. The remaining 10% are placed in reserve in order to incentivise proposed improvements to the network by participants.[234]

Not every network incorporates the concept of *Block rewards*. Unus Sed Leo, Chainlink, Maker and USD Coin all exist as application-layer tokens within other networks and rely on the transaction processing of the underlying network. The Ripple, Binance, Tether, Stellar and IOTA networks all offer no direct incentive for transaction validation and block processing, relying instead on low processing costs (in the absence of competitive validation) and the vested interest of a limited number of validators in the success of the network to safeguard the integrity of their blockchains.

Because block rewards act to incentivise a particular activity, subsequent to the initial analysis they have been added to the *Remuneration or incentives* category. The distinctive difference between these and other incentives in the category is however that in almost all cases there is no originating counterparty to a block reward.

[232] Buterin, "Ethereum White Paper." At 7.
[233] Crypto.com, "Crypto.Com Chain," 2019, https://crypto.com/images/chain_whitepaper.pdf; Saul Gray, "NEM Supernode Rewards Program," 2016, https://forum.nem.io/t/nem-supernode-rewards-program/1735.
[234] Evan; Duffield and Daniel Diaz, "Dash: A PrivacyCentric CryptoCurrency," 2015, https://www.exodus.com/assets/docs/dash-whitepaper.pdf.

4.4.1.4. *Fortuitous issuances and receipts*

4.4.1.4.1. *Airdrop participation*

The distribution of one crypto-asset in the sample, the Crypto.com Chain network's CRO token, incorporated distribution through *Airdrop participation* by holders of an existing crypto-asset, being the MCO token. Both CRO and MCO tokens were created by the same originator organisation (Crypto.com), with the MCO token created first on the Ethereum network as part of its Visa card project, and the CRO token created subsequently as a native token for the independent Crypto.com Chain blockchain. The allocation of CRO tokens in the airdrop distribution (which represented only a small proportion of the total number of CRO tokens created) depended on a recipient's MCO holding at a point in time, and the extent to which that holding was maintained for a 12-month period following the initial allocation. The airdrop of CRO tokens to MCO holders and the incentive for holders to restrict the market supply of MCO tokens for a period of time therefore served to increase the demand for MCO tokens, resulting in a positive outcome for the Crypto.com project as a whole.[235]

Airdrop participation was identified as a category in its own right in the initial analysis. With respect to airdrops, it would seem that the recipient has little control over the occurrence of the event, although it is theoretically not impossible that they participate in the governance processes that result in the decision to initiate the event, or at least in the case of MCO and CRO tokens may take actions to benefit therefrom (such as acquiring qualifying tokens in advance of the event or maintaining their holding during the vesting period). Tax consequences may therefore vary depending on the activity of the acquirer.

[235] Crypto.com, "Crypto.Com Chain."

4.4.1.4.2. ***Hard fork***

In contrast to an airdrop, there is no identifiable originator of a *Hard fork*. A *Hard fork* occurs when participants disagree on the adoption of a new protocol within the network. This results in the diverging of the common blockchain along two paths; those that recognise transactions processed in terms of the new protocol, and those that continue to process transactions in terms of the old protocol. This results in two separately existing blockchains with a common history of transactions occurring prior to the divergence. If the camps cannot be reconciled, a permanent split or 'hard fork' results, and necessitates the creation of a new crypto-asset designation to represent one of the two strands of the pre-existing blockchain.

The creation of a new blockchain sharing a common historical record with a pre-existing blockchain means that all crypto-asset tokens existing on the original blockchain are mirrored by new crypto-asset tokens on the new blockchain. All holders of the original tokens become holders of the new tokens in addition to holding the original tokens, which exist from that date onward on two separate blockchains, albeit with a shared history.[236, 237] It would be tempting but incorrect to compare this to a share split, since in that case both the original and new shares represent a claim on the same company, causing a dilution in value of the original shares, which passes to the new shares. In the present instance, the two tokens represent assets on two different blockchains, and no new tokens come into existence on the original blockchain. Any

[236] Mattia Landoni and Gina C. Pieters, "Taxing Blockchain Forks," *Stanford Journal of Blockchain Law & Policy* 3, no. 2 (2019): 197–227, https://doi.org/10.2139/ssrn.3475598.

[237] It may be technically incorrect to refer to the 'creation' of a new blockchain. The new blockchain was in a sense in existence since the creation of the pre-existing blockchain. However, at the point of the hard fork one of the two divergent strands must be renamed in order to differentiate it from the pre-existing blockchain.
Even words such as 'new' and 'pre-existing' are potentially unhelpful, since there is no objective basis for determining which is the new and which is the continuation of the original blockchain. For example, in the hard fork from Bitcoin, Bitcoin Cash rejected the adoption of the Seqwit2x scaling proposal to be introduced into the Bitcoin code, and instead supported an increase in block size from 1MB to 8MB Alyssa Hertig, "Bitcoin Cash: Why It's Forking the Blockchain And What That Means," 2017, https://www.coindesk.com/coindesk-explainer-bitcoin-cash-forking-blockchain; Webb, "A Fork in the Blockchain: Income Tax and the Bitcoin/Bitcoin Cash Hard Fork.". In the hard fork therefore both strands made changes to protocols and rejected other changes. Yet of necessity one of the two resultant blockchains must take a new name. In practice, this falls to the blockchain that represents the minority position in a dispute Landoni and Pieters, "Taxing Blockchain Forks.".

dilution that may occur could only be described as the product of an increase in the number of crypto-assets of all types in existence within the universe of available crypto-assets. Such a description would at best be a tenuous description of what constitutes a dilution, and certainly distinct from that arising in a share split.[238]

For some, these new tokens will be received without any involvement in or perhaps even knowledge of the hard fork event, while others may have been active in the disputes and decisions that gave rise to the hard fork. Others, whose crypto-assets are held on their behalf by crypto-asset exchanges and online wallet services, may not receive those new crypto-assets unless and until the wallet operator chooses to support them. Finally, new crypto-assets may fall to those who have lost access to their associated existing crypto-assets in one way or another.[239]

Five blockchains within the sample are the products of hard forks from pre-existing blockchains. Bitcoin Cash, Litecoin, and Dash are the products of hard forks from Bitcoin, while Bitcoin SV is the product of a hard fork from Bitcoin Cash. Ethereum Classic is the product of a hard fork from Ethereum. As with airdrops, hard forks appear to be characterised by good fortune rather than active participation by the recipient. On this basis, hard forks were initially coded as a separate category and subsequently added to a larger category of *Fortuitous issuances and receipts* together with airdrops. Airdrops and hard forks may however be distinguished by the presence of an active originator in respect of the former and absence in respect of the latter. In both instances it would seem that the dominant characteristic is likely to be one of passive good fortune, although it may be possible that at least some recipients participated in the events that led to or actively positioned themselves to benefit from the hard

[238] Webb, "A Fork in the Blockchain: Income Tax and the Bitcoin/Bitcoin Cash Hard Fork."
[239] Webb.

fork or airdrop. It may therefore be possible that the same event will give rise to different tax consequences for different parties depending on their actions.

4.4.1.5. *Retention*

Some crypto-asset white papers refer to tokens that appear to have been created but are retained for future use. In some cases the intended future use is specific, while in others it is more general. None appear to create a binding commitment. Such references might be allocated to a generic category of *retention*. A subsequent basis of origination will only be determinable at the date such tokens are in fact used.

4.4.1.6. *Origination transaction structuring*

The sequence of events through which crypto-assets are transferred to third parties can be complex and is sometimes opaque. Purchasers of the IOTA network's MIOTA tokens were asked to donate a portion of their total allocation to the IOTA Foundation, a non-profit foundation registered in Germany.[240] The Tezos Foundation, a non-profit foundation registered in Switzerland, distributed Tezos tokens in recognition of 'donations' made to the Foundation.[241] The Interchain Foundation made a 'recommendation' for the basis of allocation of Cosmos's Atom tokens in accordance with donations received by the Foundation, but was not itself the transferor of those tokens.[242]

It is submitted that the structures of such transactions reflect isolated attempts to take advantage of and perhaps abuse domestic legislation or to obscure the true nature of such transactions rather than representing distinctive characteristics of crypto-asset origination transactions. It is submitted that such transactions should be considered in accordance with their economic

[240] IOTA Foundation, "IOTA," 2020, https://www.iota.org/.
[241] Gideon Lewis-Kraus, "Inside the Crypto World's Biggest Scandal," Wired, 2018, https://www.wired.com/story/tezos-blockchain-love-story-horror-story/.
[242] Buchman and Goes, "Cosmos Genesis."

substance, which does not differ materially from other *Sales of crypto-asset tokens by originators*. These isolated elements will therefore not be pursued further in this study.

4.4.1.7. ***Summary on origination***

From the analysis of origination events, five transaction categories have emerged – *fiat currency deposits, sales of crypto-asset tokens by originators, remuneration or incentive, fortuitous issuances and receipts,* and *retention*.

The first transaction category is that of *fiat currency deposits*. In this case that which is received is easily identifiable and quantifiable, but a concurrent right of the holder to redeem such amounts may be created. This may be contrasted with the receipt of fiat currency or other types of crypto-asset tokens in the *sale of crypto-asset tokens by originators*, where no such right is created.

These categories may be followed by the receipt of crypto-asset tokens that act as *remuneration of other incentives* in consequence of employment or the rendering of independent services (including block processing). This is the first category containing events both with and without an identifiable counterparty. The originator is the beneficiary of the past services in the development of a particular blockchain prior to its launch. However, when further development occurs within an existing ecosystem it is less clear whether the beneficiaries are the originator or the user community (that is, existing token holders). The originator may benefit through technical advancements or attractive features that may increase the demand for tokens in future sales, while the user community may benefit from those same developments through a combination of enhanced features or good governance of the network and increased value of their tokens. When the service is that of block validation, the benefit appears more directly attributable to the user community, since it is the users whose transactions are processed, although there may be some element of benefit to an originator, since the value of tokens sold in future may be supported by the presence of a functioning network. However, it is not the

user community that grants the validator the new tokens, and therefore it is unlikely that it should be described as a counterparty.

Fortuitous issuances and receipts appear to be more likely the product of good fortune than the actions of the recipient, although in some instances participation may be the product of the actions of the recipient. Although an originator may play a more active role in an airdrop than a hard fork, in neither instance does any party receive anything in return from the recipient.

Crypto-asset tokens *retention* forms the final identified category, although no transaction occurs until such time as the retained tokens are applied in a transfer within one of the other identified categories.

The transaction categories developed from possible taxable events identified within the origination of crypto-asset tokens are shown in Table 4 below. These five transaction categories representing origination events will be included in what forms the basis of the tax analysis in Chapter 5.

Table 4: Transaction categories within origination events[243]

Origination		
Category	**Issued by**	**Subcategory**
Fiat currency deposits	By identifiable issuer	Fiat currency deposit
Sales of crypto-asset tokens by originators	By identifiable issuer	ICOs and other market sales
	By identifiable issuer	Investor sale
	By identifiable issuer	Recapitalisation (debt auction)
Remuneration or incentive	By identifiable issuer	Developer allocation
	By identifiable issuer	Remuneration and other incentives
	By identifiable issuer	Third-party developers
	By blockchain	Block rewards
Fortuitous issuances and receipts	By identifiable issuer	Airdrop participation
	By blockchain	Hard fork
Retained	By identifiable issuer	Retained

4.4.2. Possible uses by post-origination acquirers

Whether acquired through the act of origination or from a previous holder, every crypto-asset token is based on a central proposition of value to the holder. However, a holder may potentially transact with or otherwise receive benefits from each type of crypto-asset in multiple ways, according to its functions within the network within which it operates and the manner in which it is used by the holder.

As previously highlighted, this study focuses on the identification and analysis of possible taxable events arising from the transactions facilitated rather than the nature of the value

[243] A detailed table by crypto-asset is included in Appendix E.

proposition of the selected crypto-asset tokens. Central to understanding the transactions entered into by post-origination holders is an understanding of the benefits that they may enjoy. This subsection analyses and categorises those possible transactions and benefits.

4.4.2.1. *Medium of exchange*

4.4.2.1.1. *Payment solution*

While it is true that any crypto-asset token may function as a payment solution to the extent that it is used and accepted as such by two parties to a transaction, there are 17 crypto-asset white papers that explicitly propose the use of their tokens as a payment solution. The most obvious of these is Bitcoin, which proposes to act as an "electronic payment system".[244] These transactions were initially categorised as use as a *Payment solution*, but on further comparative analysis this category was expanded to a broader *Medium of exchange* category to allow for the inclusion of more context-specific payment-related use cases that were initially separately categorised.

The suitability of crypto-assets as a payment solution is evidenced by the high number within the sample proposing this use case, although this may also be partly attributable to the number which are directly or indirectly the product of hard forks from Bitcoin (four further crypto-assets in total). While use as a *Payment solution* is in many instances a proposed use, in respect of six crypto-assets (Ether, XRP, Cardano, Tron, Dash, Ethereum Classic, NEM and USD Coin), this is not the only proposed benefit to holders.

The circumstances in which these crypto-assets function as a *Payment solution* also differ. Bitcoin and the associated hard-forked blockchains (Bitcoin Cash, Litecoin, Bitcoin SV and Dash) facilitate on-chain transfer of tokens in exchange for off-chain counter-transfers. In other words, the blockchain records the transfer of tokens, but plays no part in what the token

[244] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System." At 1.

transferor receives in turn. This is true also of Monero, the origins of which are independent of Bitcoin but the primary use case of which is similar. Monero competes with Bitcoin and its by-products not on the basis of alternative use cases but rather on purportedly superior technology facilitating improvements in transaction anonymity.[245] Crypto.com Chain is a payment solution aligned to a specific context, being support of the Crypto.com Visa card and the introduction of protocols aimed at increasing acceptance of crypto-asset payments by merchants.[246]

Stablecoins (USD Tether and USD Coin within the sample) offer a specific variation on the concept of a *Payment solution*. These coins offer many of the purported benefits of crypto-assets together with a stable price in a fiat currency (US dollars in both of these cases). In order to achieve this, stablecoin issuers attempt to stabilise the price of their tokens either through the reserves that they hold or through guaranteed future redemption. A stable price makes stablecoins particularly attractive as a *Medium of exchange*. They are also an attractive option for retaining funds within the universe of crypto-assets without exposure to price volatility. For example, the holder of another crypto-asset acquired as a means of payment in a transaction may not need to locate an exchange that offers a so-called 'off-ramp' in fiat currency (with the additional regulatory requirements that may accompany this) as long as they can access an exchange that supports a stablecoin.[247] It is worth remembering that within the discussion on origination in 4.4.1, the origination of stablecoins was assigned to a unique category of *Fiat currency deposits*. This suggests that the use of stablecoins as a *Medium of exchange* may need to be considered separately from that of other tokens in the tax analysis of Chapter 5.

Despite offering a far wider use case proposition for their networks than merely the recording of payments, many networks within the sample that facilitate decentralised applications

[245] Nicolas Van Saberhagen, "CryptoNote," 2013, https://cryptonote.org/whitepaper. pdf.
[246] Crypto.com, "MCO Token," crypto.com, 2020, https://crypto.com/en/token.html; Crypto.com, "Crypto.Com," 2020, https://crypto.com/en/#.
[247] Centre, "Centre Whitepaper."

incorporate a native or application-layer crypto-asset token that serves, among other things, as a *Payment solution* (Ether, Cardano, Tron, Ethereum Classic, IOTA). This is a necessary inclusion to support decentralised applications on those networks that themselves require payments between transacting parties. The centrality of the *Payment solution* use case varies from network to network; within Ethereum (and by implication Ethereum Classic) it appears fairly central, while in Tron it appears an ex-post attempt to imbue the TRX token with long-term value. Within the IOTA network, MIOTA tokens act as a *Payment solution* within the specific context of the internet of things, where their high degree of divisibility facilitates micro-payments in transactions that occur without human intervention (for example, a micro-payment each time a user drives a car or uses a mobile phone, rather than the user paying up-front for ownership of that car or phone).[248]

4.4.2.1.2. ***Inter-currency transfer***

If stablecoins offer an attractive temporary position between other crypto-assets, then the so-called 'bridge' crypto-assets seek to create an attractive temporary position for facilitating *Inter-currency transfer* in the buying and selling of fiat currencies. Ripple seeks to displace the traditional SWIFT interbank transfer system through the introduction of a crypto-asset that is accepted by financial institutions, creating liquidity that facilitates the exchange of fiat currencies. A transferee institution that wishes to transfer one fiat currency which lacks sufficient liquidity (that is, willing buyers of that currency) uses that currency to purchase XRP, which it then sells for its target currency. Key to its success is broad adoption among financial institutions, and to this end Ripple has signed up more than 300 financial institutions.[249] The Ripple network infrastructure facilitates a far broader range of activities than merely currency bridging through XRP. Likewise, Ripple views the use of XRP as extending beyond *Inter-*

[248] IOTA Foundation, "IOTA."
[249] Ripple, "Ripple - One Frictionless Experience To Send Money Globally."

currency transfer facilitation to being "part of a new class of money which includes Bitcoin and other cryptocurrencies".[250]

While Ripple focuses on the transfer of fiat currencies between financial institutions, Stellar targets individuals, including those lacking access to traditional banking facilities, who seek to transfer fiat currencies. In addition to its accessibility, the selling proposition of Stellar is its minimal transaction fees, which it achieves through a streamlined validation process.[251] Unlike Ripple, Stellar does not explicitly position Lumens as a broader alternative *Payment solution*.

Since *Inter-currency transfer* involves a specific transfer-related transaction (fiat currency for crypto-asset followed immediately by crypto-asset for fiat currency) that is similar in nature to the broader *Payment solution transaction*, both transactions were added to a larger *Medium of exchange* category.

4.4.2.1.3. ***Payment of transaction fees***

Perhaps the most universal use case for crypto-asset tokens is in *Payment of transaction fees*. Transaction fees serve two important functions within a network. Firstly, they offer an incentive to transaction validators that is independent of the introduction of new tokens to the total supply. This is an important feature, since one of the original propositions of the crypto-asset concept is that the inflationary effects of increases in supply evident in the world of fiat currency may be mitigated by an absolute limit to the total token supply.[252]

The second important function that transaction fees perform is to provide an incentive for efficient use of the network and a disincentive for 'spamming' the network. In the absence of transaction fees, a user might attempt to flood the network with fraudulent transactions in an attempt either to overwhelm the network or in the hope that a small number of such transactions

[250] Ripple, "XRP Ledger Concepts."
[251] Stellar Development Foundation, "Stellar - an Open Network for Money," 2020, https://www.stellar.org/.
[252] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."

might be accepted as valid. Within a network that supports complex transactions, transaction fees also prohibit an instruction that is circular from continuing to be processed indefinitely.[253]

It is important for the purposes of this analysis to correctly understand the concept of a 'transaction' for which a fee may be charged. A transaction in the context of blockchain technology is primarily a reference to the addition of a permanent record to the blockchain. As can be seen from the scope of the networks within the sample that incorporate transaction fees, transactions may be but are not restricted to financial transactions. Buterin describes the Bitcoin blockchain as a "state transition system" that records at any point the state of ownership of all Bitcoin tokens in existence and facilitates the transition from one state to the next.[254] Because of the nature of Bitcoin this is a financial record. Yet non-financial records may equally be added to a blockchain, such as the results of voting processes, depending on the nature of that blockchain.[255] In a blockchain supporting decentralised applications, these records may reflect whatever information application-level developers choose to incorporate.[256] Transactions are the means through which these records are added to the blockchain.

Within some networks, such as Bitcoin and Dash, transaction fees for certain transactions may be voluntary, and serve to prioritise the processing of a user's transaction, since validators may choose the order in which transactions are processed according to the incentives offered.[257] Other networks have standard fees based on the size of the transaction. This is particularly important where the scope of transactions supported by the network are broad and the size of information content may vary considerably.[258] Still other networks employ a hybrid of a minimum mandatory fee together with a voluntary additional fee linked to prioritisation when

[253] Ripple, "XRP Ledger Concepts"; Jae Kwon and Ethan Buchman, "Cosmos," 2020, https://v1.cosmos.network/resources/whitepaper; Buterin, "Ethereum White Paper."
[254] Buterin, "Ethereum White Paper." At 6.
[255] Buterin.
[256] Bo, "Cracking the Ethereum White Paper."
[257] Dash Core Group Inc, "Features," 2020, https://docs.dash.org/en/stable/introduction/features.html#fees; Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."
[258] Buterin, "Ethereum White Paper."

network usage is high.[259] Not all networks levy transaction fees directly in their primary crypto-asset token. Both Ethereum and NEO charge transaction fees in a secondary token, referred to in both instances as 'GAS', which is purchased using the network's primary token. This allows the networks to set a consistent transaction fee denominated in GAS, while allowing the price between GAS and their primary tokens to fluctuate according to the market price of the primary token.[260]

Not every network relies on transaction fees to fulfil both of the above functions. The Ripple network does use transaction fees to reward validators, relying instead on their investment in the success of the network as motivation for transaction processing. In this instance, tokens spent in transaction fees are destroyed, or 'burned'.[261] EOS relies solely on block rewards to incentivise validators.[262] Application-level tokens (Leo, Chainlink Links, MKR, and USD Coins within the sample) cannot be used to pay for transaction fees, since transaction processing occurs on the underlying network. The IOTA network uses an innovative validation system whereby in order to initiate their own transaction a user must validate two other algorithmically-selected transactions.[263]

The payment of transaction fees represents a specific instance of a transaction in which crypto-asset tokens are used as a *Payment solution* (that is, payment in return for a transaction being processed). Payment of transaction fees was therefore added to the broader *Medium of exchange* category.

[259] Ripple, "XRP Ledger Concepts."
[260] Buterin, "Ethereum White Paper"; Bo, "Cracking the Ethereum White Paper"; Neo, "NEO White Paper."
[261] Ripple, "XRP Ledger Concepts."
[262] block.one, "EOS.IO Technical White Paper V2."
[263] Serguei Popov, "The Tangle," 2018, https://assets.ctfassets.net/r1dr6vzfxhev/2t4uxvsIqk0EUau6g2sw0g/45eae33637ca92f85dd9f4a3a218e1ec/iota1_4_3.pdf.

4.4.2.1.4. *Payment of counterparty transaction fees*

In most instances, transaction fees are paid to the party that processes the transaction rather than to a counterparty in the transaction. However, the Ripple, Binance and Chainlink networks all envisage situations where tokens are used in the *Payment of counterparty transaction fees* rather than a third-party transaction processor. In the case of Ripple, third-party financial institutions may charge fees for creating on-chain digital assets backed by currency held in the real world.[264] Binance Coin holders may use their tokens to pay Binance crypto-asset exchange fees at discounted rates.[265] Chainlink fees are paid to those who provide 'oracle' services that interface between the network and external sources of information needed to determine the outcome of transactions, while transaction processing itself occurs on the underlying network.[266]

In this context, the transaction fees do not relate specifically to transaction processing activities on the network and therefore potentially even more closely represent a *Payment solution* in a specific context and therefore such transactions have also been classified as part of the *Medium of exchange* category.

4.4.2.2. *Involuntary transfers*

4.4.2.2.1. *Incentivised hacking*

Crypto-asset tokens may also be used to pay involuntary fees or penalties. The Cosmos network incorporates the concept of *Incentivised hacking*. Cosmos transaction validators are penalised for processing invalid transactions or for being hacked. A portion of the penalty fees may be transferred to the hacker, and the balance destroyed.[267] Chainlink also envisages penalising

[264] Ripple, "XRP Ledger Concepts."
[265] Binance, "Binance Exchange Whitepaper v1.1," 2017, https://whitepaper.io/document/10/binance-whitepaper.
[266] Steve Ellis, Ari Juels, and Sergey Nazarov, "ChainLink: A Decentralized Oracle Network," 2017, https://link.smartcontract.com/whitepaper.
[267] Kwon and Buchman, "Cosmos."

oracle nodes for 'misbehaviour' such as reporting inaccurate external information,[268] although it appears that this feature is not yet active.

4.4.2.2.2. ***Theft***

A number of white papers make reference to involuntary disposals as a result of *Theft*. Ethereum Classic is the product of a hard fork from Ethereum arising out of the infamous 'DAO Hack' of 2016.[269] The end result is that, while the stolen Ether tokens were returned to their holders, those holders did not receive the equivalent in Ethereum Classic tokens in the hard fork, since the theft continued to be recognised in the Ethereum Classic blockchain.

NEM achieved notoriety in 2018 when XEM tokens to the value of USD 530 million were stolen from the Coincheck website. This was the largest crypto-asset theft to date.[270] The Bitfinex platform also suffered a hack in 2016, resulting in a loss of a significant number of bitcoins.[271] The possibility of the theft of encryption keys is contemplated in the EOS white paper, which discusses mechanisms within the EOS.IO software to recover stolen keys.[272]

The common characteristic of all identified *Involuntary transfers* is that they involve the transfer of tokens involuntarily and without the receipt of a commensurate benefit by the transferor. Since the instances of *Theft* identified suggest that all crypto-assets are potentially vulnerable to theft, all crypto-assets in the sample were added to this category.

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[268] Ellis, Juels, and Nazarov, "ChainLink: A Decentralized Oracle Network."
[269] Lewis-Kraus, "Inside the Crypto World's Biggest Scandal"; Osman Gazi Güçlütürk, "The DAO Hack Explained: Unfortunate Take-off of Smart Contracts," Medium, 2018, https://medium.com/@ogucluturk/the-dao-hack-explained-unfortunate-take-off-of-smart-contracts-2bd8c8db3562.
[270] Crypto Briefing Analyst Team, "What Is NEM? Introduction To XEM," 2018, https://cryptobriefing.com/what-is-nem-introduction-to-xem/.
[271] iFinex Inc., "Initial Exchange Offering of LEO Tokens," 2019, https://www.bitfinex.com/wp-2019-05.pdf.
[272] block.one, "EOS.IO Technical White Paper V2."

4.4.2.3. *Holding*

While some benefits to the holder of certain crypto-assets are the product of transferring those crypto-assets, the benefits may in other instances or in respect of other crypto-assets be a product of continued ownership or *Holding*.[273]

4.4.2.3.1. *Minimum account balance*

Both the Ripple and Stellar networks require a *Minimum account balance* of crypto-asset tokens to be maintained in order to transact on the network.[274] The ability to transact on the network is therefore a benefit of this token *Holding*.

4.4.2.3.2. *Network usage and Network delegation*

The Tron network assigns daily Bandwidth Points (BP) to token holders, which carry a limited right to use the Tron network. In order to obtain additional BP a holder may 'freeze' their holding, which prevents the disposal of those tokens for a period of time. If a holder's BP are insufficient for their usage, the shortfall results in a transaction fee deducted from the TRX amount transferred.[275] The accumulation of BP is therefore a benefit of *Holding*.

Rather than charging transaction fees, the EOS network grants network usage rights to token holders according to the size of their holding for so long as they hold those tokens. Holders therefore effectively purchase the right to use a portion of the network's total processing power. Users are not charged transaction fees, and transaction processing on the EOS network is rewarded exclusively through block rewards. Network usage rights are therefore a direct benefit of EOS token *Holding*. EOS token holders whose network usage entitlement exceeds

[273] In this study the term 'holding' is used to refer those instances in which the owner of a token obtains benefits from continued ownership of a token rather than from its immediate or future disposal. Such benefits may include those identified within sections 4.4.2.3.1 to 4.4.2.3.4. It is anticipated that it is primarily the receipt of such a benefit rather than the act of holding itself that represents a possible taxable event.
[274] Ripple, "XRP Ledger Concepts"; Stellar Development Foundation, "Stellar - an Open Network for Money."
[275] TRON Foundation, "Advanced Decentralized Blockchain Platform Whitepaper," 2018, https://tron.network/static/doc/white_paper_v_2_0.pdf.

their requirements may delegate or rent their excess capacity to other users.[276] This adds a further element of the benefit of *Network usage*, which is that excess capacity can confer an earning potential benefit through *Network delegation*.

4.4.2.3.3. ***DPoS candidacy and delegation***

Many networks that seek to increase transaction processing efficiency and reduce energy consumption assign transaction validation opportunities through a combination of randomisation and on the basis of the 'stake' held by candidate validators. As previously noted, such an approach is referred to as delegated proof-of-stake (DPoS). In the initial analysis, *DPoS candidacy and delegation* was identified as a transaction or benefit leading to possible taxable events.

The application of *DPoS candidacy and delegation* varies from network to network. Within the sample, DPoS is employed by the EOS, Cardano, Tron, Tezos, NEO and Cosmos networks, while the Dash and NEM networks use modified versions, called 'proof of service' and 'proof of importance' respectively. In all cases within the sample except for EOS the selected validator earns transaction fees from the transferring party, and with the exception of validators in the Cardano and NEO networks DPoS validators are also entitled to block rewards of new tokens from the network.

Within the EOS network, 21 transaction validators or 'block producers' are selected every 126 rounds to randomly process six blocks each. These validators are selected using a continuous voting system. Each EOS token entitles the holder to vote for 30 block producers. To be able to exercise their votes, token holders are required to stake their tokens, meaning that they cannot be sold for a period of three days. Token holders may also delegate the votes of their

[276] block.one, "EOS.IO Technical White Paper V2."

staked tokens to a proxy.[277] Platforms exist that facilitate the sharing of block rewards with voters.[278]

Tron uses a similar voting system to that of EOS. TRX holders must freeze their stake for three days in order to participate in the election of 27 'super-representatives' every six hours. Super-representatives must in turn pay a fee of 9,999 TRX tokens, which are burned, in order to stand for election (this is considered further under 4.4.3 below). Elected super-representatives share in block rewards, and in an additional reward to the top 127 super-representatives determined annually. Super-representatives may share rewards with voters.[279]

NEO, known as the "Chinese Ethereum",[280] refers to its validation system as delegated Byzantine Fault Tolerance (dBFT) rather than DPoS, although the distinctions seem to be marginal. NEO holders vote for their preferred consensus nodes from a current selection of seven candidates, of which five are operated by the NEO Foundation. Transaction validators are selected by an algorithm from the elected candidates and earn transaction fees, which may be shared with others. In addition, NEO charges users system fees, which are shared among NEO token holders, who also receive distributions of new GAS tokens each time a new block is created.[281]

Within the Cardano network, the chances of selection to transaction validator roles (referred to as 'slot leader' and 'slot endorser') is proportional to a candidate validator's ADA stake. ADA holders can delegate their stake to another holder in order to increase the latter's chance of

[277] Kyle Samani, "The Definitive Voting Guide For EOS Block Producers," Forbes, 2018, https://www.forbes.com/sites/ksamani/2018/09/18/the-definitive-voting-guide-for-eos-block-producers/#2c99724c4d4f; block.one, "EOS.IO Technical White Paper V2."
[278] Brady Dale, "On EOS Blockchain, Vote Buying Is Business as Usual," 2020, https://www.coindesk.com/on-eos-blockchain-vote-buying-is-business-as-usual.
[279] TRON Foundation, "Advanced Decentralized Blockchain Platform Whitepaper."
[280] Aaron Mangal, "What Is NEO Cryptocurrency? A Beginners' Guide," 2017, https://coincentral.com/what-is-neo-cryptocurrency/.
[281] Neo, "Transaction Fees," 2020, https://docs.neo.org/tutorial/en-us/3-transactions/4-NEO_transaction_fees.html; Neo, "NEO White Paper."

selection, and in return may share in the earnings of the validator when selected.[282] Dash employs a hybrid model, within which traditional miners perform transaction validation, and 'masternodes' perform other governance functions, for which they are awarded a 45% share of block rewards. Dash refers to this as 'proof of service'. In order to participate, a 'masternode' (of which there are currently around 2,400) must deposit 1,000 Dash tokens, which are returned upon withdrawal from the role.[283]

Tezos holders are also selected for transaction validation, referred to within the network as 'baking', based on the size of their stake. In order to be eligible, 'bakers' must post a bond in XTZ tokens as security, which is returned to them together with their rewards and fees at the end of each quarterly cycle. XTZ holders who do not wish to act as bakers may delegate their holding to others in return for a share of earnings.[284] Cosmos has a limited number of validator positions, beginning at 100 and increasing to 300 over ten years. Validators are those that 'bond' the highest number of Atom tokens, which are returned to them after an 'unbonding' period. Holders may delegate their tokens to others in order to increase their likelihood of qualification, in return for sharing in earnings.[285] Crypto.com Chain rewards both intermediaries and 'council nodes' for various activities, including validation and the exchange of crypto-assets and fiat currency. Both are required to stake tokens in order to function in these roles. While the number of intermediaries is not limited, council node functions will initially be performed by Crypto.com and subsequently allocated more widely in a process of 'phased decentralisation', and it is only council nodes who receive block rewards. Interestingly, while in other blockchains block rewards are a product of the validation process and transaction fees are received directly from users, within Crypto.com Chain both of these are distributed

[282] Kiayias et al., "Ouroboros: A Provably Secure Proof-of-Stake Blockchain Protocol."
[283] Duffield and Diaz, "Dash: A PrivacyCentric CryptoCurrency"; Dash Core Group Inc, "Mining," 2020, https://docs.dash.org/en/stable/mining/.
[284] Tezos, "Tezos," 2020, https://tezos.com/get-started#bake-validate; Rajarshi Mitra, "What Is Tezos? The Most Updated Deep Dive," 2019, https://blockgeeks.com/guides/what-is-tezos/.
[285] Kwon and Buchman, "Cosmos."

centrally by Crypto.com, which collects fees from users and funds block rewards from crypto-asset reserves.[286]

NEM's PoI system determines the probability of selection for validation (which it refers to as 'harvesting') not only on the basis of XEM token holdings, but also on the basis of length of time held and net XEM transactions entered into. It therefore creates an incentive not only to obtain and hold XEM tokens but also to transact with them. Token holdings are only taken into account once they have vested, which occurs at a rate of 10% of the holder's total every 1,440 blocks. Once again, holders can delegate their PoI score to others in return for a share of rewards. This act of delegation incurs a transaction fee.[287]

Despite the differences in detail, all of the *DPoS candidacy and delegation* benefits are the direct or indirect product of crypto-asset token holdings. They were therefore allocated to the *Holding* category.

4.4.2.3.4. ***Future hard fork and airdrop participation***

A number of crypto-assets within the sample were identified as being the product of a hard fork from a pre-existing blockchain. Bitcoin, Ethereum, Bitcoin Cash, and Monero were identified as being the pre-existing blockchains from which these crypto-assets forked. *Future hard fork participation* was therefore a benefit of *Holding* these pre-existing crypto-assets.

Similarly, *Holding* of crypto-assets may entitle the holder to *Future airdrop participation*. Crypto.com Chain's CRO token was the only crypto-asset token in the sample identified as being distributed in part through an airdrop to holders of a pre-existing token.[288] In addition, following the acquisition of BitTorrent by Tron, the latter's website proposes the future distribution of BitTorrent tokens in an airdrop to TRX holders as one of its value propositions

[286] Crypto.com, "Crypto.Com Chain"; Crypto.com, "Crypto.Com Chain: The next Generation Decentralized Mobile Payment Protocol," 2019, https://crypto.com/images/chain_technical_whitepaper.pdf.
[287] NEM.io Foundation Ltd, "NEM Technical Reference," 2018, https://nemplatform.com/about/.
[288] Crypto.com, "Crypto.Com Chain."

for TRX tokens.[289] As already noted in 4.4.1, a new token sometimes comes into existence through a hard fork event in an existing blockchain. While 4.4.1 considers the nature of the new token created, it must here be noted that the receipt of an allocation of this new token is the product of *Holding* the existing token.

An incentive to own or acquire a particular crypto-asset may therefore be to benefit from an anticipated *Future hard fork or airdrop participation*. This was identified as a benefit category in its own right in the initial analysis, and on subsequent comparative analysis added to the broader *Holding* category, since it represents a further means by which a holder can obtain further crypto-asset tokens by virtue of tokens already held.

The *Holding* of one token within the sample entitled the holder to a *Transaction fee reduction* outside of the network. The Unus Sed Leo network is a creation of the iFinex Inc., which also owns the BitFinex crypto-asset trading platform. Leo token holders are entitled to reductions in fees on the BitFinex and associated platforms.[290] This was added to the *Holding* category, since it represents a reduction of costs that would otherwise be incurred.

4.4.2.4. ***Speculation and investment***

Two possible benefits exist independently of the specific nature of the crypto-asset token – the gains arising from either speculation or investment in those tokens. These seldom feature in the value proposition or use cases outlined in the crypto-asset white papers, although as noted in 4.4.1 it is the primary use case of the MKR token (notwithstanding that the white paper makes no explicit reference to speculation or investment). By virtue of their very listing on the www.coinmarketcap.com website from which the sample selection was determined, all crypto-asset tokens within the sample may function as a basis for speculation or investment. The

[289] TRON Foundation, "TRX," 2020, https://tron.network/trx?lng=en.
[290] Bitfinex, "Bitfinex," 2020, https://www.bitfinex.com; iFinex Inc., "Initial Exchange Offering of LEO Tokens."

exception to this is that of the stablecoins, which by their very nature will not (or at least should not) fluctuate in value over time.

4.4.2.5. *Summary on possible uses by post-acquisition acquirers*

The holder of crypto-asset tokens may hope to benefit from those tokens through either use as a *Medium of exchange* or through the network access or earning potential attributable to continued *Holding*. They may also benefit from *Speculation and investment* in crypto-asset tokens, regardless of the underlying use case of the tokens in question. A holder may also be parted from their crypto-asset tokens through *Involuntary transfers*.

Tokens may be transferred as a *Medium of exchange* either in return for benefits received outside the network, or for specific benefits received within the network, including benefits in the form of transaction processing on the network. The transactions processed may be financial or non-financial, and may include transfers, account creation, voting, storing of information, or the addition of any other form of record to the blockchain. One particular use case is of crypto-assets is as an intermediary asset facilitating the exchange of different fiat currencies.

Although *Involuntary transfers* such as penalties and theft confer no benefit to the transferor, they do nonetheless represent a transfer and therefore a transaction.

The first type of benefit that may be obtained from continued *Holding* of a particular crypto-asset is that of network access, or the right to use a certain capacity of the network. That use might be dependent on a minimum balance held, or be proportional to the balance held. Earning potential is also created when a token holder is allowed to delegate access or usage rights. Earning potential also exists through the ability to participate in the block validation activities that give rise to block rewards and transaction fees in a DPoS network. Those benefits might be obtained through either the voting rights or proportional ownership associated with the holder's token balance, and may include elements of algorithmic selection and requirements to

'freeze' or otherwise commit tokens for a period. Earning may be either directly through transaction processing, or indirectly through the delegation to another party of the holder's voting rights or proportional ownership in return for sharing in that party's transaction processing rewards.

Earning potential also exists through the possibility of receiving tokens in the event of a hard fork in the token's blockchain, or in an airdrop of new tokens to holders of an existing token. A number of crypto-asset networks within the sample are the product of hard forks, while others have been subject to hard forks. One of the crypto-asset tokens in the sample has been distributed through an airdrop, while another promises to be the basis of a future airdrop.

The categorisation of the post-acquisition transactions identified is illustrated in Table 5. These four transaction categories representing the subsequent use of crypto-asset tokens will be added to the five transaction categories developed within origination events as the basis of the tax analysis in Chapter 5.

Table 5: Post-origination transactions categorised[291]

Post-origination											
Medium of exchange				**Involuntary transfer**		**Holding**					**Speculation and investment**
Payment solution	Inter-currency transfer	Payment of transaction fees	Payment of counterparty transaction fees	Incentivised hacking	Theft	Minimum account balance	Network usage and delegation	DPoS candidacy and delegation	Future hard fork and airdrop participation	Transaction fee reduction	

4.4.3. Extinction

White papers of crypto-assets within the sample envisage various scenarios in which crypto-asset tokens may be extinguished or otherwise result in a permanent reduction in supply. These

[291] A detailed table by crypto-asset is included in Appendix E.

may occur in either voluntary events, such as payments, repurchases and redemptions, or from involuntary extinction events, such as penalties, lost access, or transfer to non-existent accounts.

4.4.3.1. *Medium of exchange*

4.4.3.1.1. *Transaction and Storage fees*

While in most cases *Transaction fees* are paid from users to a block producer or transaction validator, in the Ripple network transaction fees are burned rather than transferred to another party.[292] Stellar transaction fees are retained in a fee pool rather than being distributed.[293] While Tezos transaction fees go to validators, *Storage* fees are burned.[294] Since the only distinguishing feature of such transactions fees in comparison to those discussed in 4.4.2 is the absence of a receiving counterparty, and since the transferor is in no way affected by this absence or by the resultant extinction or removal from circulation of their tokens (inasmuch as the transferor's transaction is still processed as a result of this payment, which is voluntarily made), this transaction may be added to the *Medium of exchange* category developed in 4.4.2 together with the transaction fees already analysed in that section.

4.4.3.1.2. *DPoS candidacy*

While a number of networks perform transaction validation assignment based on token holdings, and some require a crypto-asset token deposit to ensure eligibility, the Tron network requires a *DPoS candidacy* payment of 9,999 TRX, and this payment is burned.[295] This transaction has been categorised as a *Medium of exchange*, since its nature has more in common with the payment of transaction fees than with the *DPoS candidacy and delegation* entitlement emanating from ongoing *Holding* rather than from transfer.

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[292] Ripple, "XRP Ledger Concepts."
[293] Stellar Development Foundation, "Stellar - an Open Network for Money."
[294] L.M. Goodman, "Tezos – a Self-Amending Crypto-Ledger," 2014, https://academy.bit2me.com/wp-content/uploads/2021/04/tezos-whitepaper.pdf.
[295] TRON Foundation, "Advanced Decentralized Blockchain Platform Whitepaper."

4.4.3.2. *Speculation and investment*

4.4.3.2.1. *Repurchases*

Three crypto-asset white papers within the sample included reference to token *Repurchases*. The original 2017 Binance white paper included the commitment that "Every quarter, we will use 20% of our profits to buy back BNB and destroy them" until the total original supply is reduced by half.[296] Cointelegraph writer Helen Partz noted that the 2019 Binance white paper version 1.2 replaced this statement with "Every quarter, we will destroy BNB based on the trading volume on our crypto-to-crypto platform until we destroy 50% of all the BNB" [297], omitting any reference to repurchasing coins or using profits to do so.[298] Although these quarterly repurchase events have occurred, commentator Arjun Balaji observes that that these are not necessarily open market repurchases, nor is this an enforceable commitment, nor is there transparency in the determination of the profits on which the reduction in tokens is purportedly based, nor will all tokens be ultimately repurchased[299]. The prospective benefits to Binance Coin holders may therefore vary greatly.

LEO crypto-asset tokens are also to be repurchased and burned over time. The monthly repurchase rate will be based on 27% of iFinex's gross revenue in the previous month.[300] However, unlike the Binance Coin, the white paper proposes that all LEO tokens will ultimately be repurchased, which by implication means that some must be repurchased on the open market. Live tracking of LEO repurchases on the Bitfinex website suggest that this commitment is being honoured at present.[301]

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[296] Binance, "Binance Exchange Whitepaper v1.1." At 9.
[297] Binance, "Binance Exchange Whitepaper v1.2." At 9.
[298] Helen Partz, "Binance Updates White Paper to Reword Section on Quarterly Manipulations with BNB," 2019, https://cointelegraph.com/news/binance-updates-white-paper-to-reword-section-on-quarterly-manipulations-with-bnb.
[299] Arjun Balaji, "So, Is Binance Coin Actually Worth Anything?," 2019, https://www.theblockcrypto.com/post/12955/so-is-binance-coin-actually-worth-anything.
[300] iFinex Inc., "Initial Exchange Offering of LEO Tokens."
[301] Bitfinex, "Bitfinex."

Interestingly, the Bitfinex platform suffered both a hack in 2016, resulting in a loss of a significant number of bitcoins, as well as a freezing of funds held by a payment processor called 'Crypto Capital' in 2018. The white paper discusses both of these events, together with the company's actions in response. In addition to its revenue-based repurchase rate, the white paper commits to repurchase LEO tokens using 95% of any amounts recovered in respect of its Crypto Capital losses, and 80% of any amounts recovered in respect of the bitcoin hack.[302] The frozen funds held by Crypto Capital purportedly amounted to USD 850 million.[303]

Since repurchases of BNB and LEO tokens involve a willing seller and may occur at least partly on the open market, the attitude of the holder disposing of such tokens must at the point of disposal be that of a speculator or investor, and for this reason repurchases have been categorised to the *Speculation and investment* category. This is considered a more appropriate categorisation than to the *Medium of exchange* category, since the transactions in that category involve the holder receiving goods or services in exchange for their tokens.

4.4.3.2.2. ***Surplus auctions (supply reduction)***

As noted earlier in this analysis, the Maker network performs repurchases of its MKR tokens in order to distribute its reserves of DAI tokens (the network's stablecoin) once those reserves exceed prescribed amounts. This potential return acts as an incentive to good governance of the network, which is a function of the exercise of voting power attached to MKR tokens. Repurchased MKR tokens are destroyed.[304] In the initial analysis this event was assigned a unique category of *Surplus auctions (supply reduction)*. However, on further comparative analysis, the lack of any right of the holder to enforce a repurchase suggests that this is in fact not materially distinct from other *Repurchases*, but rather should be categorised together with

[302] iFinex Inc., "Initial Exchange Offering of LEO Tokens."
[303] Daniel Phillips, "Bitfinex LEO Token: The Full Investor's Guide," 2020, https://coindiligent.com/leo-token-bitfinex.
[304] MakerDAO, "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System."

Repurchases within *Speculation and investment*, consistent with origination transactions involving MKR tokens in 4.4.1.

4.4.3.3. ***Redemptions***

The stable price of USD Tethers to the US Dollar is maintained through confidence in the reserves that the originator holds, and it would therefore seem that USD Tethers must be redeemable. In fact this has been the subject of contestation, with critical commentators drawing attention to restrictions in the company's terms of service on any legal or contractual right to enforce redemption (although these terms appear to have been subsequently amended to be more favourable towards holders).[305] An announcement on the Tether website dated 27 November 2018 states that direct issuance and redemption from the company's site may be performed, but for a minimum amount of USD 100,000. Withdrawal fees are charges on a sliding scale, increasing from 0.4% to 3% with the size of withdrawal.[306] Clearly, these limitations prohibit redemption for smaller users, and discourage redemption of larger amounts.

In the event that USD Tether tokens are redeemed, it is unclear whether they are burned or merely held in reserve by Tether pending reissue on the receipt of future deposits. One instance of a notice of the destruction of a portion of tokens held by Tether was noted among the company's announcements.[307] It is not clear why this permanent reduction in supply was made, since token supply has no effect on the market price of USDT.

USD Coin is another stablecoin within the sample of this study. Unlike Tether, the USD Coin appears to have a policy of more accessible redemption of tokens for fiat currency from the token originator Circle, as well as a layer of protection through the functioning of Centre (the

[305] See, for example, Hay, "What Is Tether USDT - A Beginner's Guide."
[306] Tether Limited, "Tether Reopens Account Verification and Direct Redemption of Fiat from Its Platform," 2018, https://tether.to/tether-reopens-account-verification-and-direct-redemption-of-fiat-from-its-platform/.
[307] Tether Limited, "Upcoming USDT Redemption – October 24th, 2018," 2018, https://tether.to/upcoming-usdt-redemption-october-24th-2018/.

network originator) as an 'independent' verifier of the reserves of the originator. Redeemed USD Coins may be either destroyed or held in reserve by Circle. [308, 309]

Redemptions has been retained as a separate transaction category because of the distinctive right afforded the holder, and because as a category it is unique to and the corollary of stablecoin origination through *Fiat currency deposits*. However, in the absence of an enforceable right of redemption, any redemptions that might occur may be comparable in nature to *Repurchases*, since they would require both a willing buyer and a willing seller.

4.4.3.4. *Involuntary transfers*

4.4.3.4.1. *Penalties*

As part of its incentivised hacking initiative, Cosmos imposes *Penalties* on any transaction validators that are successfully hacked, being a percentage of their staked tokens, which it refers to as 'slashing'. It appears that these penalty tokens are destroyed. Validators may also be penalised for incorrect processing of actions. Cosmos also penalises voters who choose to veto a development proposal that has received majority support in the network's proposal approval system. It is unclear whether these penalties result in token destruction.[310] Chainlink has a penalty system for oracle nodes that report incorrect information, although it appears that this is not yet active. Once again, it is unclear whether this penalty system results in token extinction.[311] The distinctive characteristic of *Penalties* is that the transferor receives no benefit in return.

[308] Centre, "Centre Whitepaper."
[309] Although Centre has its origins within the Circle organisation, the network envisages the creation of other stablecoins by other independent originators.
[310] Kwon and Buchman, "Cosmos."
[311] Ellis, Juels, and Nazarov, "ChainLink: A Decentralized Oracle Network."

4.4.3.4.2. *Non-existent accounts*

White papers also warn of the possibility of losing crypto-asset tokens permanently if they are inadvertently sent to *Non-existent accounts*.[312] In all these cases, while the associated tokens are not truly extinguished, they are permanently removed from circulation. Since once again the transferor receives no benefit from these transactions, they have therefore been categorised together with *Penalties* as an *Involuntary transfer.*

4.4.3.4.3. *Lost access*

Although not specifically discussed in any white papers, stories abound of holders either losing their cryptographic keys or access to the computer hardware on which their crypto-assets were stored,[313] and such an event is therefore considered potentially applicable to all crypto-assets in the sample. Here too, the distinctive characteristic is the absence of any benefit to the transferor. While *Lost access* has also been categorised as an extinction event since it involves the permanent removal from circulation of such tokens, it must be noted that in this case the tokens may not in fact have been transferred by the holder, and that this distinction may be significant in further analysis. Crypto-asset recovery services offer password recovery and hardware repair, and appear to be partially successful in doing so.[314]

4.4.3.5. *Summary on extinction*

Both the payment of transaction and DPoS candidacy fees that lead to the extinction of tokens is a transfer from the perspective of the holder, who is unaffected by the fact that there may be no recipient. Both have therefore been categorised as use as a *Medium of exchange*.

A distinction between redemptions and repurchases is drawn on the basis of the centrality of the role of redemption in the value proposition of the stablecoin crypto-asset token in

[312] Ripple, "XRP Ledger Concepts"; NEM.io Foundation Ltd, "NEM Technical Reference."
[313] Bal, "Bitcoin Transactions : Recent Tax Developments and Regulatory Responses."
[314] Simon Chandler, "How Good Are Bitcoin Recovery Services?," 2019, https://cryptonews.com/exclusives/how-good-are-bitcoin-recovery-services-4703.htm.

comparison to the open-market and contingent nature of repurchases. *Redemption* has therefore been retained as a separate category, while repurchases have been categorised as a *Speculation and investment* transaction. It has however been noted that the identity of *Redemptions* as a separate category may be dependent on the holder's right to enforce redemption.

Involuntary transfers resulting in token extinction (or at least permanent removal from circulation) include penalties and token loss. Both have been categorised as an *Involuntary transfer*, while noting that not all loss of access to tokens is as the result of the transfer of ownership.

Within extinction events, only one new transaction category has emerged, while other events have been added to four categories developed in 4.4.2. This suggests that recognising *Extinction* as a distinct stage is largely unnecessary. The table previously presented in 4.4.2 can thus be expanded to include the product of the analysis in 4.4.3 as presented in Table 6 below. Together with transaction categories identified in origination transactions, the categories as represented in the table will form the basis of the tax analysis in Chapter 5.

Table 6: Post-origination transactions categorised (including extinction transactions)[315]

Medium of exchange							**Redemptions**	**Holding**					**Speculation and investment**			**Involuntary transfers**				
Payment solution	Inter-currency transfer	Payment of transaction fees	Payment of counterparty transaction fees	Transaction fees	Storage	DPOS candidacy		Minimum account balance	Network usage and delegation	DPoS candidacy and delegation	Future hard fork and airdrop participation	Transaction fee reduction	Speculation and investment	Repurchases	Surplus auctions (supply reductions)	Incentivised hacking	Theft	Penalties	Non-existent accounts	Lost access

[315] A detailed table by crypto-asset is included in Appendix E.

4.5. Conclusion

In the initial analysis of 25 crypto-asset white papers and other supporting documents, 32 transactions representing possible taxable events were identified. These were initially presented according to stages in a crypto-asset token life cycle of Origination, Subsequent Use, and (possible) Extinction.

Through the processes of constant comparison, the possible taxable events at the Origination stage have been grouped into five categories, each with common characteristics. These categories are origination by Fiat currency deposits, Sales of crypto-asset tokens by originators, Remuneration or incentive, Fortuitous issuances and receipts, and Retention.

Through the same process, a further five transaction categories were developed that spanned Subsequent Use and Extinction. Those categories are Medium of exchange, Redemptions, Holding, Speculation and investment, and Involuntary transfers.

In combination, the categorisations developed in the process of this analysis may be presented in a single summary matrix, where tokens are originated for a variety of potential post-origination uses, with observed intersections within the sample marked with an X. For example, tokens originated by fiat currency deposit may be used as a medium of exchange and extinguished by redemption. Such tokens were however not observed to grant the holder any ongoing benefit while continuing to hold that token. In some instances, intersection may not be possible, or at least highly unlikely.

Table 7: Summary crypto-asset transaction category matrix[316]

	Subsequent use or extinction				
	Medium of exchange	**Redemptions**	**Holding**	**Speculation and investment**	**Involuntary transfers**
Origination					
Fiat currency deposits	X	X		X	X
Sales of crypto-asset tokens by originators	X		X	X	X
Remuneration or incentive	X		X	X	X
Fortuitous issuances and receipts	X		X	X	X
Retained	X		X	X	X

In total, ten transaction categories have been developed to represent the similar and unique characteristics of the 32 transactions identified as possible taxable events from the analysis of crypto-asset white papers. These ten transaction categories will form the basis of the analysis of direct tax consequences and classification in Chapter 5.

[316] A detailed table by crypto-asset is included in Appendix E.

5. TAX ANALYSIS OF IDENTIFIED CATEGORIES

5.1. Introduction

In the preceding chapter, 32 transactions identified as arising in the 25 crypto-assets analysed were categorised according to their characteristics. This resulted in the development of the ten transaction categories in Table 7 to be taken forward for further analysis.

In this chapter, the direct tax consequences of the income arising, and the classification thereof, will be assessed with references to the first normative framework for this study, being the text of the articles of the model tax conventions, which serves as a commonly-accepted point of reference within the international tax system. Where classification within the framework cannot be achieved or gives rise to further considerations, these shall be addressed with reference to the principles of good tax design, being the second normative framework for this study, as discussed in Chapter 2.

The analysis of the income categories developed in the preceding chapter will proceed systematically according to the table below. Consideration begins with each of the possible *Origination* transaction categories, and continues to address each of the possible transactions occurring subsequent to *Origination.*

Table 8 provides a cross-reference for each transaction category developed in Chapter 4 to the corresponding analysis in this chapter.

Table 8: Chapter section cross reference table

		Subsequent use or extinction				
		Medium of exchange	**Redemptions**	**Holding**	**Speculation and investment**	**Involuntary transfers**
Origination						
Fiat currency deposits	5.2	5.7.2	5.8		5.10.2	5.11
Sales of crypto-asset tokens by originators	5.3	5.7.3		5.9	5.10.3	5.11
Remuneration or incentive	5.4	5.7.3		5.9	5.10.3	5.11
Fortuitous issuances and receipts	5.5	5.7.3		5.9	5.10.3	5.11
Retained	5.6	5.7.3		5.9	5.10.3	5.11

5.2. Origination by fiat currency deposit

5.2.1. Introduction

Two blockchain networks were identified that originate new crypto-assets tokens in exchange for deposits in fiat currency – USD Tethers and USD Coins. Both crypto-asset tokens are stablecoins, and in both cases the market value of the tokens issued is maintained at a constant price against the US Dollar. This constant price makes them ideally positioned as a medium of exchange, a unit of account and a store of value.

The question of whether crypto-assets could be included within the definition of 'money' has been considered in Chapter 3.2. Stablecoins present the strongest case for such inclusion. It was also observed previously that such tokens were in some instances excluded from the definition of 'crypto-asset' in various contexts because of the closeness of their relationship to fiat currency. Yet while these tokens may be well-positioned to fulfil all the economic criteria of 'money', the ability to issue fiat currency is unique to governments (and indeed is one of the tests for 'money' in terms of the legal definition thereof) . It is submitted that it would be highly problematic to classify the origination of tokens as equivalent to the creation of fiat currency for tax purposes. The introduction of new fiat currency into the financial system does not give

rise to any tax consequences until the occurrence of some subsequent taxable event.[317] To place non-government crypto-asset originators in such a position would be unique for tax purposes, and one which the current tax system is understandably unable to accommodate.

Stablecoin origination is also not perfectly comparable to the government issuance of fiat currency, since (with the abandonment of the gold standard) a government does not hold reserves to give value to the currency that it issues, whereas stablecoins derive their value from that which is given in exchange and held in reserve.[318] Classification of the origination of stablecoins as equivalent to that of fiat currency would thus not achieve the horizontal equity that its stable price in fiat currency might initially suggest.

This study therefore finds no basis for challenging the consensus among individual jurisdictions that crypto-assets should not be classified as fiat currency, as observed in Chapter 3. A more appropriate classification of the origination of stablecoins may be as the sale or issuance of a negotiable instrument.

An instrument is "a legal document that records an act or agreement and provides the evidence of that act or agreement",[319] while negotiable instruments are "any securities that carry legal title when endorsed or delivered, as well as the right to demand the full par value upon maturity".[320] Securities may be further divided into equity and debt instruments.[321] Clearly, a stablecoin does not represent an equity instrument.[322] Therefore, the appropriate consideration is whether it might represent a negotiable debt instrument.

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[317] Akins, Chapman, and Gordon, "A Whole New World: Income Tax Considerations of the Bitcoin Economy."
[318] A. Christians and M. Tazeem, "Facebook's Libra: The next Tax Challenge for the Digital Economy," *Stanford Journal of Blockchain Law & Policy* 3, no. 2 (2020): 228–56, https://heinonline.org/HOL/P?h=hein.journals/sjblp3&i=228.
[319] OECD, "Glossary of Tax Terms," 2020, https://www.oecd.org/ctp/glossaryoftaxterms.htm.
[320] IBFD, "Glossary," Tax Research Platform - IBFD, 2021, https://research.ibfd.org/#/glossary.
[321] IBFD.
[322] As considered in 5.3.1.1.2, an equity instrument represents an ownership interest in an entity (typically a company), with an accompanying right to participate in profits and in the residual assets of the entity on liquidation. See IBFD; OECD, "Glossary of Tax Terms"; Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings.".

A debt instrument gives the holder an unconditional right either to repayment or to a return on investment.[323] In order to be classified as a negotiable debt instrument, a stablecoin would therefore have to entitle the holder to repayment of the amount deposited on presentation. As discussed in 4.4.1.1, it would seem that the USD Coin token meets this requirement, while it is less clear whether it is met by the USD Tether token. It is submitted that the mere practice of accepting redemption is insufficient in the absence of such a contractual right to result in the creation of a debt instrument. Thus, the origination of a stablecoin should be classified as the creation of a negotiable debt instrument only if the holder has a right to enforce redemption. This view is supported by Bal.[324] It is also consistent with the conclusion of Kjærsgaard with respect to the classification of so-called 'security tokens' with debt-like features, in one of the few studies to date considering in detail the classification of ICO income in the context of international taxation.[325]

One possible remedy in support of the definitive classification of stablecoin origination might be a regulatory requirement for stablecoins to provide clarity on the holder's right of redemption.

5.2.2. Direct tax consequences for the originator

If the origination of a stablecoin is classified as that of a negotiable debt instrument, there are no direct tax consequences for the originator, since the receipt of the originator simultaneously gives rise to an equal obligation to redeem the token in the future. This view is supported by Kjærsgaard.[326]

[323] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[324] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market"; Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[325] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[326] Kjærsgaard.

If a stablecoin does not satisfy the criteria of a negotiable debt instrument, the direct tax consequences of origination will be aligned with the *Sale of crypto-asset tokens by originators*, analysed in 5.3 below.

5.2.3. Direct tax consequences for the transferee

If the origination of a stablecoin satisfies the criteria of a negotiable debt instrument, there are no immediate direct tax consequences for the transferee, who has acquired an asset in the form of a future claim, with a cost equal to the amount deposited in exchange. Three possible intentions for acquiring a stablecoin have been identified – for transfer as a *Medium of exchange*, for *Redemption* of the underlying deposit in the future, or for *Speculation and investment*. Each of these are considered in the sections that follow.

5.3. Sale of crypto-asset tokens by originators

5.3.1. Introduction

Sixteen crypto-assets within the sample of 25 included origination by way of sale, whether in an ICO or equivalent open-market transaction, to selected investors, or on an ongoing basis.

5.3.1.1. *Rejection of classification as issuance of financial instrument*

Characteristics such as trading on exchanges and price volatility are suggestive of the classification of the *Sale of crypto-asset tokens by originators* as the issuance of a financial instrument. Recall from Chapter 3 that countries such as Canada, South Africa, and Switzerland (in respect of 'equity tokens') consider or designate crypto-asset tokens to be financial instruments, while others such as Austria, Denmark[327] and France explicitly or implicitly reject such classification.

[327] This was according to a 2018 binding answer of the Danish Tax Board Skattestyrelsen, Gevinst ved afståelse af bitcoins [Gain on the disposal of bitcoins], SKM2018.28 skat.dk (2018).. The OECD (2020b) report suggests that this position may subsequently have changed.

An instrument is the legal document evidencing an act or agreement.[328] Financial instruments may be either primary instruments (that is, equity or debt) or derivatives.[329] International Accounting Standards (not binding in the context of taxation, but nonetheless instructive) emphasise that financial instruments create a financial asset for one party, which may be cash, an equity instrument, or a contractual right to receive cash or a financial asset or liability, or a contract which may be settled in the holder's own equity instruments under certain conditions.[330]

5.3.1.1.1. *Debt instrument*

Classification as a debt instrument has already been considered in the context of stablecoins in 5.2 *Origination by fiat currency deposit*, where it was concluded that the definitive criteria would include the holder's contractual right to redemption. The classification of the origination of tokens that do not embody such a right (which is unique to stablecoins, and even then, not necessarily a feature of all stablecoins) must be rejected here, as it was in the preceding discussion. This position is supported by Kjærsgaard, who concludes that so-called 'utility tokens' cannot be classified as debt instruments because they lack an unconditional right to repayment or return on investment.[331]

5.3.1.1.2. *Equity instrument*

An equity instrument represents an ownership interest in an entity (typically a company), with an accompanying right to participate in profits and in the residual assets of the entity on liquidation.[332]

[328] OECD, "Glossary of Tax Terms."
[329] IBFD, "Glossary."
[330] IFRS Foundation, "International Accounting Standard 32 Financial Instruments: Presentation," 2008, http://eifrs.ifrs.org/eifrs/bnstandards/en/IAS32.pdf.
[331] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[332] IBFD, "Glossary"; OECD, "Glossary of Tax Terms"; Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."

While crypto-asset tokens may not currently be legally recognised as shares, whether classification for the purposes of taxation as the issuing of an equity instrument would achieve horizontal equity merits further consideration. Such classification would result in there being no income tax consequences for the originator, since the issuance of shares is a fund-raising rather than an economic activity.[333]

The nature and naming of the ICO event, with its close association to an Initial Public Offering (IPO), inevitably suggests classification as the issuance of an equity instrument. While acknowledging their differences, Bal notes that both ICOs and IPOs share the objective of raising funds for the issuer.[334] Limitation on the number of tokens available for issue is also suggestive of share capital. In various contexts reference is made to 'equity tokens'[335] or 'share-like tokens'[336] as a particular subcategory of crypto-assets.

It is true that crypto-asset token holders often are entitled to exercise voting rights in respect of the governance of the underlying blockchain. Kjærsgaard identifies this as a potentially relevant consideration in determining whether tokens should be considered equity instruments.[337] For example, the Dash white paper speaks of 'Decentralized Governance By Blockchain',[338] while the MKR token is referred to as the 'governance token' of the MakerDAO network.[339] Governance functions are however not in all cases conferred on token holders. For instance, Ripple amendments and fee changes are voted on only by network validators, and not by token holders.[340]

[333] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."
[334] Bal.
[335] Bal; Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[336] Euler, "The Token Classification Framework: A Multi-Dimensional Tool for Understanding and Classifying Crypto Tokens."
[337] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[338] Dash Core Group Inc, "Governance," 2020, https://docs.dash.org/en/stable/governance/index.html.
[339] MakerDAO, "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System."
[340] Ripple, "XRP Ledger Concepts."

It is submitted it is unlikely that such governance functions are ever sufficiently broad to be analogous to rights of ownership. Within the sample, it would appear that these functions are limited to decisions concerning the operation of and amendment to the blockchain and network protocols, rather than to the governance of any organisation comparable to a company in which ownership of the blockchain may reside. It is therefore submitted that governance rights afforded to the holders of tokens within the sample are distinguishable from the rights afforded equity shareholders and do not support classification as an equity instrument.

There are a number of further obstacles to the classification of any crypto-asset tokens in the sample as equity instruments. That crypto-asset token value is not associated with the prospects of the underlying entity is cited as evidence of their difference to shares.[341] None of the tokens analysed in the sample were identified as conferring on the holder any residual right in the assets of the originator. No evidence was found to suggest that crypto-asset token originators place themselves under any obligation to administer or preserve the proceeds of an ICO or other token sale in a manner that would typically be associated with equity contributions, such as maintaining solvency and liquidity requirements.

Finally, no tokens within the sample were identified as giving rise to the receipt of any distribution that would be appropriately classified as a dividend. Receipts arising from tokens granting the right to participate in DPoS transaction validation, or the receipt of secondary tokens representing network usage rights, may be most closely comparable to dividend income. Such transactions are considered in 5.4.5 *Block rewards* and 5.5 *Fortuitous issuances and receipts* respectively. In both instances, it is concluded that they do not merit classification as dividend income. Similarly, the possible repurchase of tokens by an originator is considered in

[341] Kjaersgaard and Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives"; Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings"; Skatteverket, HFD, Case No. 2674-18. Divestment of bitcoin, skatteverket.se (2018).

5.10.3 within *Speculation and investment* below, where classification of income as a dividend is also rejected.

Therefore, since none of the tokens in the sample incorporate governance rights comparable to those of equity ownership, none have a claim on residual assets of any entity, and none give rise to income that might be classified as a dividend, classification of the *Sale of crypto-asset tokens by originators* as the issuance of an equity instrument must be rejected. This is consistent with the conclusion of Kjærsgaard (focusing specifically in that instance on so-called 'utility tokens'). [342]

5.3.1.1.3. ***Derivative financial instrument***

Having rejected classification as the issuance of a debt or equity instrument, classification as a derivative is the final financial instrument subcategory that must be considered. The OECD states that "These are financial instruments whose values are linked to or depend on the value of a primary (underlying) asset, e.g. debt assets, liabilities and equity securities, commodities or currency. The primary types of derivatives include forward contracts, futures, options and swaps".[343]

Within the sample, no crypto-asset tokens were identified that derive their value from any underlying asset (other than those within *Origination by fiat currency deposit*, which are considered separately in 5.2). Tokens within the sample consistently derive their value either from market forces of supply and demand, or from the benefits of use or holding that they afford the holder, or from a combination of these factors. Although the existence of crypto-asset tokens associated with commodity values has been noted (see for example the Digix

[342] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings." It should however be noted that Kjærsgaard further concluded that the possible classification of so-called 'security tokens' as equity or debt instruments cannot be rejected where such token "has no other value or purpose than granting the ICO investor financial and non-financial rights" (at 889). However, Kjærsgaard does not suggest any specific examples that in her opinion would qualify as equity tokens on this basis. No such tokens were identified during the course of the present study.
[343] OECD, "Glossary of Tax Terms."

token),[344] no such crypto-asset tokens were included in the sample. Therefore, the *Sale of crypto-asset tokens by originators* cannot be classified as the issuance of a derivative financial instrument within the sample.

Having been rejected as the proceeds of the issuance of a financial instrument, the proceeds on the *Sale of crypto-asset tokens by originators* must represent income. Whether and how such income might be classified within the text of the articles of the model tax conventions will therefore be considered.

5.3.1.2. *Rejection of classification as royalties – OECD Model Tax Convention*

Of the 13 special classes of income, royalties (Article 12) may appear at face value to offer the most likely classification of income arising from *Sale of crypto-asset tokens by originators* based on comparison between the nature of blockchain technology and of traditional software or other intellectual property. The distinction between classification as royalties and business profits was noted by the OECD's Technical Advisory Group on Treaty Characterisation of Electronic Commerce Payments as one of the most significant considerations within the digitalised economy.[345] Classification as royalties is potentially significant because of the withholding taxes frequently levied on this class of income.[346]

Article 12 of the OECD Model Tax Convention defines royalties as "payments of any kind received as a consideration for the use of, or the right to use, any copyright of literary, artistic or scientific work including cinematograph films, any patent, trade mark, design or model, plan, secret formula or process, or for information concerning industrial, commercial or scientific experience".[347] In practice the definition of royalties differs between treaties, in

[344] DIGIX, "DGX the Finest Gold Tokenised."
[345] Referred to at that date in more limited terms as 'e-commerce'. See Technical Advisory Group on Treaty Characterisation of Electronic Commerce Payments, "Tax Treaty Characterisation Issues Arising from E-Commerce," 2001, https://www.oecd.org/tax/consumption/1923396.pdf.
[346] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[347] OECD. At M-41.

particular due to the inclusion of technical services within that definition in some treaties.[348] This analysis will however be restricted to the article as presented in the OECD Model Tax Convention 2017. Likewise, the interpretation of the definition contained in the OECD Commentary has been met with resistance from some countries that favour a wider interpretation, and may be at odds with definitions of royalties in domestic legislation, notwithstanding that the definition in Article 12 remains independent of domestic legislation.[349] Here too, this analysis will restrict itself to consideration of the interpretation of the OECD Commentary and will not attempt to investigate or reconcile the differing interpretations held by individual jurisdictions.

Kjærsgaard suggests that, while any income arising from the sale of so-called 'equity tokens' cannot be classified as royalties, income from the sale of 'utility tokens' might be classified as royalties where the originator grants the token holder rights in respect of intangible assets.[350] The author does not provide any specific examples of crypto-asset tokens that in her opinion might grant such rights.

The definition of royalties as currently expressed consists of two elements; copyright royalties and industrial royalties.[351] While definitions vary between jurisdictions, the common theme of royalties is the use of intellectual property or transfer of 'know-how'.[352] Article 12 recognises three types of contracts: those involving the use or right of use, those involving the transfer of

[348] A.J. Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries," Global Topics IBFD, 2019, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/linkresolver/static/gttc_article12; Louise Fjord Kjaersgaard and Peter Koerver Schmidt, "Allocation of the Right to Tax Income from Digital Intermediary Platforms - Challenges and Possibilities for Taxation in the Jurisdiction of the User," *Nordic Journal of Commercial Law* 1, no. Special Issue (2018): 146–71, https://heinonline.org/HOL/Page?handle=hein.journals/njcl2018&id=146&div=11&collection=journals.
[349] Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."
[350] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[351] Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."
[352] IBFD, "Glossary."

'know-how', and those involving transfer of ownership. While the first two may give rise to a royalty, the transfer of ownership cannot do so.[353]

The OECD Commentary discusses royalties extensively in the context of software, which, notwithstanding the references to copyright ownership and use, may be comparable to blockchain technology.[354] While not explicitly mentioned in the definition of royalties, most jurisdictions consider software to fall within 'literary or scientific work'.[355] The OECD Commentary distinguishes between income from the granting of two different types of use or right of use of software; the right to use the copyright in respect of that software, and the right to use the software itself. The former would for example entitle the holder to copy and distribute the software, while the latter would entitle the holder merely to install and use the software on their own computer. Income arising from the granting of the former would likely be classified as a royalty, while income from the latter would be classified as business profits.[356] While this interpretation is expressed through the example of software and electronic transactions, it represents a more general principle in the interpretation of the definition. A royalty represents a right to commercially exploit the intellectual property, and not merely to use it in either a business or personal context.[357]

The OECD Commentary extends the discussion of software to include the consideration of income in respect of the provision of digital media. It concludes that such income is not a royalty where it relates to the granting of a digital product for the user's use or enjoyment for

[353] Matthias Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC," in *Klaus Vogel on Double Taxation Conventions (Updated)*, ed. Ekkehart Reimer and Alexander Rust (Wolters Kluwer, 2019), http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/KLICCHICVogel2015Art12poheadingidUUd1BmTmxkivgstV0Y4row!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B72F8DA64-EB10-4765-964F-EE1A6CAA4BF0%7D--WKUS_TAL_9958%23teid-169?searchItemId=&da=WKUS_TAL_9958.
[354] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[355] Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC."
[356] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[357] Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."

which the granting of rights in terms of a copyright may be necessary to provide that digital product. In this context, the digital media is the true subject of the transaction, and the copyright an incidental although necessary element thereof. Income from such a transaction would not be classified as a royalty. This is contrasted with a transaction in which the right of use of a copyright in a digital image is granted to allow a book publisher to include it in a work for publication. Such income would be classified as a royalty, because it is the right under the copyright rather than the digital media that represents "what the payment is essentially in consideration for".[358]

The OECD Commentary distinguishes between the supply of know-how and the provision of services. Know-how payments are in compensation for the impartation of specialist knowledge already in existence, and requires little further action by the supplier of that know-how. In the context of computer software, a know-how payment would only exist "where it is made to acquire information constituting ideas and principles underlying the program, such as logic, algorithms or programming languages or techniques, where this information is provided under the condition that the customer not disclose it without authorisation and where it is subject to any available trade secret protection".[359] A distinguishing feature of know-how is that once it has been imparted it cannot be taken back.[360] This concept clearly does not find application in the context of the origination of crypto-asset tokens, where the substance of the transaction is the provision of a cryptographic record within a publicly-available ledger, rather than the imparting of the ability to independently exploit or recreate that record or its underlying technology.

[358] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)." At C(12)-17.
[359] OECD. At C(12)-11.
[360] Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC."

Income can only be classified as a royalty if it is received by the owner of that property for the use or right of use thereof.[361]

Finally, it is worth noting the OECD Commentary's conclusion that income cannot be a royalty if it is in respect of a design, model or plan that is not yet in existence at the time of the income, even if the recipient thereof will retain the rights of ownership. If, however, the owner grants the right to modify or reproduce an existing design, model, or plan without performing any further work, the resulting income may be classified as a royalty.[362]

In summary, it can be concluded that income from know-how and copyrights relating to software should rarely be classified as royalties, and in most cases as business profits (Article 7, considered further in 5.3.1.6), since such payments more characteristically relate to use than to rights over the underlying intellectual property or to know-how.[363]

Based on the above considerations, it must be concluded that no income arising from the *Sale of crypto-asset tokens by originators* analysed in this study could rightly be classified as a royalty. If such income is considered to be in respect of the future use of the blockchain network, such income is often received in advance of the development of the blockchain as a basis of funding its development. Any right of use of the holder of a token affording benefits of *Holding* is a right to a proportionate share of the network's capacity. That capacity is provided not by the originator but by decentralised transaction validators. Notwithstanding that such right of use can be ceded or delegated, it represents a right of use of the network in the role of user rather than the exploitation through reproduction and distribution of intellectual property. In most cases the software supporting the blockchain technology is shared freely and widely, and is unlikely to be the subject of any copyright, although it cannot be conclusively

[361] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[362] OECD.
[363] Kjaersgaard and Schmidt, "Allocation of the Right to Tax Income from Digital Intermediary Platforms - Challenges and Possibilities for Taxation in the Jurisdiction of the User."

said that this will be the case in every instance. To the extent that the token originated is to be used as a *Medium of exchange* rather than in *Holding*, it is the digital product (that is, the unique digital record) rather than the embodiment of any rights that represents "what the payment is essentially in consideration for".[364] The transfer therefore represents an alienation rather than a right of use of the token.

Therefore, the income from the sale of crypto-asset tokens by originators cannot be classified as royalties in terms of the definition in Article 12 of the OECD Model Tax Convention in respect of any of the crypto-asset tokens analysed in this study. While the possibility that such income might in some circumstances represent royalties, as suggested by Kjærsgaard,[365] cannot be conclusively rejected in every hypothetical instance, no instances were identified in this study where such classification might be supported, and it is submitted that a detailed consideration of the distinctive characteristics of royalties indicates that such possibility is remote.

5.3.1.3. *Rejection of classification as royalties – UN Model Double Tax Convention*

While the OECD's Article 12 grants taxing rights to the country of residence, the UN's Article 12 grants it to the country of source, and is the most striking evidence of the ongoing tension between the interests of residence and source countries, and particularly between developed and developing countries.[366] Article 12 of the UN Model Double Tax Convention also differs from that of the OECD Model Tax Convention in its inclusion of income from "the use of, or the right to use, industrial, commercial, or scientific equipment" (ICS equipment) within its definition of royalties, addressing the perceived narrow definition of royalties and the

[364] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)." At C(12)-17.
[365] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[366] Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."

interpretation thereof within the OECD Model Tax Convention.[367] This is potentially significant in the current context, since those crypto-asset tokens that grant holders ongoing use of the blockchain network may potentially represent rights of use analogous to those in a lease. The inclusion of leases over ICS equipment was present in earlier versions of Article 12 of the OECD Model Tax Convention, but was omitted from the current version as it was considered by the OECD more appropriate that such income be classified as business profits within Article 7 given that it represents a subcategory of lease income. Nonetheless, the OECD Commentary includes consideration of such income due to its inclusion in previous versions of the OECD's Article 12.[368]

In considering the application of this element of the definition, the UN Commentary draws a distinction between a satellite transponder that is leased to a lessee who operates the transponder and the granting of the right to use the capacity of a transponder that is operated by the supplier. The UN Commentary considers the former to fall within this element of the definition of royalties, whereas the latter to be transmission services that fall within business profits (Article 7). It notes however that this is not an exclusive view, and that some member states would consider both types of income to be royalties.[369]

The OECD Commentary concludes that income from the right to transponder capacity is not a royalty, whereas lease income from ICS equipment is included within the definition, because the user has not been granted the right to use the equipment itself, but only a portion of its capacity. Such income is therefore more appropriately considered the product of a service and classified as business profits. The OECD Commentary also considers income received in the granting of the use of telecommunication network capacity under a 'roaming' agreement, as

[367] United Nations, "Model Double Taxation Convention between Developed and Developing Countries", at 22; Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."
[368] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[369] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."

well as of radio frequency spectrum use in the context of broadcasting (transactions which the UN Commentary does not consider). Here again, it concludes that such income is neither a royalty nor the product of as a lease, since it is not in respect of the use of intellectual property in the manner envisaged, nor of the physical ICS equipment.[370]

Klaus Vogel on Double Taxation Conventions addresses the present issue most directly, stating that 'cloud computing' gives rise to lease income only when the user has physical access to and exclusive control over the ICS equipment, in the absence of which such income should be classified as income from services.[371]

It must therefore be concluded that the classification of income from origination by sale would not fall within the inclusion of income from the lease of ICS equipment as royalty income. Where tokens incorporate rights associated with *Holding*, those rights are to network use or to participation in DPoS validation processes rather than to rights over any physical infrastructure. Even where a country takes the alternative view that this is not a conclusive distinction, it is submitted that such income should not be classified as royalty income. The decentralised nature of most blockchain networks also means that any such capacity is provided by the network of transaction validators rather than by the originator, which further distinguishes the income of the originator from royalties. It would also be problematic for income to be classified as royalties based on the elevation of what may be one of many possible use cases for the acquirer, who may never exercise the right of network use conferred by the token.[372] However, it cannot be conclusively asserted that such classification could never arise under any interpretation of the definition of royalties. While this study does not favour such an interpretation, it highlights

[370] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[371] Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC."
[372] Within the context of the sample analysed, only two tokens conferred a benefit of ongoing network usage – EOS and TRX – and only TRX embodied multiple use cases that might give rise to a conflict in classification in this context depending on the use case that was prioritised. See block.one, "EOS.IO Technical White Paper V2"; TRON Foundation, "TRX."

that the existing lack of consensus in this regard may be exacerbated by the proliferation of crypto-asset transactions.

5.3.1.4. *Rejection of classification as fees for technical services – UN Model Double Tax Convention*

The UN Model Double Tax Convention contains Article 12A in respect of fees for technical services. This article does not have an equivalent in the OECD Model Tax Convention. Although following the construction of Article 12, Article 12A is unique to the model convention in its special allocation. It attempts to address divergent practices with regard to technical services, which are sometimes included within the construction of Article 12, sometimes addressed by separate articles, and sometimes not specifically addressed.[373] The limitation of application to 'technical services' rather than all services seems to have more to do with the former's historical association with the concept of royalties than with purposive intent, and the conceptual distinction between the two may be somewhat artificial.[374] In practice, where this article is included in a treaty it may give rise to significant challenges in differentiating between technical services, independent personal services (Article 14 of the UN Model) and business profits (Article 7).[375]

The UN Commentary indicates that Article 12A was introduced into the UN Model in response to the ability of those within the digitalised economy to supply services to customers in a contracting state without the need for a permanent establishment (PE) in that state. Such services are considered distinguishable from royalties in Article 12, which would have allowed

[373] Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC."
[374] A. Báez Moreno, "The Taxation of Technical Services under the United Nations Model Double Taxation Convention: A Rushed – Yet Appropriate – Proposal for (Developing) Countries?," World Tax Journal, Journal Articles & Opinion Pieces IBFD, 2015, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/wtj_2015_03_int_2.
[375] Jonathan Schwarz, "Chapter 9 Business Profits," in *Schwarz on Tax Treaties*, ed. Jonathan Schwarz (Wolters Kluwer, 2017), http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/4bd22f747cf310008a0ed8d385ad169401!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B8D89C844-84A1-4605-B43D-1D711A01C117%7D--WKUS_TAL_12839%23teid-76?searchItemId=&da=WKUS_TAL_12839.

for taxation in the contracting state of the customer (in terms of the UN Model Double Tax Convention allocation of taxing rights). However, where such income is classified as business profits (Article 7), the supplier of technical services would not be subject to tax in the contracting state of the customer unless the income were attributable to a PE in that state. Article 12A therefore attempts to address this perceived imbalance.[376] Even where a more expansive drafting of the UN Model Double Tax Convention is favoured in Article 12, the distinction between classification under Article 12 or 12A remains potentially significant if rates of taxation applicable to the two articles differ.[377]

Paragraph 3 of Article 12A defines the article as applying to services "of a managerial, technical or consultancy nature".[378] The UN Commentary explains that managerial services relate to the management of the business of the recipient provided by a party other than directors or employees. Technical services are those supplied by holders of specialised expertise, such as those within regulated professions. Consultancy services involve the provision of specialised consulting or advice. The UN Commentary also notes that the definition in paragraph 3 is exhaustive, and that the defining characteristic of all three services is the application of "specialised knowledge, skills or expertise" of the provider.[379] The presence of human intervention appears to be an inherent characteristic of technical services from the definitions provided in the UN Commentary.[380]

Although Article 12A may be intended to address base erosion attributable to the growth of the digitalised economy, digital services do not automatically fall within the definition of technical services, but must be assessed on the extent to which they provide specialised knowledge,

[376] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[377] Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."
[378] United Nations, "Model Double Taxation Convention between Developed and Developing Countries." At 24.
[379] United Nations. At 340.
[380] Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."

skills, or expertise. Where the parties to a treaty wish all digital services to fall within Article 12A, the definition may be expanded to specifically achieve this.[381]

The UN Commentary notes by way of example that the provision of access to a specialised database would not be that of technical services, because although the creation of that database may have required specialised knowledge or skills, the provision of access to that database to customers does not require the application of such skills, and is by contrast routine in nature. The creation of a specific database for an individual customer would however represent the application of technical skills.[382] Whether services are technical or routine in nature must therefore be decided on a case-by-case basis.[383]

The definition of technical services in paragraph 12A(3) is subject to various exclusions. Notably in this context, it excludes payments to an employee (which therefore remain within the ambit of Article 15), and payments by individuals for personal use of technical services.[384] In practice, it may be difficult in some instances to determine an objective basis for whether such services are for personal use.[385]

From the above definitions it may be concluded that the classification of income from the *Sale of crypto-assets by originators* would not fall within fees for technical services. The originator is not providing any of the three types of services that constitute technical services in Article 12A. Furthermore, although the underlying crypto-asset technology is undoubtedly complex and the creation of a blockchain requires specialised skills, what the acquirer of crypto-asset tokens receives in its transaction with the originator is routine in nature. It does not represent

[381] Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC."
[382] United Nations, "Model Double Taxation Convention between Developed and Developing Countries"; Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries"; Báez Moreno, "The Taxation of Technical Services under the United Nations Model Double Taxation Convention: A Rushed – Yet Appropriate – Proposal for (Developing) Countries?"
[383] Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC."
[384] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[385] Valta, "Article 12: Income from Royalties, D. Article 12(2) OECD MC and Article 12(3) UN MC."

the application of technical skills to provide a tailored product specific to that particular transaction. The sale transaction requires little if any human intervention. Application of Article 12A would also appear to be difficult if not impossible in practice due to the obstacles to determining the extent to which counterparties were engaged in private use, given their diversity, the presence of intermediaries and the pseudonymity of the underlying technology.

5.3.1.5. *Rejection of classification as income from immovable property*

Article 6 includes within income from immovable property any "income derived from the direct use, letting, or use in any other form of immovable property".[386] Article 6 of the UN Model Double Tax Convention differs from that of the OECD Model Convention only in respect of the inclusion of reference to the performance of independent personal services, which is a necessary inclusion due to the retention of Article 14 in the UN Model Double Tax Convention, which has been deleted from that of the OECD.[387] 'Immovable property' is not defined by the OECD Model Tax Convention but by the domestic law of the country in which the immovable property is situated.[388]

A case may be made that the *Sale of crypto-asset tokens by originators*, especially of those tokens subsequently intersecting the *Holding* category, grants the holder rights of use in terms of the blockchain network and may therefore represent income from letting of immovable property, being the computer hardware on which the blockchain transactions are processed and recorded. However, any right of use that a token confers is not to physical assets but to network capacity, and therefore it does not represent lease income (as concluded in 5.3.1.3 above). Furthermore, the network and its ongoing functionality is provided not by the originator but by the network of transaction validators.

[386] United Nations, "Model Double Taxation Convention between Developed and Developing Countries." At 15.
[387] United Nations.
[388] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

Therefore, income from the *Sale of crypto-asset tokens by originators* cannot be classified as income from immovable property.

5.3.1.6. ***Classification as business profits***

There are no other special categories within the remaining articles of the model tax conventions to which income from origination by sale bears a *prima facie* resemblance. Therefore, such income must be considered for classification as business profits (Article 7). This, together with Article 13 in respect of capital gains, is the residual category encompassing business income that does not fall within one of the special distributive rules.[389]

Article 7 of the UN Model Double Tax Convention differs from that of the OECD in respect of the extension of taxing rights to the source country where a PE is present to also encompass either products or activities in that country that are similar to those of a PE of the taxpayer in that country. It also addresses the allowed, limited and prohibited deductions in determining the income of a PE as well as the basis of determination, while omitting the OECD paragraph on adjustments to eliminate double taxation. Some of these differences arise from subsequent deletions within the text of the OECD Model, while others have always been unique to the UN Model.[390] While these differences may be significant, they are not immediately relevant for the purposes of determining classification.

The terms 'business' and 'enterprise' are defined according to domestic law rather than within the OECD Model Tax Convention, although the OECD Commentary indicates that the terms are broadly similar. [391] The IBFD Glossary indicates that the term 'business' generally has a

[389] OECD; Ekkehart Reimer, "Article 7: Business Profits," in *Klaus Vogel on Double Taxation Conventions (Updated)*, ed. Ekkehart Reimer and Alexander Rust, 2014, http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/KLICCHICVogel2015Art07a0001!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B72F8DA64-EB10-4765-964F-EE1A6CAA4BF0%7D--WKUS_TAL_9958%23teid-102?searchItemId=&da=WKUS_TAL_9958; Schwarz, "Chapter 9 Business Profits."

[390] United Nations, "Model Double Taxation Convention between Developed and Developing Countries"; OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

[391] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

wider meaning than 'trade' and is used to refer to "any commercial activity".[392] Reimer views Article 7 as being the primary article addressing companies and other entrepreneurial profits. In contrast, non-entrepreneurial income would (in the absence of the application of a specific distributive rule) be classified as other income (Article 21).[393]

The model conventions do not provide a definition of what constitutes a capital gain for the purposes of Article 13, nor do they prescribe a basis for distinguishing between capital gains and business profits. Such distinction is not significant in the allocation of taxing rights, since the taxing rights afforded the contracting states are consistent in the two articles. Together they ensure that all income is addressed, whether arising from the ongoing sale of goods, or from the disposal of operating assets. It is therefore left to individual jurisdictions to determine the classification of such income.[394] The theoretical distinction between Articles 7 and 13 may be that business profits are the product of the activity of the taxpayer with respect to the object of the transaction, whereas capital gains are the result of the increase in value of that object.[395] Notwithstanding that such classification may have no impact on the allocation rights it may be significant for other reasons, as individual jurisdictions may have specific rules that apply to the taxation of one or other classification, apply lower tax rates to or not tax capital gains, or levy other taxes on capital.[396]

Kjærsgaard suggests that income from the *Sale of crypto-asset tokens by originators* should be classified as business profits only if it satisfies all three of the conditions of being (i) realised,

[392] IBFD, "Glossary."
[393] Reimer, "Article 7: Business Profits."
[394] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[395] Reimer, "Article 7: Business Profits"; Ekkehart Reimer, "Article 13: Capital Gains," in *Klaus Vogel on Double Taxation Conventions (Updated)*, ed. Ekkehart Reimer and Alexander Rust (Wolters Kluwer, 2020), http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/KLICCHICVogel2015Art13poheadingidUigy1eoe5UqXMNoaNXZzhg!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B72F8DA64-EB10-4765-964F-EE1A6CAA4BF0%7D--WKUS_TAL_9958%23teid-179?searchItemId=&da=WKUS_TAL_9958.
[396] It is interesting to note that the chapter on Article 13 of *Klaus Vogel on Double Tax Conventions (updated)* contains what appears to be the only explicit reference to Bitcoin or 'artificial (virtual) currency' in that work. The reference is not however instructive, indicating only that transactions might give rise to a capital gain. See Reimer, "Article 13: Capital Gains."

(ii) separated from its source and (iii) arising from a profit-making motive. She suggests that while the first and third criteria are satisfied, the second criteria may not be satisfied in respect of so-called 'equity tokens', as such tokens may represent the source of future income. Having already rejected classifying the transaction as the issuing of an equity instrument, Kjærsgaard suggests that in such instances such income should be considered a capital gain of the originator, likening the tokens to the tree that may produce apples in future if the blockchain development is successful, and therefore representing "extraordinary enrichment from the alienation of operating assets".[397] In terms of this view, such income should only be classified as business profits if the business of the originator consists of the selling of crypto-asset tokens.[398]

It is submitted that the action of originating and selling crypto-asset tokens falls within the broad concept of a 'business' or 'entrepreneurial activity' and is therefore consistent with classification within Article 7. Furthermore, the seemingly comfortable fit within such classification renders consideration of classification as other income (Article 21) unnecessary, since the latter functions as a final residual category for all forms of income that are not addressed by articles 6 to 20.[399] In regard to the proposition that income from the origination of so-called 'equity tokens' be classified as a capital gain, it was noted in the consideration of *equity instruments* in 5.3.1.1.2 that no instances were identified within the sample analysed of a token granting the holder a claim to the profits of the originating entity.[400] Furthermore, if the business operations of the originator do not consist of the sale of such tokens, it is difficult to

[397] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings." Quoting Reimer, "Article 13: Capital Gains." At 39.
[398] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[399] Luís Eduardo Schoueri, "Article 21 - Other Income - Global Tax Treaty Commentaries," Global Topics IBFD, 2020, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/linkresolver/static/gttc_article21.
[400] As considered with respect to income in the form of DPoS block rewards (within 5.4), transaction fees and the delegation of rights (within 5.9), holding tokens may produce income for the holder. However, such income is not paid by the token originator, nor is it a distribution of the profit of the originator.

identify what other source of income the originator might be pursuing. Finally, although such tokens may represent a source of future income for the holder (although the dividend-type income seemingly envisaged by Kjærsgaard[401] was not observed in this study), it is difficult to see how that token could represent a source of future income for the originator, which it is respectfully submitted is the appropriate perspective to consider in this instance. Therefore, although the possibility of classification as a capital gain arising from the origination of such a token cannot perhaps be conclusively rejected in every hypothetical instance, it cannot be supported in respect of the origination of any tokens considered in this study.

Being a residual classification of income, neither Article 7 nor the OECD or UN commentaries thereto provide a list of the types of income that fall within the definition of business profits. However, concluding on the nature of income from the *Sale of crypto-asset tokens by originators* classified as business profits may be significant in further determinations such those of timing and source, particularly for individual jurisdictions whose domestic responses may be guided by the outcome of this study, and therefore merits further consideration.[402]

5.3.1.7. ***Rejection of classification as prepayment for future services***

In considering the nature of royalty income it was concluded that the *Sale of crypto-asset tokens by originators* differed from a transaction granting the use of computer software in the manner giving rise to a royalty, since it did not put the rights to the underlying intellectual property at the disposal of the transferee. It was noted that where the classification of income from the use of software as royalties was rejected, such income should then be classified as income from

[401] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."

[402] Vogel notes that countries may be divided into those that apply a single source to the determination of source of all business profits, and those (usually common law countries) that apply different source rules to different types of income according to their character. See Vogel, "Worldwide vs. Source Taxation of Income - A Review and Re-Evaluation of Arguments."
The relevance of distinguishing between different types of income within the classification of business profits to bilateral treaties and domestic legislation was acknowledged by the Technical Advisory Group on Treaty Characterisation of Electronic Commerce Payments. See Technical Advisory Group on Treaty Characterisation of Electronic Commerce Payments, "Tax Treaty Characterisation Issues Arising from E-Commerce."

services. If the comparison to software is pursued, a case may then be made that the origination of crypto-asset tokens should be classified as income from services.

Classification as income from services would depend on the existence of an obligation upon the originator to deliver services to the crypto-asset token holder. This seems to be the view reflected in the position taken by Israel and Malta on ICOs, which require income from ICOs to be recognised in line with the subsequent satisfaction of the originator's obligation to provide services.[403] Similarly, reference is frequently made in crypto-asset discussions to 'smart contracts' (such as ERC-20 tokens). Furthermore, the UK's HMRC states that crypto-assets are "cryptographically secured digital representations of value or contractual rights",[404] while Huber *et al.* suggest that in Switzerland so-called 'utility tokens' may be accepted as embodying transferrable contractual rights.[405] Therefore, there may be *prima facie* support for the view that crypto-asset tokens represent contractual rights to be settled by future performance. Whether the *Sale of crypto-asset tokens by originators* identified within the sample provides evidence in support of the classification as a prepayment for future services will therefore be considered.

Among tokens subsequently used as a *Medium of exchange*, transfer always occurs in exchange for goods or services, which may be delivered either on-chain (primarily in the form of transaction processing) or off-chain. The counterparty to such transactions is a third party and not the originator, and the counterparty transacts with the token holder voluntarily. This is true when used as a payment solution or in an inter-currency transfer. It is also true of the payment of transaction fees; transaction validators participate voluntarily in transaction processing, and

[403] Office of the Commissioner for Revenue, "Guidelines on the Income Tax Treatment of Transactions or Arrangements Involving DLT Assets"; EY, "Israeli Tax Authorities Address Issues Regarding Issuance of Utility Tokens, Blockchain Technologies and Cryptocurrencies, Including Related Tax Benefits."
[404] HMRC, "Cryptoassets for Individuals."
[405] Huber, Guler, and Dumont, "Switzerland By the Same Token: Swiss Tax Questions in the Context of Initial Coin Offerings."

often are entitled to choose which transactions they will process. Once in circulation, such tokens do not normally expire or cease to exist once used; they remain in circulation and can continue to be used for further payments. Therefore, the transaction fee is truly a payment to the transaction validator and not the redemption of a prepayment. The ability to use some tokens within the sample as a *Medium of exchange* therefore does not provide evidence of a contractual relationship between originator and holder for future services.

Amongst those tokens that provide benefits through *Holding*, those that entitle the holder to network use – EOS and TRX – most clearly appear to embody contractual rights to future services. However, to the extent that any such contractual right of use exists (as considered further in 5.9 *Holding*), it is the network of transaction validators and not the originator that gives effect to that use. Therefore, such rights do not impose an obligation on the originator. Similarly, the right to participate in DPoS block validation does not create an obligation for the originator. As considered further in 5.4.5.3 within *Block rewards* and in 5.9 *Holding*, such tokens only grant a right to participate in transaction validation, the future reward for which is dependent on a combination of the actions taken to participate (which may include freezing, voting or delegating participation rights), probability-based selection, and the action of validating transactions once selected. The future receipt is therefore dependent on subsequent actions taken or work performed, not solely on tokens held and, as discussed further in 5.4.5 *Block rewards*, the originator of tokens by sale cannot be considered the originator of tokens in reward for transaction validation. The sale of tokens that grant the holder usage or participation rights therefore does not create a contractual relationship between originator and holder for future services.

Finally, it is submitted that tokens of networks requiring the holding of a *Minimum account balance* in order to transact – XRP and XLM – do not represent rights in any meaningful sense

on this basis alone (any more than the requirement by a bank on a customer to hold a minimum balance in fiat currency can be said to confer any rights on that currency).

Therefore, it is submitted that no income of the originator arising from the *Sale of crypto-asset tokens by originators* within the sample should be classified as income from services rendered or a prepayment for future services.

5.3.1.8. *Classification as sale of intangible assets*

Having exhausted all other classifications, the *Sale of crypto-asset tokens by originators* occurring within the sample must simply be classified as the alienation of property. Such classification is appropriate when intellectual property is sold for use rather than a right of use being granted, as discussed in 5.3.1.2. All obligations of the originator are satisfied at the point that the tokens are transferred, and the originator has no further control over or future obligation in respect of those tokens. This is true within the sample both for tokens in respect of which subsequent use occurs within the *Holding* and *Medium of exchange* categories.

It is therefore submitted that origination by sale should be classified as business profits arising from the sale of intangible property, being "property which has no physical existence but which has a value based on a legal right of the owner, e.g. goodwill, patent, trade mark, copyright, software, inventions, designs, i.e. all manner of intellectual property".[406] This most accurately represents the true nature of all transactions analysed within the sample that were categorised as the *Sale of crypto-asset tokens by originators*. It also aligns with the recognition by many jurisdictions of crypto-assets as intangible assets observed in Chapter 3.

5.3.1.9. *Timing of income recognition*

The role of tax treaties is to facilitate the interaction and resolve competing claims of domestic systems of taxation rather than to create a new system of taxation. For this reason, the model

[406] IBFD, "Glossary."

conventions leave issues of timing to be governed by domestic legislation.[407] Nevertheless, the issue of timing merits further consideration here given the nature of ICOs and a stated intended outcome of this study being that it may be instructive to the development of domestic responses.

5.3.1.9.1. *Issue of tokens convertible to native tokens in an ICO*

The *Sale of crypto-asset tokens by originators* often occurs in the context of an ICO or comparable transaction. The ICO represents the funding of costs either already or still to be incurred in development.[408] Thus, the ICO often precedes the launch of the blockchain that forms the underlying value proposition. For example, the EOS ICO preceded the launch of the EOS blockchain. Participants acquired Ethereum ERC-20 contracts entitling conversion to EOS tokens upon the launch of the EOS network.[409] TRX and CRO tokens were sold on a similar basis in their respective ICOs.[410] The originator's obligation in an ICO is thus satisfied at the point that the token purchased is transferred to the purchaser on the native blockchain.

In such situations, to subject income to taxation in advance of the incurral of the corresponding development expenditure would potentially give rise to a tax burden in the period of the ICO that is at odds with the greater economic reality. It is therefore submitted that the recognition of such income should be deferred and recognised to the extent of costs incurred until the successful launch of the native blockchain, evidenced by the conversion of the claims of holders (whether represented by a contract on another blockchain or otherwise) to the native tokens of that blockchain. Elements of this approach are present in the position taken by

[407] J.C. Wheeler, "Time in Tax Treaties - Global Tax Treaty Commentaries," Global Topics IBFD, 2021, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/linkresolver/static/gttc_time_s_1.&refresh=1617964333740%23gttc_time.
[408] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."
[409] P.H. Madore, "What Is EOS? Introduction To The EOS Token," 2018, https://cryptobriefing.com/what-is-eos-introduction-to-the-eos-token/.
[410] Crypto.com, "Crypto.Com Chain"; Crypto Briefing Analyst Team, "What Is Tron? Introduction To TRX," 2018, https://cryptobriefing.com/what-is-tron-introduction-to-trx/.

Switzerland in respect of the ICOs of some types of tokens.[411] Such an approach would further objectives of equity as well of simplicity and certainty, acknowledging the economic reality of the ICO transaction while providing a definite date for the recognition of the balance of income and a simple basis for application to the extent of conversion. Consideration should also be given to establishing a limited period beyond which the income in respect of all claims not presented for conversion would automatically be taxable. It may also be appropriate to limit deferral to those instances where the future conversion to native tokens represents a contractual obligation of the originator.

It should be noted that not all tokens represented by ERC-20 or other similar smart contracts represent claims for conversion to native tokens. Such tokens also exist for application-level blockchains such as the Chainlink, MakerDAO, and Circle/Centre networks. In such instances, the *Sale of crypto-asset tokens by originators* should not be considered a prepayment but rather immediately recognised as income. The underlying proposition of the originator will therefore have to be considered in every instance.

5.3.1.9.2. ***Issue of tokens incorporating possible future hard fork or airdrop participation***

It is submitted that *Future hard fork or airdrop participation* for holders does not represent an obligation of the originator that might warrant the deferral of income in respect of the sale of the pre-existing token. The hard fork of a blockchain – of which BTC, ETC, BCH and XMR within the sample are products – is not an event contemplated at the origination stage, and therefore clearly does not represent a contractual obligation between originator and holder. TRX was the only token within the sample identified as granting holders the opportunity to participate in a future airdrop. Whether a passing reference in the TRX token discussion could be considered an enforceable contractual right is questionable. Such an airdrop has in fact

[411] Schweizerische Eidgenossenschaft, "Kryptowährungen [Cryptocurrencies]."

subsequently taken place, and would seem to have served as an incentive to acquire TRX tokens.[412] However, although TRX tokens may have had a right to participate that was contemplated at origination, it is submitted that this was not the definitive feature of TRX token origination. TRX tokens may be used in seven of the 21 voluntary transaction types in Table 3 (presented in Chapter 4.3), and TRX tokens were not extinguished through the receipt of airdropped tokens. Therefore, it seems appropriate to conclude that this feature should not result in the deferral of any portion of income arising on sale.

5.3.1.10. *Conclusion on income from the sale of crypto-asset tokens by originators*

The proposition of recognising income from the *Sale of crypto-asset tokens by originators* as arising from the sale of intangible assets, deferred if applicable during the launch of the native blockchain, best reflects the underlying nature of such transactions occurring within the sample analysed. While providing simplicity and certainty to taxpayers, such classification also creates horizontal equity with the direct tax treatment of comparable transactions.

Although it cannot be conclusively asserted that classification as royalties might not be pursued by countries adopting the alternative interpretation of the UN Model Double Tax Convention's construction of Article 12, it is submitted that such an application of this interpretation would not be correct in this context.

5.3.2. Direct tax implications for the originator

It is submitted that the direct tax implications for the *Sale of crypto-asset tokens by originators*, whether in an ICO or otherwise, and whether to members of the public or selected investors, is that income must be recognised as arising on the sale of intangible assets. Such income should be classified as business profits (Article 7) in terms of the model conventions.

[412] Brady Dale, "What to Know About Tron's BitTorrent Token Airdrop This Week," 2019, https://www.coindesk.com/what-to-know-about-this-weeks-bittorrent-token-airdrop-on-tron.

It is proposed that domestic legislation should permit the deferral of such income in instances where the sale relates to the origination of native tokens on a blockchain that has not yet been made publicly available. Income should then be recognised to the extent of deductible expenditure incurred until the conversion of the acquirer's claim to native tokens following the launch of the native blockchain, whereupon the balance of any income should be recognised. In all other instances, income should be recognised in full at the moment of sale.

5.3.3. Direct tax implication for the transferee

In this instance, the transferee pays for the purchase of crypto-assets in an ICO or other origination-by-sale transaction in either fiat currency or other crypto-assets. No income therefore arises for the transferee at acquisition. The direct tax implications for the transferee will therefore be a consequence of future use within the various potential use categories identified, and may be reduced by the cost of acquisition. These will be considered later in this chapter in sections 5.7 to 5.11.

5.4. Origination as remuneration or incentive

5.4.1. Introduction

Within the sample in Table 2, a variety of transactions have been identified where tokens were originated and issued either to developers of the underlying blockchain for their work prior to launch or to developers and other employees of the originating entity for their ongoing service. Also included in this category are tokens offered as incentive to third-party developers for their contribution to blockchain projects. Finally, the origination of tokens awarded to block producers as incentive to participate in transaction validation was included in this category.

Unlike origination by sale, in *Origination as remuneration or incentive* there are potentially two transactions occurring simultaneously – the origination of the token by the originator, and the provision by the recipient of that which is incentivised in return. However, this may not be the case in every instance, and depends on the nature of the specific transaction.

5.4.2. Allocations retained

Not every allocation of tokens to developers is necessarily the product of a transfer of ownership. In the founding of Ripple, XRP tokens were transferred to Ripple (the company) by the developers of the underlying blockchain technology, while a portion of those tokens was retained.[413] No consideration appears to have been given for the tokens transferred, while the tokens retained were the property of the developers both before and after the transaction.

In evaluating the direct tax consequences of developer allocations, it must therefore be determined whether a transfer of ownership of the tokens that form this allocation has in fact taken place. If this is not the case, no transaction has occurred in respect of tokens allocated. The basis on which such developers will be taxed on the tokens retained in their possession at the point of origination must be determined consistently with *Retentions* as considered in 5.6, and on subsequent use consistently with the transactions considered in sections 5.7 to 5.11, rather than consistently with those receiving tokens as remuneration or other incentive, since the lack of an initial transfer of ownership distinguishes the two situations.

If, however, developers were compensated for the transfer of tokens to a separate entity, it would place them in the position of originators of the tokens transferred, and the tax consequences for those developers should be determined in accordance with 5.3 *Sale of crypto-asset tokens by originators*. Where the transfer is made for no consideration (as appears to be case in the transfer of XRP to Ripple) no income will arise unless such transfer is not considered to be conducted at arm's length and is between related parties. If this were the case, jurisdictions would be entitled to apply measures within their domestic legislation to adjust the price in the transaction to align it with an arm's length price, while in a cross-border transaction a similar

[413] See Ripple, "XRP Ledger Concepts." and B.3 *XRP (XRP)* of Appendix B.

adjustment may be appropriate in terms of the provisions of Article 9 on associated enterprises, operating together with Article 7.[414]

5.4.3. Allocation as remuneration or incentive

Beyond Ripple and its XRP tokens, six other crypto-asset token originators within the sample either allocated tokens to developers for work performed prior to the launch of a blockchain, set aside tokens as incentive for future contributions, or used tokens to pay employees on a recurring basis. In some instances, these allocations were subject to vesting conditions or other restrictions.

In such transactions, it is the originator that determines the allocation of tokens and the conditions thereof, there is (or will be) a transfer of ownership of tokens, and it is the originator that has or will receive the benefit of the services of those to whom tokens are allocated. This relationship often appears to be evidenced by some form of contractual relationship between originator and recipient.

5.4.3.1. *Direct tax consequences for the originator*

In such instances, there is a clear *quid pro quo* barter transaction of tokens given in exchange for services rendered.[415] Such income should therefore be treated from the originator's perspective in the same manner as income from the *Sale of crypto-asset tokens by originators*, as considered in 5.3, since there is no requirement that income be in the form of cash.[416] Unlike remuneration granted in the form of shares or stock options, the originator must recognise

[414] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)"; E. Baistrocchi, "Article 9: Associated Enterprises - Global Tax Treaty Commentaries," Global Topics IBFD, 2020, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/linkresolver/static/gttc_article9_s_4.1.&refresh=1617988572937%23gttc_article9_s_4.1.

[415] A barter transaction exists when four elements are present: articles that may be considered products or services, the exchange of those articles, the exchange occurring between two suppliers (in other words, neither party is distinctly identifiable as either recipient or supplier, although this element may have more relevance in other legal contexts than in tax law), and the absence of money as the means of payment. See Kjaersgaard and Schmidt, "Allocation of the Right to Tax Income from Digital Intermediary Platforms - Challenges and Possibilities for Taxation in the Jurisdiction of the User.".

[416] Indeed, in some instances, origination by sale may have occurred in exchange for payment in other crypto-asset tokens, which is also strictly speaking a barter transaction.

income in respect of these tokens, since (as concluded in 5.3) they do not represent financial instruments and their origination does not represent a financing activity. Rather, such income should be classified as business profits (Article 7).

As noted in 5.3, Article 7 does not address considerations of timing of recognition, leaving this to domestic legislation.[417] It is submitted that such income should be recognised at the time such services are provided, and at the fair value of those services, in accordance with the principles of taxation of barter transactions.[418] Given the challenges in determining an objective value of the services received, it is submitted that they should be valued on the basis of the value of the crypto-assets received in exchange, determined at the date such services are delivered.[419] If the true intention of the parties is payment in an agreed number of crypto-asset tokens, it is submitted that no subsequent tax consequences should arise for any changes in value between the time services are rendered and when payment is made. If, however, the substance of the agreement is the payment of an agreed amount denominated in fiat currency to be settled in an equivalent value in crypto-assets, it may be necessary for an additional gain or loss to be recognised by the originator in respect of any changes in crypto-asset prices between transaction and settlement date.

Where such tokens are subject to restrictions, income should be recognised by the originator at the date that such restrictions are lifted, since this is when transfer to the developer or employee is in substance complete. This most accurately represents the true nature of the transaction, and creates horizontal equity with the obvious alternative available to the parties, being the sale of

[417] Wheeler, "Time in Tax Treaties - Global Tax Treaty Commentaries."
[418] See for example the discussion of these principles in general by Robert I. Keller, "The Taxation of Barter Transactions," *Minnesota Law Review* 67, no. 2 (1982): 441–512, https://heinonline.org/HOL/Page?handle=hein.journals/mnlr67&id=453&div=20&collection=journals., or in application to Bitcoin by see Cara R. Baros, "Barter, Bearer, and Bitcoin: The Likely Future of Stateless Virtual Money," *University of Miami Business Law Review* 23, no. 1 (2014): 201–24, https://heinonline.org/HOL/Page?handle=hein.journals/umblr23&id=209&div=10&collection=journals..
[419] Keller notes that in most barter transactions using the value of products or services given or received should result in the same outcome. See Keller, "The Taxation of Barter Transactions."

tokens in the market by the originator on that date in order to finance a payment in fiat currency to the recipient. Again, such considerations fall to individual jurisdictions to address.

5.4.3.2. *Direct tax consequences for the transferee*

5.4.3.2.1. *Transferee as employee*

Income from employment is addressed by Article 15 of the model conventions. The UN Model Double Tax Convention's construction of Article 15 differs only in name and in respect of reference to a fixed base as an alternative to a PE.[420] This is a consequence of the retention of Article 14 on independent personal services in The UN Model Double Tax Convention and does not alter the substance of the article.[421] The UN construction therefore does not require separate consideration.

The OECD Commentary to Article 15 emphasises the importance of establishing a causal relationship between employment and the income arising, particularly for the purposes of determining the source state in respect of such income. Article 15 makes it clear that employment income includes amounts received both in cash and in kind.[422] Employment income would therefore include crypto-asset token receipts derived from employment.

The OECD Commentary to Article 15 notes that income may arise from employment either in terms of a formal contract of employment or as the result of legislation or tests developed by a jurisdiction to determine an employment relationship. Where jurisdictions arrive at different conclusions as to the existence of such a relationship, the OECD Commentary provides considerations aimed at resolution, including the extent to which the services are integral to the business of the entity and the degree of authority and control of the entity over the person

[420] Within the UN Model, Article 15 is titled 'Dependent personal services'.
[421] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[422] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

rendering the services.[423, 424] It is submitted that the context of services rendered to crypto-asset token originators does not provide any additional challenges to distinguishing between employment income and income from services independently rendered, and that such income should be classified according to the outcome of such tests.

As for the originator, income for the employee should be recognised at the market value of the tokens awarded at the date the services are provided, in accordance with the principles of a barter transaction, as discussed in 5.4.3.1. Unlike originators, there appears to be no need for employees to recognise additional income where there is a change in token value between that date and the date of payment, regardless of the substance of the agreement. Where the number of tokens represents the true substance of the agreement, the number of tokens received in payment will be equal to those agreed. Any change in value will lead to tax consequences on realisation. Where the fiat currency value is the true substance, any subsequent adjustment to the number of tokens received to maintain that value will have no effect on the amount of income denominated in fiat currency.

It was noted in several instances within the sample that tokens allocated were subject to restrictions. Whether such tokens were transferred subject to restrictions on disposal or retained by the originator until such time as the conditions were satisfied was not clear in every instance. Such allocations call to mind obvious comparisons to the granting of restricted stock-options.

Where restricted stock-options are granted, the OECD and UN Models address considerations of income classification but leave those of timing to be determined by domestic legislation. For the purposes of the application of Article 15, such income should be taxed as employment income to the extent that it arises up to the date on which the recipient has a vested right in the

[423] OECD.

[424] These distinctions focus on differentiating a contract for services between two entities from employment income arising directly from the provision of those services to the first entity by employees of the second entity. Nonetheless, it is submitted that such tests are equally applicable to transactions between an entity and an individual.

underlying share. As discussed in 5.3 *Sale of crypto-asset tokens by originators*, crypto-asset tokens are not equity instruments, nor are they stock options. The OECD Commentary suggests however that the principles put forward in the context of restricted employee stock-options may be applied to other forms of incentive.[425]

The OECD Commentary to Article 15 stipulates that income may be classified as from employment even if arising after such services are rendered, and even if arising after the termination of such employment.[426] Therefore, whether crypto-asset tokens are granted to developers or other employees concurrent with work performed or for past work performed once the blockchain development is complete, and whether an employment relationship continues to exist at the date of granting or of vesting, does not alter the classification of that income in terms of Article 15, so long as such tokens were derived in respect of employment.

Since the model conventions do not address considerations of timing, in the interests of achieving horizontal equity with transactions that are clearly aimed at achieving a similar purpose, it is submitted that domestic legislation applicable to restricted equity instruments should be extended to incorporate restricted crypto-asset tokens, and should ensure that employment income arising should be taxed at the date all such restrictions are satisfied and reflect the market value of such tokens on that date, rather than on the date and value at which such tokens were granted.

Finally, it should be noted that from the perspective of the classification of the employee's income it is irrelevant whether crypto-asset tokens received as remuneration are newly-originated tokens or are paid from tokens otherwise acquired by the employer.

[425] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)"; Wheeler, "Time in Tax Treaties - Global Tax Treaty Commentaries"; United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[426] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

5.4.3.2.2. *Transferee as director*

It is possible that crypto-asset tokens may be allocated to persons in their capacity as directors rather than employees.[427] In such instances the income arising should be classified as directors' fees in terms of Article 16. The primary effect of classification within Article 16 rather than Article 15 is that taxing rights are determined with reference to the country of residence of the company rather than to the country in which employment was exercised.[428]

Income determined to be received for services rendered that does not arise within an employment relationship or as directors' fees should be treated as income from independent services rendered, and would fall within business profits (Article 7) within the OECD Model Convention, but in terms of the UN Model Double Tax Convention should first be considered for classification as independent personal services (Article 14) as well as technical services (Article 12A).[429]

5.4.3.2.3. *Transferee as independent provider – OECD Model Tax Convention*

The OECD Commentary to Article 7 makes frequent reference to the rendering of services within the context of business profits, and Article 3 states that the term 'business' specifically includes "the performance of professional services and of other activities of an independent character".[430] It therefore appears clear that if such services occur outside of an employment relationship they should be classified as business profits.

5.4.3.2.4. *Transferee as independent provider – UN Model Double Tax Convention*

Where services are rendered outside an employment relationship, it is submitted that the resultant income may be classified as independent personal services (Article 14). The taxing

[427] For example, ATOM tokens were allocated to amongst others, the 'founders' of the Cosmos blockchain, who it is not unreasonable to presume might have held positions as directors, although this is not explicitly stated. See B.21 *Cosmos (ATOM)* in Appendix B.
[428] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[429] OECD; United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[430] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)." At M-10.

rights are consistent with those of Article 7, except that reference is made to both a 'fixed base' and to a time-based test of physical presence for allocating taxing rights to the country of source (the so-called 'service PE') rather than to a PE. Article 14 was included in earlier versions of the OECD Model (without reference to a time-based test), but was later conceptually subsumed into Article 7.[431]

In addition, such income may also be classified as fees for technical services within Article 12A where this is included within a treaty. Where this is the case, Article 12A takes precedence over Article 7 in the absence of a PE.[432] As noted in 5.3.1.4 within *Sale of crypto-asset tokens by originators*, such services are defined by the application of "specialised knowledge, skills or expertise" of the provider.[433] The UN Commentary notes that technical services are not limited to professional services[434], and it would seem clear that at least some of the services employed in the creation and development of a blockchain network would be aptly described as requiring specialised expertise. Such services require human intervention, and in many instances are likely to be specific rather than routine. Across the spectrum of such services, however, it may be difficult to determine the point at which such services cease to be sufficiently technical to be classified as such. This lack of a conceptual or purposive distinction to the definition of technical services has been highlighted as one of the weaknesses of Article 12A.[435] Clarification in this regard in the context of blockchain technology would therefore be valuable.

[431] OECD; United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[432] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[433] United Nations. At 340.
[434] United Nations.
[435] Báez Moreno, "The Taxation of Technical Services under the United Nations Model Double Taxation Convention: A Rushed – Yet Appropriate – Proposal for (Developing) Countries?"

5.4.4. Allocation to third-party developers

Not all crypto-asset tokens used as incentives occur in the context of transactions between an identifiable originator and the recipient. The EOS, Tezos and NEO white papers all propose the future allocation of tokens to incentivise third-party developers to enhance the respective blockchains subsequent to their initial release.[436] Both EOS and Tezos indicate that allocations will be made to third-party developers based on the voting of token-holders rather than being under the control of the originator. The basis of allocation of NEO tokens to third-party developers is somewhat vague.

5.4.4.1. *Direct tax consequences for the originator*

Where allocation is determined by token-holders and is based on the perceived benefits derived by them from the work performed, there is an absence of a *quid pro quo* relationship between the developer and the token originator identified in origination-by-sale or in the payment of remuneration to employees, and indeed among blockchains where tokens are not originated by these means there may be no identifiable originator of such tokens. No originating party can rightly be said to have received income in the form of services in this instance, since it is the token-holders rather than an identifiable originator that are the beneficiaries of those services and who in return control the allocation of reward.[437]

While the collective body of token-holders may in some sense be the originator in this context, it does not represent an entity or person for tax purposes. It is submitted that it would be theoretically tenuous and practically impossible to require token-holders to recognise a

[436] block.one, "EOS.IO Technical White Paper V2"; Goodman, "Tezos – a Self-Amending Crypto-Ledger"; Neo, "NEO White Paper."

[437] As noted in 4.4.1, not every crypto-asset has an identifiable originator (as for example acknowledged in the ECB Crypto-Assets Task Force's analysis - see ECB Crypto-Assets Task Force, "Crypto-Assets: Implications for Financial Stability, Monetary Policy, and Payments and Market Infrastructures."). The absence of a counterparty to a transaction is a concept somewhat unique to blockchain technology - see Akins, Chapman, and Gordon, "A Whole New World: Income Tax Considerations of the Bitcoin Economy.". This concept is considered further within the more-frequently occurring transactions of *Block rewards* and *Fortuitous issuances and receipts* in 5.4.5 and 5.5 respectively.

proportionate share of any income determined to arise from such a transaction. Therefore, no originating party (that is, no transferor) should be required to recognise taxable income in respect of the origination of tokens allocated to third-party developers for subsequent improvements to the network offering in this context. Were allocation to be made by a central originator, that transaction should be treated consistently with *Allocation as remuneration or incentive* in 5.4.3.

5.4.4.2. ***Direct tax consequences for the transferee***

The third-party developer awarded crypto-asset tokens by the collective decision of token-holders has rendered a service to the community and has been rewarded accordingly. This view is strengthened by the conclusion in the analysis of *Block rewards* in 5.4.5 below. The developer is neither subject to a contract of employment with the community nor to its control in a manner suggested by Article 15. Therefore, the developer should recognise any such income as income from services within Article 7, Article 14 of the UN Model, or possibly, where the article is included, within Article 12A of the UN Model, in accordance with the bases discussed in 5.4.3.2.3 and 5.4.3.2.4 respectively.

5.4.5. Block rewards

Fourteen networks within the sample originate tokens through the issuing of rewards for block processing and transaction validation. This includes both PoW and DPoS rewards.

5.4.5.1. ***Direct tax implications for the originator***

As discussed in Chapters 1.2 and 4.4.1.3.4 within *Origination*, block rewards are not 'issued' by any originating entity. The beneficiaries of the validation process are the network user community in general, and perhaps more specifically those whose transactions are recorded in the validated blocks added to the blockchain, although they too play no role in the process of

granting block rewards.[438] For this reason, the term 'reward' is potentially deceptive, since it may incorrectly imply a transferring entity. Rather, the new tokens are created (that is, added for the first time to the record of tokens in issue) as part of the block validation process.[439] For this reason, it is submitted that there is no originator (that is, no transferor) that can be required to recognise income on the origination of new tokens in block rewards. If, however, block rewards were to be administered and paid by an identifiable originator from existing reserves, that transaction should be treated consistently with *Allocation as remuneration or incentive* in 5.4.3.

5.4.5.2. ***Direct tax implications for the transferee***

From the perspective of the transferee, two possible interpretations of the block reward event may be considered. These alternative interpretations have potential consequences to both the classification and timing of recognition of the resulting income. The first is that the block producer has discovered or created the new tokens by their own efforts. Within this perspective, the transaction validator is viewed as truly the creator of something of value. Within the US tax code, this might be viewed as an 'accession to wealth'. Such an interpretation might allow for taxation either on accession or on subsequent disposal.[440] This interpretation is closely aligned to associations with the terminology of 'mining', and is analogous to the miner who extracts precious metals from the ground by their own effort.[441] The limitation of this analogy is that the transaction validator does not discover, create, or refine something of value already in existence. Rather, it is the blockchain that autonomously creates value upon the completion of the validation process. Furthermore, the traditional miner's efforts go directly into the search for and excavation of precious material. By contrast, the transaction validator's efforts go into

[438] Flavio Rubinstein and Gustavo G. Vettori, "Taxation of Investments in Bitcoins and Other Virtual Currencies: International Trends and the Brazilian Approach," *Finance and Capital Markets, Journal Articles & Opinion Pieces IBFD* 20, no. 3 (2018), https://research.ibfd.org/#/doc?url=/document/dfi_2018_03_br_1.
[439] Akins, Chapman, and Gordon, "A Whole New World: Income Tax Considerations of the Bitcoin Economy."
[440] Akins, Chapman, and Gordon.
[441] Baros, "Barter, Bearer, and Bitcoin: The Likely Future of Stateless Virtual Money."

the validation of broadcast transactions; *Block rewards* are a by-product of those efforts built into the blockchain design.[442]

Alternatively, *Block rewards* may be interpreted as products of a service that the validator performs for the user community and for which they are rewarded. Within this perspective, the network is viewed as dependent on the input of the transaction validator, who provides a necessary service for a predefined reward. Such an interpretation would necessitate the taxation of block rewards on receipt. The limitation of this interpretation is that there is no single direct recipient of these services, which are provided to the user community in aggregate.[443] Furthermore, the tokens resulting from the reward do not pre-exist the validation of transactions,[444] and not every transaction validator is rewarded for their efforts each time they participate.[445]

It is submitted that, on balance, classification as services rendered is the more convincing of the alternatives. The new tokens are not the direct product of the validator's efforts; they are not what is 'discovered', nor are they 'made' by the validator. The validator attempts to complete the processes necessary to add a new block of transactions to the blockchain. This is the service that they seek to render, and the new block is the direct product thereof. The new tokens are the known reward for those efforts and their coming into existence is the by-product of the act of transaction validation. Therefore, it is submitted that the resultant rewards should be recognised as income from services rendered.[446]

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[442] Akins, Chapman, and Gordon, "A Whole New World: Income Tax Considerations of the Bitcoin Economy."
[443] Akins, Chapman, and Gordon; Rubinstein and Vettori, "Taxation of Investments in Bitcoins and Other Virtual Currencies: International Trends and the Brazilian Approach."
[444] Rubinstein and Vettori, "Taxation of Investments in Bitcoins and Other Virtual Currencies: International Trends and the Brazilian Approach."
[445] Bal, *Chapter 14 - How to Tax Bitcoin?*
[446] This aligns with the preference of Akins *et al.* (2015), but not of Rubinstein and Vettori (2018). However, the latter authors favour this classification in respect of transaction fees, which do pre-exist the transaction validation event and are paid by an identifiable transferor. Notwithstanding these distinctions, it is submitted that it is preferable to have a single classification for both variations of income arising from the same event.

As discussed in 5.4.3.2.3, where services are rendered outside of an employment relationship, such income would be classified within the articles of the OECD Model Tax Convention as business profits (Article 7). However, unlike the conclusion reached in that discussion, it is submitted here that such income should not be classified as arising from technical services where Article 12A of the UN Model Double Tax Convention are included.[447] Transaction validation uses software downloaded by the validator, is an automated process that requires minimal human intervention, and is standardised rather than customised for any particular user or transaction. As discussed in 5.3.1.4, services with such characteristics fall outside the meaning of 'technical services'. The transaction validator is in effect providing computational processing power to the network. Since no user nor the collective network has any rights over the physical infrastructure of the validator, classification as royalties in terms of Article 12 of the UN Model Double Tax Convention should also be rejected. However, as noted in 5.3.1.3 within *Sale of crypto-asset tokens by originators*, it cannot be conclusively stated that classification as royalties will not be pursued under the alternative interpretation of this element of Article 12, and perhaps more so in this instance since the income is at least in respect of the ICS equipment capacity of the recipient, although such an interpretation is again not supported by this study.

Classification as income from services within Article 7 suggests that such income should be taxed on accrual but is not in itself conclusive, since as noted previously the OECD and UN Conventions do not address considerations of timing.[448] It is therefore submitted that individual jurisdictions should address the classification of such income as being from services within domestic legislation or guidance where they have not already done so, and set the taxation of

[447] Where Article 14 is included, the allocation of taxing rights would be consistent with those of Article 7, and is therefore not considered further here.
[448] Wheeler, "Time in Tax Treaties - Global Tax Treaty Commentaries."

such income as being at the time of accrual. This is the position favoured by Akins *et al*.[449] The analysis of Chapter 3 suggests that this represents the majority position among jurisdictions that have addressed this issue.

The taxation of income prior to realisation through subsequent disposal is potentially at odds with the principle of convenience established in Chapter 2. However, it is submitted that it is nonetheless appropriate. The nature of the crypto-asset tokens received may be such that they bestow significant benefits of continued ownership on the holder, in which case disposal is not an inevitability. Furthermore, the classification of the income arising from subsequent disposal may then be considered in terms of the subsequent use transaction categories analysed in 5.7 to 5.11 without those consequences being obscured by the presence of any untaxed income arising from *Block rewards*.

Finally, certain jurisdictions contemplate the inclusion of *Block rewards* within provisions relating to 'hobby activities' or similar designations when undertaken on a non-commercial basis.[450] It is a matter for individual jurisdictions to determine whether concessionary exclusions from direct tax consequences should be extended to such income on the basis of its quantum or the nature of the activities undertaken.

5.4.5.3. ***Proof-of-stake transaction validation***

In contrast to PoW validation, DPoS validators do not compete for rewards. Rather, opportunities to validate transactions are awarded in proportion to the balance of tokens held. It may therefore be argued that the resulting rewards are a return for the validator's investment in those tokens. For example, this seems to be the position taken by the tax authority in Finland.[451]

[449] Akins, Chapman, and Gordon, "A Whole New World: Income Tax Considerations of the Bitcoin Economy."
[450] See for example Canada Revenue Authority, "Guide for Cryptocurrency Users and Tax Professionals."
[451] Vero Skatt, "Beskattning Av Virtuella Valutor [Taxation of Virtual Currencies]."

While such income may appear similar in nature to a dividend, it differs in a number of important respects. Central to the concept of classification as a dividend is that such income represents a participation in profits and is by virtue of a shareholding. Furthermore, dividends are only contemplated when paid by a company or other entity treated as a company for tax purposes.[452] In such context, profits distributed would normally already have been subject to tax. By contrast, DPoS validation rewards are not the distribution of profits by the originator, since the originator's residual net assets are unaffected. The tokens awarded have no cost to the originator nor any inherent value, therefore no distribution of profits can be said to have occurred. Further, crypto-asset tokens are not equity instruments, as concluded in 5.3. Insofar as the originator may be a company, its shareholders are distinct from holders of its crypto-asset tokens, and the profits in which those shareholders may participate are not diminished by the origination of tokens. Therefore, income arising from DPoS validation cannot be classified as a dividend. Neither is such an allocation equivalent to interest. It is not an unconditional right, it does not arise because of a debt claim, and it does not represent the incurral of any cost by the originator.

In determining the nature of income from DPoS transaction validation, the distinction between *causa causans* and *causa sine qua non*, established in the case of *Hochstrasser v Mayes (1959) 38 T.C. 673* and applied in this and many subsequent cases in the context of employment income may find application. In that case, the British (then) House of Lords found that an amount received by an employee from his employer in compensation for a loss incurred on the disposal of his house was not income from employment because it was the product of a separate contract to that of the contract of employment, and both parties derived benefits from that

[452] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."

contract. His employment was therefore a condition of, but not the cause of, the receipt of this amount.[453]

In the context of DPoS validation, a validator cannot participate without holding crypto-asset tokens, and in most cases will be selected to validate blocks more frequently as the number of tokens held increases. Alternatively, selection may depend on a voting process, which is also indirectly linked to token holdings through the votes attributable thereto. However, rewards are not earned because of the holding of tokens. Not every token-holder participates in validating transactions, and not every token-holder earns rewards. In some instances, further actions are required to be eligible as a transaction validator, such as 'freezing' token holdings for a period of time, paying a deposit, or paying a non-refundable fee. Finally, rewards are not received unless and until the selected validator in fact validates blocks of transactions. Therefore, it is submitted that while holding tokens is a condition for receiving rewards, it is the act of validating transactions that is the cause of the income earned. Such income should therefore be classified as income from services rendered, as it was proposed in the case of PoW transaction validation.

5.4.5.4. *Delegation of participation rights*

In some instances, it is possible to participate indirectly in DPoS mining by delegating the rights of participation or votes attributable to one's tokens to another participant. The active participant then shares the resultant rewards with any indirect participants.

A comparable traditional arrangement might be that of a partnership. There the partners combine their resources and efforts for mutual benefit and recognise a proportionate amount of the resultant income.[454] In the present instance, the token holder contributes the rights

[453] R. Kerridge, "Emoluments and Causation - Hochstrasser Investigated," *British Tax Review* 1982 (1982), https://heinonline.org/HOL/Page?handle=hein.journals/britaxrv1982&id=304&div=42&collection=journals.
[454] IBFD, "Glossary."

associated with their tokens, while another party contributes their own tokens together with their computer processing power and position as validator node. Together they share in the risks associated with the undertaking embodied in the validation selection algorithm and in any resultant income according to predetermined proportions.

Alternatively, this comparison may be rejected on the basis that the token holder who shares in the reward has not actively participated in the process of transaction validation. It is not their processing capacity or access to computer hardware that is delegated to the transaction validator. Rather, they have increased the transaction validator's probability of selection by placing some of the rights attached to their tokens under the control of the validator. The DPoS algorithm might give rise to risk of selection for the validation of any particular block, but is intended over time to allocate opportunity in proportion to token holdings. The risks in participating in such an undertaking through delegation may therefore be minimal. Unlike the transaction validator, whose subsequent actions are the cause of their income, the tokens that the delegator holds may, in this interpretation, be considered the cause of their income, which might then be considered a rental received from the validator.

Both rental income and income from services fall within business profits (Article 7). While classification as rental income cannot be conclusively rejected, it is submitted that the more appropriate classification is as business profits arising in a partnership. It is not necessary that all partners make the same contribution or perform the same roles in a partnership. While the risk to the delegating token holder may be minimal it is not entirely absent.[455] Such classification also aligns with that of the income of the transaction validator from the same event, which furthers consideration of horizontal equity.

[455] For instance, both the validator and the delegator may be required to lock in or 'stake' their tokens for a period of time and to expose themselves to the success of the blockchain network while forfeiting other opportunities in the intervening period.

5.5. Fortuitous issuances and receipts

5.5.1. Introduction

The category of *Fortuitous issuances and receipts* encompasses both hard forks and airdrops. Hard forks are fortuitous inasmuch as they are not contemplated by the creator of the original blockchain, but come about as the result of disagreements over the adoption of subsequent changes to protocols (such as increases in block sizes in the case of Bitcoin Cash) or actions taken (such as the reversing of fraudulent transactions in the case of Ethereum Classic).[456] New tokens on a new blockchain come into existence because all holdings on the existing blockchain at the time of the fork become represented on the new blockchains as well.[457] By contrast, airdrops are employed by the originator as a means of distributing a new token, and the originator receives nothing directly in return.

5.5.2. Direct tax consequences for the originator

In a hard fork it would not be correct to refer to an originator of the new tokens, since the hard fork is the result of decisions taken by the blockchain community (that is, token holders, or perhaps a specific subset of actors such as transaction validators). In an airdrop, although there is an originator, there is no direct *quid pro quo*; tokens are allocated free of charge. Any benefit that the originator receives, such as an increase in demand for the tokens through which the transferee qualifies to participate in the airdrop, is an indirect benefit. Such a benefit may result in an increase in income on the sale of those tokens, and will lead to direct tax consequences arising from that transaction. Therefore, in neither instance can there be any direct tax consequences arising for an originator.

[456] Eric D. Chason, "A Tax on the Clones: The Strange Case of Bitcoin Cash," *Virginia Tax Review* 39, no. 1 (2019): 1–38, https://heinonline.org/HOL/Page?handle=hein.journals/vrgtr39&id=7&div=4&collection=journals; Ethereum Classic Community, "The Ethereum Classic Declaration of Independence," 2016, https://ethereumclassic.org/blog/2016-08-13-declaration-of-independence/.

[457] Rubinstein and Vettori, "Taxation of Investments in Bitcoins and Other Virtual Currencies: International Trends and the Brazilian Approach."

5.5.3. Direct tax consequences for the transferee

Transferees may simply be the fortunate recipients of tokens in a hard fork or airdrop of which they had no prior knowledge. Alternatively, transferees may play a role in the events that lead to the hard fork, or position themselves to benefit from either a hard fork or an airdrop by acquiring tokens in advance of the event that enable them to participate therein. That the latter is possible is evidenced by the internet blogs that provide advice on how to participate in upcoming hard forks, and by the enticement offered by Tron to prospective TRX holders that they would qualify to receive BitTorrent tokens in a future airdrop.[458]

5.5.3.1. *Hard forks*

Identifying a traditional transaction comparable to a hard fork is challenging. As noted in 4.4.1.4.2 within *Origination*, Webb rejects comparison to a share split. Split shares have a claim to and derive their value from the same company. Any claim attributable to the new shares comes at the expense of the existing shares. By contrast, the new crypto-asset tokens come into existence on a separate blockchain, while the existing blockchain is unaffected. While this may have a negative effect in the general sense of causing concern amongst or increasing competition for the attention of market participants, it may equally have a positive effect by demonstrating the robustness of the respective blockchains or increasing interest in the market. It does not however have a dilutive effect in the specific sense of increasing the number of claims against the same entity.[459]

A corporate unbundling is perhaps a closer analogy, since two blockchains emerge from one in a hard fork. Yet even here the analogy is found wanting. A corporate unbundling suggests a restructuring of complementary activities, whereas it is likely that the new blockchain will operate in competition with the existing blockchain. Furthermore, in an unbundling the assets

[458] For the latter, see TRON Foundation, "TRX."
[459] Webb, "A Fork in the Blockchain: Income Tax and the Bitcoin/Bitcoin Cash Hard Fork."

of the new entity previously formed part of the assets of the existing entity. In a hard fork, nothing is transferred from the existing blockchain to the new blockchain. This is both a philosophical failing of the analogy as well as a practical one. Both the share split and unbundling analogies necessarily imply the attributing of some portion of the value of the existing token to the new token, which may be difficult to do in practice.[460]

Webb concludes that the most appropriate classification within the US tax code may be as 'found property' (or 'treasure trove') which represent "undeniable accessions to wealth"[461] included within the US concept of income.[462] At the same time, he notes several philosophical and practical limitations arising from this classification. The value of the new tokens may be highly volatile at the date of receipt.[463] Uncertainty as to what price to use in the determination of taxable income would seem to undermine the principle of certainty. The price may increase over time as acceptance of the new blockchain spreads or may decrease if positive sentiment proves to be short-lived. The taxpayer may not immediately have control over the tokens to which they are theoretically entitled.[464] For all these reasons, Webb argues that taxation should be deferred until the date of subsequent disposal.[465] Similarly, Chason rejects taxation at receipt, pointing both to comparable examples such as free samples, prospecting for gold or big game fishing, where application of the 'treasure trove' approach is not pursued in practice, and to the administrative challenges of following such an approach.[466]

[460] Landoni and Pieters, "Taxing Blockchain Forks"; Chason, "A Tax on the Clones: The Strange Case of Bitcoin Cash."
[461] As referred to by the court in *Commissioner v. Glenshaw Glass Co., 348 U.S. 426 (1955)*
[462] Webb, "A Fork in the Blockchain: Income Tax and the Bitcoin/Bitcoin Cash Hard Fork."
[463] An analysis of past hard forks suggests that newly-created tokens are "severely overpriced" at the date of the hard fork, and potentially susceptible to market manipulation See Landoni and Pieters, "Taxing Blockchain Forks." At 209.
[464] Such a situation may occur where the token-holder's wallet provider does not provide support for the new tokens.
[465] Webb, "A Fork in the Blockchain: Income Tax and the Bitcoin/Bitcoin Cash Hard Fork."
[466] Chason, "A Tax on the Clones: The Strange Case of Bitcoin Cash."

The practical limitations of attempting to recognise a taxable event at the date of receipt may be a moot point. Huber *et al.* argue that at the exact moment new tokens come into being and existing token holders obtain entitlement they appear from nothing, are not yet actively traded, and have no inherent value, and therefore can give rise to no immediate tax consequences.[467] This argument is however rejected by Landoni and Pieters, who observe that there are a number of reasons why such tokens may immediately have value, including that there may already be an active market created through futures contracts.[468]

The 'treasure trove' analogy does not find favour with Landoni and Pieters. They note that a 'treasure trove' is unexpected before the fact and known and desirable after the fact, neither of which may be true in respect of hard forks. Many hard forks are widely announced beforehand. Yet not all announced forks materialise, not all forks result in a publicly-traded new token, and existing token holders may not desire the tokens to which they are entitled, or be able to access those tokens if their wallet provider does not support them.[469] Landoni and Pieters therefore prefer the analogy of 'calving', taken from the world of farming, which they note most closely approximates the tax approach in Japan. The attraction of this comparison is that it does not imply the creation of quantifiable value at the point of the hard fork, and it does not require any reallocation of cost.[470] This approach is also supported by Chason, who refers to treating the initial receipts as "open transactions" that require some later action by the taxpayer to "close" the transaction to give rise to a taxable event.[471] Such treatment is however potentially open to

[467] Huber, Guler, and Dumont, "Switzerland By the Same Token: Swiss Tax Questions in the Context of Initial Coin Offerings."
[468] Landoni and Pieters, "Taxing Blockchain Forks."
[469] In a study of Bitcoin forks, on 32 of the 48 announced forks occurred, and in only 17 instances could active trading be identified for the resultant new tokens - see Landoni and Pieters.
[470] Landoni and Pieters.
[471] Chason, "A Tax on the Clones: The Strange Case of Bitcoin Cash." At 36.

abuse where the token of lesser value may be intentionally assigned the identity of parent rather than of offspring in order to result in a loss on realisation of that token.[472, 473]

The current IRS prescription most closely approximates the 'treasure trove' approach. Guidance indicates that tokens received in a hard fork should be included in income at receipt unless the taxpayer does not have control over the tokens.[474] By contrast, Australia, Denmark, and Finland all indicate that such tokens will only have direct tax consequences on realisation, while the UK takes a similar position on tokens received via airdrop.[475]

Notwithstanding the view of the IRS, it is submitted that any recognition of income at the point of receipt in a hard fork or airdrop within the model conventions would be highly problematic. 'Found property' is a US concept that has no obvious equivalent within the model conventions. Indeed, income arising at receipt in such circumstances would seem to defy classification within the model conventions – it is not a dividend, interest or a royalty, and the acquirer has rendered no service. At best it could be classified in a generic sense as either business profits (Article 7) or other income (Article 21). The concerns in the literature considered above suggest that taxation at the date of receipt introduces considerable complexity, a lack of certainty and in some instances may result in an inequitable outcome, and therefore such an approach is not favoured by this study.

The majority of these challenges will be addressed if income is recognised only at the date of realisation. Realisation will only occur if the taxpayer is aware of the existence of and able to exercise ownership over such tokens. The nature of the income arising may be determined with reference to the actions and context prior to and during the course of disposal. The disposal

[472] Landoni and Pieters, "Taxing Blockchain Forks."
[473] By contrast, Landoni and Pieters note the incentive that exists to designate the token of lesser value as the 'treasure trove' – see Landoni and Pieters.
[474] Internal Revenue Service, "Rev. Rul. 2019-24."
[475] Australian Taxation Office, "Tax Treatment of Cryptocurrencies"; HMRC, "Cryptoassets for Individuals"; Skattestyrelsen, Virtuelle valutaer - Bitcoins - Spillegevinst [Virtual currencies - Bitcoins - Gambling winnings], SKM2019.10 skat.dk (2018); Vero Skatt, "Beskattning Av Virtuella Valutor [Taxation of Virtual Currencies]."

will give rise to certainty of amount and will provide the resources from which to pay the tax arising, and will further considerations of simplicity.

It is therefore submitted that income from crypto-asset tokens received in a hard fork should be recognised only upon realisation, and should be classified according to the actions of the taxpayer in acquiring, holding, and disposing of those tokens.[476] This aligns with the position of Landoni and Pieters,[477] but is contrary to that of the IRS. Since the model conventions do not explicitly address the timing of recognition of income, this may need to be addressed at the level of domestic legislation.

5.5.3.2. *Airdrops*

Within the sample, the one past airdrop and one prospect of a future airdrop identified both related to the granting of new crypto-asset tokens to existing holders of a different token.[478] Therefore the value of new tokens is not derived from any dilutive effect on the existing tokens, although it is not unreasonable to presume that it may have some effect on the market price of existing tokens around the participation period.[479]

One further instance of an airdrop identified (although the NEO white paper does not refer to it as such) is the receipt by virtue of an existing NEO token holding of secondary GAS tokens that function on the same blockchain. While Ethereum users use Ether to buy the GAS that pays for transaction fees, NEO token holders receive a daily allocation of GAS tokens that

[476] It should perhaps be noted that Chason does not favour an outcome that could give rise to a capital gain for the recipient on disposal merely by virtue of time held, since in his view this would add a tax windfall to an economic windfall. While this may be part of the considerations in evaluating the classification of such income, this study takes the view that to prescribe a universal outcome in either direction would ignore other relevant considerations. This however may be best considered at the level of domestic legislation. See Chason, "A Tax on the Clones: The Strange Case of Bitcoin Cash."
[477] Landoni and Pieters, "Taxing Blockchain Forks."
[478] See Crypto.com, "Crypto.Com Chain"; TRON Foundation, "TRX."
[479] Landoni and Pieters, "Taxing Blockchain Forks."

allow them to use the network. NEO's GAS tokens are separately listed on crypto-asset exchanges,[480] meaning that token-holders may choose to sell their unwanted GAS tokens.

The receipt of airdropped tokens is the clearest example of something of value that token holders receive by virtue of their existing holdings without having to do anything further in exchange. While this may appear comparable to a dividend or interest arising from ownership of the primary token, it cannot be classified as such, for the reasons already discussed in 5.4.5 within *Origination as remuneration or incentive*. The tokens that entitle participation in the airdrop are not shares or a debt claim, the distribution of new or secondary tokens does not represent a cost to the originator, it has no impact on the residual net asset value of the originator, and it is not funded from after-tax income. Therefore, any income represented by airdropped tokens does not belong to a special income classification.

Consistent with the arguments presented above in respect of hard forks, it is submitted that the taxation of income arising from an airdrop should be deferred until disposal, and classified according to the actions of the taxpayer in acquiring, holding, and disposing of those tokens. It is however acknowledged that some of the pragmatic concerns with regard to the taxation of hard forks may be less evident in respect of airdrops, and therefore a stronger argument could be made for taxation at receipt. Especially where such events are recurring and predictable such income might be considered revenue in nature and classified either as business profits (Article 7) or other income (Article 21), while the classification of any further income arising on disposal would require separate consideration.

5.5.4. Fortuitous receipts and the determination of cost or basis

Although this study focuses on classification of income, it is worth including some observations on the cost allocated to tokens fortuitously received, as there are significant

[480] CoinMarketCap, "CoinMarketCap," 2020, https://coinmarketcap.com/.

differences between jurisdictions in the current guidance in this respect. The US approach implies a cost assigned to the new tokens equal to the amount recognised as income on receipt. The UK requires apportionment of the cost of the pre-existing token between the new and pre-existing tokens, while Australia and Finland allocate no cost to the new token. Australia however requires that the 'new' token be determined according to which of the divergent blockchains represents the adoption of new protocols and which continues the old protocols.[481]

The UK approach approximates that of a corporate unbundling.[482] There are however significant differences in these two events (as noted above). Most notably, it is difficult to see how value has been transferred from the pre-existing to the new tokens, or on what basis this should be determined. While it may be true that in some cases the value of pre-existing tokens might increase in anticipation of a hard fork (in much the same way as the price of a share in anticipation of a dividend) and decrease thereafter, unless the tokens were acquired during this period, these changes in value are entirely notional. It is also difficult to imagine how the apportionment of cost is to be determined. In the case of share splits or unbundling, this is an objective calculation. In the present instance, however, it would appear to be entirely subjective, which may result in two taxpayers recognising different outcomes to identical transactions. The HMRC guidance is silent in respect of this practicality.

The Australian approach to identifying the 'new' tokens may appear insightful but is likely to raise several issues in practice. It assumes that the hard fork is the result of a single new protocol that is accepted by some token holders and rejected by others. However, it may well be the case that both groups adopt alternative new protocols, as appears to have occurred in the Bitcoin-Bitcoin Cash hard fork.[483] Under the Australian approach, both resultant blockchains might

[481] Australian Taxation Office, "Tax Treatment of Cryptocurrencies"; Vero Skatt, "Beskattning Av Virtuella Valutor [Taxation of Virtual Currencies]"; HMRC, "Cryptoassets for Individuals."
[482] Landoni and Pieters, "Taxing Blockchain Forks."
[483] Hertig, "Bitcoin Cash: Why It's Forking the Blockchain And What That Means."

then be considered ‘new’. Such an approach may also result in the transfer of cost from the token which the holder acquired intentionally to that which was perhaps acquired entirely fortuitously. This might expose the holder to the possibility of prejudicial tax outcomes when disposing of either the new or pre-existing tokens. For instance, where the cost incurred in acquiring a well-established token is transferred to a new token (which continues the old protocol) with an uncertain future, this may result in exaggerated gains calculated on the disposal of the token originally acquired, or of substantial losses on the disposal of the token fortuitously acquired. The taxpayer may be prejudiced not only in the timing of the respective realisations, but also through differences in the nature of those realisations. Finally, there is the practical challenge that the cost for tax purposes may become disconnected from the recorded transaction cost, since inevitably beyond the world of taxation it is the token that retains its name that will be considered the pre-existing token. This may cause difficulties in reconciling record-keeping and tax reporting.

As in the determination of income, the ‘calving’ analogy of Landoni and Pieters resolves these philosophical and practical difficulties, since it does not presume any value to be transferred from ‘parent’ to ‘offspring’, which is assigned no cost.[484] This adds weight to the proposal of this study that the taxation of income from fortuitous receipts be deferred until disposal, and that such tokens be assigned no cost, as is already the case in some jurisdictions.

5.6. Retentions

5.6.1. Introduction

In some white papers reference is made to future allocation or use of tokens by the originator. Whether such tokens have been created and held in reserve or exist only in the nominal sense and will be created at the moment of allocation or use is not always clear.

[484] Landoni and Pieters, “Taxing Blockchain Forks.”

5.6.2. Direct tax consequences for the originator

With respect to tokens held in reserve by the originator, it is submitted that no income can arise until a realisation event has occurred in which ownership is transferred. No objective measure of value exists at the moment of creation, making administrability impossible. Taxation prior to realisation also violates the principle of convenience, and it is difficult to think of a comparable context with respect to which such treatment would establish horizontal equity. To recognise income prior to transfer would also be at odds with the recognition of income from the *Sale of crypto-asset tokens by originators*, as considered in 5.3, since a sale must necessarily be preceded by a creation event. It is also comparable to and further supports the rejection of the application of the US concept of 'undeniable accessions to wealth' considered in 5.5 *Fortuitous issuances and receipts*, which if applicable in the instance of a hard fork might have equal application to tokens retained by the originator.

5.7. Medium of exchange

5.7.1. Introduction

Use subsequent to origination as a *Medium of exchange* is the most frequently-identified transaction among crypto-assets within the sample, with only three of the twenty-five tokens not acting as a possible *Medium of exchange*.

As first noted in 5.4.3 within *Allocation as remuneration or incentive*, where crypto-asset tokens are used in payment for services, the transaction is a barter transaction. This is equally true when exchanged for goods, or for other crypto-asset tokens. Delivery by the counterparty may occur either off-chain (in the case of goods and services not directly connected to the underlying blockchain on which payment occurs) or on-chain (where tokens are used in

payment for transaction fees). The result is that the acquirer of goods or services also has a disposal of their crypto-asset tokens which gives rise to direct tax consequences.[485]

In considering the origination of the various tokens within the sample within sections 5.2 to 5.6, it was evident that crypto-asset tokens originated by fiat currency deposit (that is, qualifying stablecoins) were distinct from all other tokens analysed. The origination of such tokens gave rise to the creation of a negotiable debt instrument. In contrast, all other origination transactions gave rise to the creation of an intangible asset regardless of the means of origination. Therefore, the subsequent use of qualifying stablecoins as a *Medium of exchange* will be considered separately to the use of all other crypto-asset tokens in similar transactions.

5.7.2. Tokens originated through fiat currency deposits

5.7.2.1. *Direct tax consequences for the transferor*

The most likely intention behind the acquisition of stablecoins would seem to be for subsequent disposal as a *Medium of exchange.* Stablecoins are particularly suited to functioning as a medium of exchange due their constant value in a particular fiat currency. Both stablecoins within the sample were priced in US Dollars.

In instances where the transferor's local currency is the same as that in which the stablecoin is priced there will very likely be no gain or loss on transfer when used as a medium of exchange, in which case classification is irrelevant. However, where the transferor's local currency differs, there may be a gain or loss on transfer associated with the change in exchange rate between acquisition and disposal date.[486] It may be argued that any such gains or losses should be classified as gains or losses on foreign currency, which may afford the transferor protection from taxation thereon in certain instances in terms of domestic legislation (often afforded to

[485] Baros, "Barter, Bearer, and Bitcoin: The Likely Future of Stateless Virtual Money."
[486] Christians and Tazeem, "Facebook's Libra: The next Tax Challenge for the Digital Economy."

individuals who are not dealing in foreign currency, and potentially up to certain limits).[487] However, as noted in 5.2 *Origination by fiat currency deposit*, this would fail to acknowledge that there is a meaningful difference between fiat currency and stablecoins, the latter embodying not only a redemption value but also the originator's perceived ability to honour a claim for redemption. Therefore, any gain or loss on transfer of stablecoins as a medium of exchange must be characterised as a gain or loss on a negotiable debt instrument.

As already noted in 5.3.1.6 within *Sale of crypto-asset tokens by originators*, whether a gain or loss is capital or revenue in nature is left largely to domestic legislation. Nevertheless, this remains a significant consideration. An initial view might be that all such transactions must be evidence of acquisition with the intention for disposal and therefore should be revenue in nature. Such a view, however, does not stand up to scrutiny. Other plausible reasons may be given as to why stablecoins may have been acquired. The transferor may hold stablecoins out of concern for the stability of their local fiat currency, to benefit from lower transaction fees, due to lack of access to traditional financial infrastructure, for ideological reasons, because they were accepted in payment in a preceding transaction, or because they are the means of payment prescribed by the transferee. Not all these instances would necessarily be considered to give rise to revenue income on disposal. In the absence of specific domestic legislation designating a particular nature to such transactions, due consideration must be given to whether those tokens were acquired and subsequently dealt with in the context of a business, recognising that plausible alternative reasons and contexts exist.

Where such income is determined to be revenue in nature, it may be classified as either business profits (Article 7) or as other income (Article 21), which serves as the final default income classification category, and is subordinated to both the specific classifications as well as to

[487]For example, see the exclusions granted to individuals in Italy and South Africa. Cancelliere and Tardini, "The (Non-Public) Response to Request No. 956-39/2018: Tax Regime Applicable to Cryptocurrencies Held by Individuals Resident in Italy"; South Africa, Income Tax Act.

Article 7. Article 21 therefore serves as the final classification for all income that does not fall within another article. In consequence, its boundaries are defined not by what is included but by what is excluded by virtue of inclusion in other articles. For this reason, it is a potentially significant article. Despite this, Article 21 has a fairly narrow application. Types of income that may fall within other income include alimony payments, social security system retirement benefits, gambling winnings, payments in terms of non-competition agreements, punitive compensation for damages that does not replace lost business profits, and income from non-traditional financial instruments such as derivatives (which fail to be classified as dividends or interest, or as business profits or capital gains). It may also include lease income from moveable property that falls outside of Article 7.[488] Some treaties further reduce the application of Article 21 by placing reference in other articles to specific classes of income that might otherwise be governed by this article.[489] However, in practice, instances exist of jurisdictions pursuing a broader application of Article 21, particularly where this results in favourable outcomes in the taxing rights granted. This includes attempts by both Brazil and India to argue that in some instances, where fees for services fall outside the scope of Article 12 as constructed within a treaty, they should be classified in terms of Article 21 rather than Article 7. In some cases this practice has been upheld, while in others the reasoning has been refuted.[490]

The only classification as other income arising from crypto-asset transactions proposed by Kjærsgaard is in respect of returns on so-called 'security tokens' that fail to be classified as

[488] Alexander Rust, "Article 21: Other Income," in *Klaus Vogel on Double Taxation Conventions (Updated)*, ed. Ekkehart Reimer and Alexander Rust (Wolters Kluwer, 2019), http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/KLICCHICVogel2015Art21poheadingidTxNHfNPRFUesQnQk58QZhw!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B72F8DA64-EB10-4765-964F-EE1A6CAA4BF0%7D--WKUS_TAL_9958%23teid-242?searchItemId=&da=WKUS_TAL_9958; Jonathan Schwarz, "Chapter 13 Other Income and Miscellaneous Cases," in *Schwarz on Tax Treaties*, ed. Jonathan Schwarz (Wolters Kluwer, 2017), http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/52f7eb687cf310008efd90b11c18c90201!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B8D89C844-84A1-4605-B43D-1D711A01C117%7D--WKUS_TAL_12839%23teid-126?searchItemId=&da=WKUS_TAL_12839.

[489] For example, Article 18 might be extended to include not only pensions associated with past employment but all forms of retirement benefits. See Schoueri, "Article 21 - Other Income - Global Tax Treaty Commentaries."

[490] Schoueri.

either dividends or interest, based on references to financial instruments with respect to the application of Article 21.[491] That proposal however focuses on returns in the form of income transfers from the originator rather than on disposal, and it is submitted that such forms of income are distinct from that which is contemplated here. It is difficult to see how income arising from the use of tokens originated by fiat currency deposit as a medium of exchange could be revenue in nature without regarding such tokens as the trading stock of a business, which would consequently support classification as business profits. However, drawing comparisons to income from shares, Vincent Ooi suggests that in Singapore, where gambling is considered distinguishable from trade, it may be that income from crypto-asset transactions would in some instances be classified as other income. Such classification would need to take into account the level of skill and degree of organisation as well as the identity of the taxpayer, and may be more likely to apply to individuals than companies. Whether gambling income would be considered other income or capital in nature would then be a further relevant consideration.[492]

Taking into account the subordinated position of Article 21 to Article 7, as well as considerations of certainty and horizontal equity, the preference of this study is that revenue income arising from the use of crypto-asset tokens as a medium of exchange be classified as business profits (Article 7) rather than as other income (Article 21). However, it cannot be conclusively determined that the latter classification would not be pursued in practice given the association between financial instruments and other income, as well as the contributions of skill and chance. Furthermore, such debates of classification may pit the interests of the country of residence against those of the country of source. For this reason, it is submitted that it would

[491] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[492] Vincent Ooi, "The Taxation of Cryptocurrency Gains," *Bulletin for International Taxation, Journal Articles & Opinion Pieces IBFD* 75, no. 7 (2021), https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/bit_2021_07_sg_1.

be beneficial for a clear global position to be articulated on the extent to which this classification may be relevant to transactions involving crypto-asset tokens considered to be negotiable debt instruments.

Where a capital gain arises on the disposal of a debt instrument, which it is submitted is possible in this context, no consideration is given in terms of Article 13 to whether that gain represents any expectation regarding the risk of default or of future interest or currency gains.[493]

Whether the direct tax consequences of any income arising from changes in exchange rates are recognised prior to realisation would again be a matter for individual jurisdictions, consistent with their provisions applicable to debt instruments held either as trading stock or as capital assets. Where classified as business profits, the transferor must be afforded a deduction for the acquisition price of such tokens, while the acquisition price must represent the cost in the determination of any capital gain or loss.

Where a country has taxes on capital, stablecoins may also give rise to such tax consequences, classified in terms of Article 22. Article 22 may however have limited practical application given that few countries currently have a general tax on capital.[494]

5.7.2.2. *Direct tax consequences for the transferee*

The transferee receives stablecoins as a medium of exchange. Since it is not the receipt of fiat currency such a transaction is a barter transaction, and therefore represents income for the transferee at the market value of the stablecoin accepted in payment for the goods or services delivered.[495]

[493] Reimer, "Article 13: Capital Gains."
[494] Yoshihiro Masui, "Article 22 - Capital - Global Tax Treaty Commentaries," Global Topics IBFD, 2020, https://research.ibfd.org/#/doc?url=/linkresolver/static/gttc_article22.
[495] See the discussion of whether crypto-assets in general can be fiat currency in 3.2.7 and the nature of stablecoins specifically in 5.2.

The direct tax consequences for the transferee as holder and later disposer of such stablecoins must be considered from their subsequent position as transferor of those tokens, as addressed in 5.7 to 5.11 of this analysis, taking into account the context in which those tokens were acquired as well as subsequent actions.

5.7.3. Tokens originated by all other means

5.7.3.1. *Direct tax consequences for the transferor*

With the exception of stablecoins, all crypto-asset tokens within the sample have been determined to be intangible assets. Their use as a *Medium of exchange* represents a barter transaction. Because there is no basis on which the value of such tokens is held constant against any fiat currency, such transactions are more likely to give rise to gains or losses for the transferor than transactions involving tokens originated by fiat currency deposits.

In terms of the principles of taxation of barter transactions the selling price should be the fair value of the goods or services received.[496] In some instances, this fair value may be simple to determine, while in other instances it may be more difficult. In instances where such fair value cannot be determined it is submitted that the amount of income should be based on the market value of the crypto-asset tokens disposed of.[497] Among other contexts, this may be relevant when paying for transaction fees on the blockchain, since such fees are denominated in crypto-asset values and have no readily observable price in fiat currency.

Where such tokens are disposed of with a profit motive or as part of the business operations of the transferor, the resultant gains or losses should be classified as business profits (Article 7), whereas in other instances they should be classified as capital gains (Article 13).[498] In instances where crypto-assets disposed of were acquired by means of purchase, the cost should include

[496] Keller, "The Taxation of Barter Transactions."
[497] As already noted, Keller observes that in most barter transactions using the value of products or services given or received should result in the same outcome – see Keller.
[498] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."

the acquisition cost incurred. Where they were acquired in a barter transaction (including as block rewards or transaction fees for the performance of transaction validation), the cost should include the amount that has already been subject to tax, so as to tax only the incremental gain and prevent double-taxation on disposal.

Circumstances can be envisaged where transfer as a *Medium of exchange* does not represent a trading activity. In addition to those already noted in the consideration of stablecoins, other crypto-asset tokens may have been acquired for the various purposes associated with the *Holding* category of use, as considered in 5.9 below. The transaction may also represent the payment of transaction fees, the nature of which is subsidiary to the purpose of the transaction being processed. Since the model conventions are not decisive in this regard, whether such gains or losses should be classified as revenue income from trading in intangible assets within business profits (Article 7), or as capital gains (or losses) (Article 13) is once again dependent on the particular circumstances of each transaction and the determining factors applied within the domestic context of contracting states. The possibility of classification as other income (Article 21) arising from gambling[499] is again a relevant consideration. The association between financial instruments and other income[500] is a less relevant consideration in this instance, assuming that it is accepted that crypto-asset tokens other than those originated by fiat currency deposit should not be considered financial instruments.

In the analysis of possible transactions in Chapter 4 it was noted that in some instances there may be no transferee in respect of a transfer as a *Medium of exchange*. This arose in instances where tokens were extinguished in the process of paying transaction, storage and DPoS candidacy fees rather than being paid to a counterparty. Such fees exist not to incentivise a service provider but to disincentivise the transferor from conducting such activities frivolously

[499] Ooi, "The Taxation of Cryptocurrency Gains."
[500] Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."

or maliciously. In such contexts, transaction validators have other incentives for performing their function, which may be in the form of *Block rewards* or simply the indirect benefits of a functioning blockchain to them in their role as financial intermediaries.[501] Token extinction also decreases the supply of tokens in issue, although the price of transaction fees is not typically high enough for this to alter the supply at a significant rate.[502]

Where crypto-asset tokens are alienated in a such a manner that they are extinguished rather than transferred to a counterparty it is submitted that the direct tax consequences for the transferor should be determined consistently with those transactions where a transferee exists in order to achieve horizontal equity, since the nature of the transactions are similar from the perspective of the transferor. Furthermore, such treatment furthers objectives of simplicity and administrability. Transaction fees are almost inevitably a subsidiary element of a larger transfer of tokens, and to separate the two elements of such a disposal would likely be unmanageable.

5.7.3.2. ***Direct tax consequences for the transferee***

As with stablecoins, the immediate direct tax consequences for the transferee as the counterparty in a barter transaction must be measured at the market value of the crypto-asset tokens received, and classified according to the nature of the transaction, which, with the exception of transaction fees earned, is not defined by the acceptance of crypto-asset tokens in payment.

Income arising from transaction fees earned must be classified consistently with the earning of *Block rewards*, since the two sources of income are the product of the same activity (although both types of income may not necessarily be incorporated within every blockchain network). In 5.4.5 within *Origination as remuneration or incentive* it was concluded that in respect of both PoW and DPoS validation such income should be classified as income from services

[501] See for example the discussion of Ripple/XRP (B.3) or EOS (B.8) in Appendix B.
[502] Ripple, "XRP Ledger Concepts."

rendered, thus falling within business profits (Article 7). The amount recognised as income should then be treated as the cost of such tokens for the purposes of any subsequent transaction involving those tokens.

Where crypto-asset tokens are accepted in payment merely to facilitate a transaction or as a prerequisite to transacting in a particular market and subsequently disposed of for fiat currency, any such gains or losses arising from intervening changes in crypto-asset prices are incidental to the primary transaction. It is therefore submitted that the classification of any such gains or losses should be consistent with that of the income arising from the primary transaction. Where however the intention of the transferee is specific to the tokens received, any income arising must be considered from their subsequent position as transferor of those tokens, as addressed in 5.7 to 5.11 of this analysis.

5.8. Redemptions

5.8.1. Introduction

Only qualifying stablecoins are capable of being redeemed, since they embody a contractual right of redemption. Rather than using such a token as a *Medium of exchange*, the transferor may dispose of it through *Redemption* of the fiat currency deposit from the originator.

5.8.2. Direct tax consequences for the transferor

The action of *Redemption* does not provide conclusive insight into the nature of any income arising, since the redemption price of a stablecoin should in theory always be the same as the current market price of that stablecoin. Whether the holder chooses to redeem a token rather than hold it for future use as a *Medium of exchange* may however be affected by considerations such as market liquidity and any fees arising on redemption in comparison to fees charged by a crypto-asset exchange on transfer. As with transfers as a *Medium of exchange*, income on redemption of stablecoins may arise from movements in the exchange rate between the holder's

local currency and the currency in which the stablecoin is denominated.[503] The classification of any income arising on redemption should be determined consistently with the approach outlined in 5.7.2 of *Medium of exchange*. Such tokens may also give rise to taxes on capital (Article 22) where this is relevant.

5.8.3. Direct tax consequences for the transferee

Direct tax consequences may arise for the originator on the *Redemption* of a stablecoin token. The originator is a borrower in respect of that token, which represents a debt instrument. The redemption extinguishes the originator's liability and may give rise to gains or losses where the fiat currency against which that token is priced differs from the originator's local currency.

The model conventions do not specifically address the determination of or provide separate classification for foreign exchange gains and losses. Since in this context *Redemption* is fundamental to the business of the stablecoin originator, it is submitted that they should be classified as business profits (Article 7).

The originator may therefore be required to recognise a gain or loss on foreign currency, adjusted for any such gains or losses required to have been recognised prior to realisation in terms of domestic legislation applicable to foreign currency gains and losses.

Where a stablecoin does not meet the requirements for classification as a negotiable debt instrument, any voluntary 'redemption' of those tokens should be considered a repurchase, as discussed in 5.10 *Speculation and investment*.

[503] Christians and Tazeem, "Facebook's Libra: The next Tax Challenge for the Digital Economy."

5.9. Holding[504]

5.9.1. Introduction

Not every crypto-asset is acquired with the intention of subsequent disposal. Crypto-assets may also be acquired for the benefits that they afford the holder while owned. Eleven tokens within the sample grant the holder either access to DPoS earning opportunities or to reduced transaction fees. Two tokens would have allowed the holders to participate in past hard forks and one in a future airdrop. Two tokens allow the holders use of a proportionate amount of their respective blockchain networks, and a further two fulfil minimum balance requirements.

5.9.2. Direct tax consequences for the holder/transferor

The direct tax consequences arising from the receipt of newly-originated tokens linked to existing token ownership (that is, a benefit of *Holding*) have already been considered in the context of a number of transaction categories above. Income arising in the form of DPoS *Block rewards* or the delegation of participation rights attributable to tokens is considered in 5.4.5 within *Origination as remuneration or incentive*. The receipt of tokens in a *Hard fork* or *Airdrop*, including the receipt of secondary tokens representing network usage rights, is considered in 5.5 *Fortuitous issuances and receipts*. This section focuses on benefits of ownership other than the receipt of newly-originated tokens, and on the ultimate disposal of the tokens affording such benefits.

5.9.2.1. *Network usage rights*

Tokens may afford owner the right to use a proportionate amount of the underlying blockchain network. In the case of EOS tokens, transaction validators who support the network are rewarded only through DPoS validation rewards, while in the case of the TRON network users pay for transaction fees using their daily GAS token allocation determined according to their

[504] The reader is reminded that in this study the term 'holding' is used to refer those instances in which the owner of a token obtains benefits from continued ownership rather than from its immediate or future disposal. Such benefits may include those identified within sections 4.4.2.3.1 to 4.4.2.3.4.

TRX holding.[505] Within the EOS network, therefore, network use is granted on the basis of token ownership rather than the payment of transaction fees. While the utilisation of such usage rights is a benefit of ownership, it cannot represent income, as there is no receipt or accrual to the holder. Rather, it represents the future benefits acquired at acquisition, in much the same way as an ongoing right of access to a physical facility may be purchased and enjoyed over time. The purchase price is the compensation of the facility owner for the access that it will grant in the future, and the user when exercising that right is using what they have already paid for. The difference in this instance is perhaps that the transaction validators receive their compensation indirectly; the tokens they receive in DPoS validation rewards do not come from the user, but have value because there is a demand for usage of the network, which is created by current users.

By contrast, it was concluded in 5.5 *Fortuitous issuances and receipts* that the receipt and subsequent utilisation of secondary tokens such as those awarded to TRX holders should give rise to direct tax consequences.

5.9.2.2. ***Delegation of network usage rights***

It may also be possible for the holder to delegate rights to use the network in return for compensation. EOS is the only token within the sample identified as having this functionality. It is submitted that income earned through such delegation should be classified as income from the rental of property as part of business profits (Article 7), since the holder renders no service to the user to whom usage rights are delegated. This differs from the preferred classification proposed for income from the delegation of DPoS participation rights considered in 5.4.5 within *Origination as remuneration or incentive*, since in the *Delegation of network usage rights* the token holder does not share in any risk with respect to the other party's activities.

[505] See B.8 and B.14 of Appendix B.

Tokens received in payment for *Delegation of network usage rights* may either be retained by the holder to increase their future income from delegation, or used within any of the transaction categories arising subsequent to origination. The tax consequences of such transactions must therefore be considered from their subsequent position as holder or transferor of those tokens, as addressed in 5.7 to 5.11 of this analysis.

5.9.2.3. ***Disposal of tokens***

A capital gain arises from the disposal of a taxpayer's operating assets.[506] Although the model conventions do not define how a capital gain should be distinguished from other classes of income, it is submitted that the earning of income or the utilisation of benefits arising from token ownership strongly supports the conclusion that the subsequent disposal of tokens acquired for such purposes represents a capital disposal and should be classified in terms of Article 13. However, many tokens affording benefits of ownership may also be used as a medium of exchange in various contexts. For example, all tokens required for DPoS eligibility (except EOS tokens) can also be used to pay for transaction fees. Similarly, any token may be acquired and disposed of simply for speculative purposes, and any income or other benefits arising during ownership of such tokens may be incidental to that purpose. Therefore, the nature of the income arising cannot be determined in the abstract based on the features of the token disposed of. Rather, it is important that the classification of income arising in each transaction be determined according to the specific facts surrounding that transaction.

As noted with respect to earlier categories of transactions arising subsequent to origination, the holding of such tokens may also give rise to taxes on capital (Article 22) where this is a relevant consideration.

[506] Reimer, "Article 7: Business Profits."

5.9.3. Direct tax consequences for the transferee

The transferee has no income arising from the acquisition of tokens held by the transferor for benefits of *Holding*, unless it has been accepted in payment by the transferee in a barter transaction (which would include, but not be limited to, transaction fees). In such instances the classification of income arising should be considered in line with the nature of the transaction from the perspective of the transferee, as discussed in 5.7.3 within *Medium of exchange*.

5.10. Speculation and investment

5.10.1. Introduction

It is possible to utilise any crypto-asset token in the sample for the purposes of speculation or investment rather than for the purported purposes for which it exists, such as acting as a *Medium of exchange* or conferring benefits through continued *Holding*. This is true even of tokens issued by *Origination by fiat currency deposit*, where a gain or loss may arise where the fiat currency against which the stablecoin is priced differs from the local currency of the holder.

5.10.2. Tokens originated through fiat currency deposits

5.10.2.1. *Direct tax consequences for the transferor*

The transferor has disposed of a negotiable debt instrument, as noted in both 5.2 *Origination by fiat currency deposit* and 5.7.2 within *Medium of exchange* (assuming the requirements for classification as a negotiable debt instrument have been met). Where that transaction is speculative in nature it is submitted that it should be classified to business profits (Article 7), and where capital in nature as capital gains (Article 13). As previously considered, the distinction between these classifications may be supported by the specific circumstances and must be determined according to the domestic provisions of the relevant jurisdiction. It is again possible that classification as business profits may in some instances be rejected in favour of classification as other income (Article 21) As noted within 5.7 *Medium of exchange*, such income seems distinguishable from a return on financial instruments that fails to be classified

as interest or dividends, which would be one argument in favour of classification as other income. However, such income may in some instances be argued to be income from gambling, especially for individuals, which might also support classification as other income. Once again, clarity as to the application of Article 21 in this context would be welcome.

Such tokens may also give rise to taxes on capital (Article 22) where this is a relevant consideration.

5.10.2.2. *Direct tax consequences for the transferee*

No direct tax consequences will arise for the transferee on purchase, and any subsequent direct tax consequences will depend on the reason for which those tokens were acquired and the manner in which they are subsequently used, which should be considered in terms of 5.7 to 5.11.

5.10.3. Tokens originated by all other means

5.10.3.1. *Direct tax consequences for the transferor*

Any gains or losses arising from speculation or investment in any other crypto-assets within the sample should be classified as gains or losses on speculation or investment in intangible assets within either business profits (Article 7) (or possibly as other income (Article 21)) or capital gains (Article 13). Such tokens may also give rise to taxes on capital (Article 22) where this is a relevant consideration. Notwithstanding that such tokens may be bought and sold on regulated exchanges, they do not represent financial instruments, as concluded in 5.3 *Sale of crypto-asset tokens by originators*. That they may in some instances be treated as securities is a matter of regulatory rather than tax classification.[507]

Whether such tokens are sold to another holder or repurchased by the originator has no impact on the nature of the income arising for the transferor. As already noted in various categories

[507] See, for example, U.S. Securities and Exchange Commission, "Framework for 'Investment Contract' Analysis of Digital Assets," 2020, https://www.sec.gov/corpfin/framework-investment-contract-analysis-digital-assets.

above, although such transactions bear some similarity to dividend distributions, they cannot be classified as such. Similarly, such transactions cannot be classified as a return of capital since it was concluded that the origination of such tokens did not represent the issuance of a financial instrument.

5.10.3.2. *Direct tax consequences for the transferee*

There will be no immediate direct tax consequences for the transferee arising from the acquisition transaction, with the cost price representing either a deduction in respect of future revenue income or an addition to the cost in a subsequent capital disposal. Income arising from subsequent use or disposal should be considered in terms of 5.7 to 5.11.

If the transferee is the originator repurchasing tokens without an obligation to do so, such a repurchase should be treated as revenue in nature and allowed as a deduction against business profits, since it is part of the business operations of the originator and is consistent with the classification of income arising on origination. Where a repurchase is in terms of an obligation, classification should be considered in terms of *Redemptions* considered in 5.8 above.

5.11. Involuntary transfer

5.11.1. Introduction

Within the sample, involuntary disposals were observed to arise as a function of the underlying blockchain, as in the case of penalties and incentivised hacking, through the actions of the holder transferring tokens to a non-existent account or losing the private key to a wallet, or though theft.

In most instances these events clearly result in a transfer of tokens. In some, this results in a receipt for the transferee, while in others it results in the extinction of those tokens. In other instances, it is less clear whether a transfer has occurred. Most notably, where the token holder loses their private key, they still have legal title to the tokens within that wallet, although they cannot access those tokens. It may or may not be possible to recover that access if the holder

retains ownership of the physical device on which that wallet is stored. In contrast, where the token holder has ceased to own the physical device on which a wallet is stored, they have also lost title to those tokens. It was noted in the review of domestic legislation in Chapter 3 that the consequences of lost private keys were considered only by the UK and Australia. Australia allows a loss to be recognised for tax purposes, whereas the UK does not recognise such a loss.[508]

The model conventions refer to 'alienation' but do not provide an exhaustive definition of this term. The OECD Commentary to Article 13 indicates that the term 'alienation of property' includes sales, exchanges, part alienations, expropriations, transfers in exchange for shares, sales of rights, the giving as a gift and the transfer of property on death.[509]

Reimer defines the core of the term 'alienation' to be "the transfer of the authority to dispose of a property or parts of property to another person without a time limitation".[510] He further suggests that the context implies a broad interpretation of 'alienation' that should encompass events that are legally or economically similar to alienation, as well as events that would be considered an alienation in terms of domestic legislation.

It would seem that penalties, theft and the transfer of tokens to a non-existent account would fall within the concept of alienation. However, whether the loss of access to tokens might be considered sufficiently economically similar to alienation to be regarded as such is unclear. This is something that could be clarified either within the context of the model conventions and commentaries, or addressed at the level of domestic legislation.

[508] HMRC, "Cryptoassets for Individuals"; Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[509] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[510] Reimer, "Article 13: Capital Gains." At 12.

5.11.2. Direct tax consequences for the transferor

There were no instances within the sample where a transaction or event categorised as an involuntary transfer would give rise to any income for the transferor. Therefore, assuming the event met the requirements in terms of domestic legislation for recognition as an alienation or disposal, the cost price together with any income recognised prior to realisation should be treated as a loss. Since that loss was not contemplated by the transferor at acquisition, it should be classified consistently with the manner in which any income arising on the intentional disposal of that token would otherwise have been classified.

5.11.3. Direct tax consequences for the transferee

Tokens may be involuntarily transferred by a transferor to a transferee in the case of incentivised hacking, which is designed to enforce adequate security measures among actors within the network. In such instances, such tokens are the product of services rendered by the hacker to the network akin to those considered in the *Allocation to third-party developers* in 5.4.4. Such income should be classified as business profits (Article 7), or alternatively as fees for technical services (Article 12A of the UN Model) where they are the product of human intervention rather than automated processes.

The only other instance in which tokens may be involuntarily transferred to a transferee is by theft. Whether such events give rise to income and how such income should be classified is not contemplated by the model conventions. This is a matter for individual jurisdictions to determine consistently with their approach to the proceeds of crime in other contexts.

5.12. Conclusion – direct tax consequences of identified transaction categories

In the preceding analysis, ten transaction categories have been analysed in order to determine whether and how any income arising from such categories might be classified within the text of the articles of the model tax conventions. Where necessary, these categories were further disaggregated on the basis of key characteristics of transaction subcategories that might affect

such classification. Income identified was further analysed beyond the classification level to address considerations of identity and nature that may inform considerations of source, timing, and the application of specific legislation at the jurisdictional level.

5.12.1.1. *Classification in terms of the text of the articles of the model tax conventions*

It is not proposed that any crypto-assets within the sample be classified as fiat currency for direct tax purposes. Stablecoins that represent a right of redemption are the only crypto-asset tokens within the sample that should be classified as a financial instrument. In all other instances, crypto-assets within the sample would most appropriately be classified as intangible assets.

It is submitted that the origination of stablecoins does not give rise to income for the originator where a contractual obligation to redeem such tokens exists. By contrast, the origination of tokens by sale or in reward for services rendered to the originator gives rise to income for the originator. Such income does not represent royalties in terms of the OECD Model's construction of Article 12. However, while not the position of this study, it cannot be conclusively stated that classification as a royalty in terms of the UN Model's construction of Article 12 will not be pursued by countries that favour the alternative interpretation that royalties from ICS equipment leases arise where merely the use of that equipment's capacity is granted. The analysis concludes that such income would most appropriately be considered income from the disposal of intangible assets and classified as business profits (Article 7). It highlights however that the proliferation of crypto-assets may place further emphasis on the already divergent interpretations of the boundaries of the royalty classification in practice, and notes that further clarity at the level of the model conventions and their commentaries in respect of the application of the definition of royalties from ICS equipment leases to crypto-asset origination would be welcome.

Unlike tokens originated in return for services rendered to the originator, which it was concluded give rise to income that should be classified consistently with income from the sale of tokens by originators, tokens originated as incentive for services rendered to the network community were determined not to give rise to income for any originating entity (if indeed any entity could be said to be the originator in respect of such transactions). In both instances, however, the receipt of such tokens was considered to represent income for the recipient. Such income would be classified as income from employment (Article 15) or directors' fees (Article 16) within the context of such relationships. Classification would be assisted if the principles in the OECD Commentary applicable to restricted stock options were explicitly extended to incorporate restricted crypto-asset tokens.

Where services are rendered outside an employment relationship, such income could be classified as business profits (Article 7) in terms of OECD Model. However, where such services required specialised knowledge and skills such income might be classified as fees for technical services (Article 12A) in terms of the UN Model, where included in a treaty. A lack of clarity as to the boundaries of this definition has been noted in the literature as a weakness, and classification would be assisted if explicit guidance were provided as to which services might be considered 'technical' in this context.

In respect of both PoW and DPoS transaction validation, such income was determined to be the product of rendering services, which should be classified as business profits (Article 7). In this instance, it was concluded that within the UN Model it would not be appropriate to classify such income as fees for technical services since, notwithstanding the complexity of the underlying technology, such services are themselves routine and automated. However, it again cannot be conclusively concluded that classification as royalties (Article 12) might not be pursued in instances where the UN construction is employed and the alternative interpretation in respect of the lease of ICS equipment is favoured. In this respect too, clarity at the level of

the model conventions and their commentaries as to the applicability of this interpretation would aid classification, and a greater degree of consensus on the broader issue of what constitutes a royalty would be welcome, although beyond the scope of this study to pursue.

No income was identified as arising for any originator in respect of fortuitous issuances such as hard forks or airdrops. While it is possible that the recipient played some active role in securing their receipt of such tokens, it is considered both appropriate and pragmatic that income from such events be recognised only at the point that such tokens are subsequently disposed of, and that the nature of the income arising on realisation should be determined according to the manner in which such tokens were acquired and subsequently dealt with by the recipient. It is however noted that a stronger case may be made for the taxation of airdrops at receipt, especially where such airdrops are recurring and predictable. It is further noted that both the literature and current domestic practices are divided regarding the taxation of hard forks and airdrops, and that the articles of the model conventions themselves do not provide a definitive basis for the classification of such income.

Tokens retained, whether by the originating entity or withheld by the initial developers from tokens transferred to the originating entity, were considered not to represent income until such time as they were otherwise utilised.

Subsequent to origination, crypto-asset tokens transferred as a medium of exchange were considered to give rise to income from the disposal of intangible assets, or of negotiable instruments in the case of qualifying stablecoins, in a barter transaction. No universal classification of such income as either business profits (Article 7) or capital gains (Article 13) can be prescribed. Classification must be determined based on the facts of the specific event. Where such income arises from the disposal of tokens in payment of transaction fees, such income should be classified consistently with the underlying transaction processed.

While Article 7 would appear to be the more appropriate classification with respect to most of the transactions considered in this study, the distinction between business profits and other income (Article 21) may be less obvious in some instances. Guidance within the OECD Commentary as to what activities constitute a 'business' or 'enterprise' in this context, as well as the contexts in which income from crypto-asset transactions might constitute other income, would be welcome.

For the transferee of crypto-asset tokens, the classification of income arising from a barter transaction would be dependent on the nature of the goods or services provided in exchange rather than on the receipt of crypto-asset tokens in payment, with the only conclusive classification proposed being that transaction fees be treated in a manner consistent with the classification of income from block rewards.

The classification of income arising for the transferee from the disposal of tokens acquired in origination, whether through acquisition or in a barter transaction, or from subsequent use by the transferor, should be determined on the basis of the manner in which they are subsequently used and disposed of by the transferee in the initial transaction (now transferor). This cycle continues for as long as such tokens remain in circulation.

Various tokens within the sample afford benefits to the holder prior to disposal, with the most notable benefits being DPoS validation participation and network usage rights, and income arising from the delegation of those rights. Where tokens were acquired for such purposes, income from the subsequent disposal of such tokens should be classified as a capital gain (Article 13). However, the classification of such income cannot be based merely on the nature of the token disposed of, but in each instance must take into account the intention and actions of the taxpayer. Where DPoS participation rights are delegated, the preference of this study is that the income arising be treated as the sharing of block rewards in a partnership, whereas where network usage rights are delegated, the income arising be treated as from the rental of

property. In both cases such income would be classified as business profits (Article 7), although again the challenges arising from alternative interpretations of what constitutes royalties from ICS equipment use must be noted in respect of block rewards.

Crypto-asset tokens acquired in a variety of circumstances may be sold for fiat currency or, in the case of stablecoins, redeemed from the originator. Again, the nature of income arising on such disposals should be determined according to the intention and actions of the taxpayer. The decisive consideration should be the circumstances and purpose for which such tokens were acquired, unless the actions taken in the intervening period provide evidence that subsequent to acquisition the taxpayer has engaged in speculation or investment in respect of such tokens. The contractual redemption of stablecoins may give rise to foreign exchange gains or losses for the originator that should be classified as business profits (Article 7). The cost of repurchases of tokens by originators should be offset against business profits.

It is possible to engage in speculation or investment in all the crypto-asset tokens within the sample. Whether such income should be classified as business profits (Article 7) or capital gains (Article 13) should be determined according to the intention and actions of the taxpayer.

In all transaction categories subsequent to those of origination, crypto-asset tokens may give rise to taxes on capital (Article 22) where these are relevant. As was noted at the outset, however, this may have little practical application given that few countries have such taxes, and that many treaties omit Article 22 from their construction.

5.12.1.2. *Considerations for domestic legislation*

Within the analysis, a number of considerations were identified that are most appropriately addressed at the level of domestic legislation or guidance. The interests of inter-nation equity would be furthered if such considerations were addressed consistently.

The introduction of regulatory requirements requiring originators to state whether they accepted any obligation to redeem tokens that they originate would address the uncertainty of whether a token should be considered a negotiable debt instrument or an intangible asset. This distinction has far-reaching consequences for income classification in terms of the proposals of this study.

Since the model conventions do not concern themselves with the timing of taxation, it is submitted that domestic legislation or guidance should consider the deferral of income in respect of the sale of native tokens not yet issued on the proposed native blockchain. It is also suggested that the domestic approach to taxation of restricted share options awarded to employees be expanded to encompass the granting of restricted crypto-asset tokens, and that the income on the disposal in payment of such tokens by the employer be determined at the date that they become unrestricted. Jurisdictions should also address the timing of taxation of income arising from block rewards. The conclusion of this study is that such income, whether from PoW or DPoS validation, would most appropriately be considered as arising from the rendering of a service. If this were accepted in the domestic context, this would imply taxation occurring at the time such services were rendered.

With respect to fortuitous issuances and receipts, while considerations of classification and timing are closely interlinked, to the extent that they relate to timing they should be addressed at the domestic level. While noting differing current positions in this respect and the merits of alternative arguments, this study favours that tax be levied only at the point of any subsequent disposal.

Whether income arising from the activities analysed should be excluded from the direct tax consequences of the proposed classifications on the basis of their size or frequency is a matter for domestic legislation to consider, as indeed some jurisdictions have already done. Lastly,

whether involuntary disposal of crypto-asset tokens or the loss of access thereto represents a disposal or alienation for direct tax purposes should be considered by individual jurisdictions.

5.12.1.3. *Diagrammatic representation of proposed outcomes*

The proposed determination of direct tax consequences and classification in terms of the model conventions is represented diagrammatically in Figure 2: Diagrammatic representation of direct tax consequences and income classification.[511]

[511] For simplicity, the possibility of taxes on capital (Article 22) has been omitted. However, where relevant such taxes may arise in respect of 5.7 to 5.10.

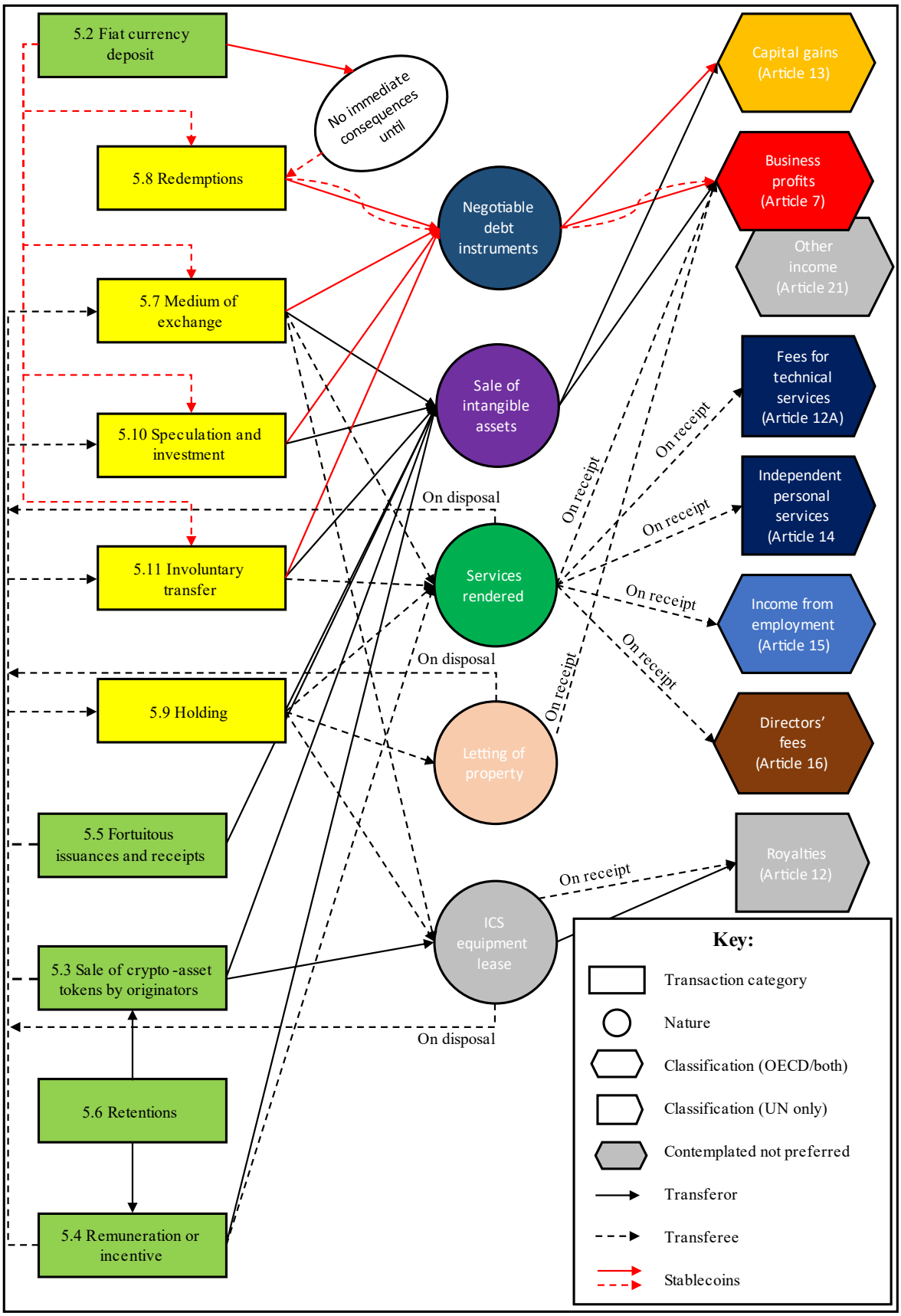

Figure 2: Diagrammatic representation of direct tax consequences and income classification

5.13. Testing of proposed outcomes against exemplar

In order to test the efficacy of the identification and classification outcomes proposed in the preceding analysis as a foundation for a globally coordinated approach to the taxation of crypto-asset transactions, an exemplar crypto-asset was selected from outside the original sample and analysed. The crypto-asset token selected was Polkadot's DOT token, which enjoys the largest market capitalisation at 31 March 2021 of those crypto-assets not included in the original sample.[512]

In order to perform this exercise, the Polkadot white paper was obtained. This white paper was then analysed in NVivo, using the nodes created during the analysis of the original sample of this study. An overview of the Polkadot white paper analysis is presented in B.26 of Appendix B, while the NVivo coding outputs are included in Appendix D.

It was found that all identified possible taxable events could be coded to the existing NVivo nodes, which in turn correspond to the 32 transactions identified in Chapter 4 and the ten transaction categories developed from those 32 transactions in Chapter 5.

The analysis suggests that DOT tokens were originated by the sale of crypto-asset tokens by originators.[513] In terms of the classifications proposed by this study, this would give rise to business profits for the originator.

DOT tokens serve to allow holders to participate in transaction validation, which is the second means by which DOT tokens are originated.[514, 515] Such income would be the result of services rendered by the validator and would represent business profits. Participation rights may also

[512] CoinMarketCap, "CoinMarketCap," 2021, https://coinmarketcap.com/.
[513] Gavin Wood, "Polkadot: Vision for a Heterogeneous Multi-Chain Framework," 2017, https://github.com/ethereum/wiki/wiki/Chain-Fibers-Redux.
[514] Wood.
[515] Validation is in fact achieved by two parties performing complementary functions in the process – collators and validators. While validators are required to stake tokens to qualify, collators are not required to do so. Both are rewarded for their roles. For simplicity, both parties will be referred to as validators here. For more detail, see in B.26 of Appendix B.

be delegated to another token holder in return for a share of the resultant rewards. Such action would approximate a partnership and result in a share in the business profits.

DOT tokens function as a medium of exchange to pay for transaction fees.[516] Payment of transaction fees would result in a disposal for the transferor, the classification of which would require assessment on a case-by-case basis according to the nature of the underlying transaction processed. It would also give rise to further business profits for the transferee transaction validator.

Penalties may also be charged against staked token balances for malicious or negligent actions. Such penalties result in part in the extinction of tokens, while also rewarding those actors who identify the action.[517] Since the penalty is charged against staked tokens it would result in a capital loss for the transferor, and to business profits for the transferee, whose actions are comparable to those identified as participating in 'incentivised hacking' in Chapter 4 and represent a service to the blockchain community. Alternatively, such income might be considered fees for technical services where Article 12A is included, depending on the degree to which such income arises from human intervention rather than automated actions.

The success of the Polkadot ICO and its rise in market capitalisation in the period since the sample for this study was selected indicates that DOT tokens are an attractive basis for speculation or investment, the income arising from which would represent either business profits or capital gains.

The outcomes of the exemplar analysis can be presented diagrammatically as follows:

[516] Wood, "Polkadot: Vision for a Heterogeneous Multi-Chain Framework."
[517] Wood.

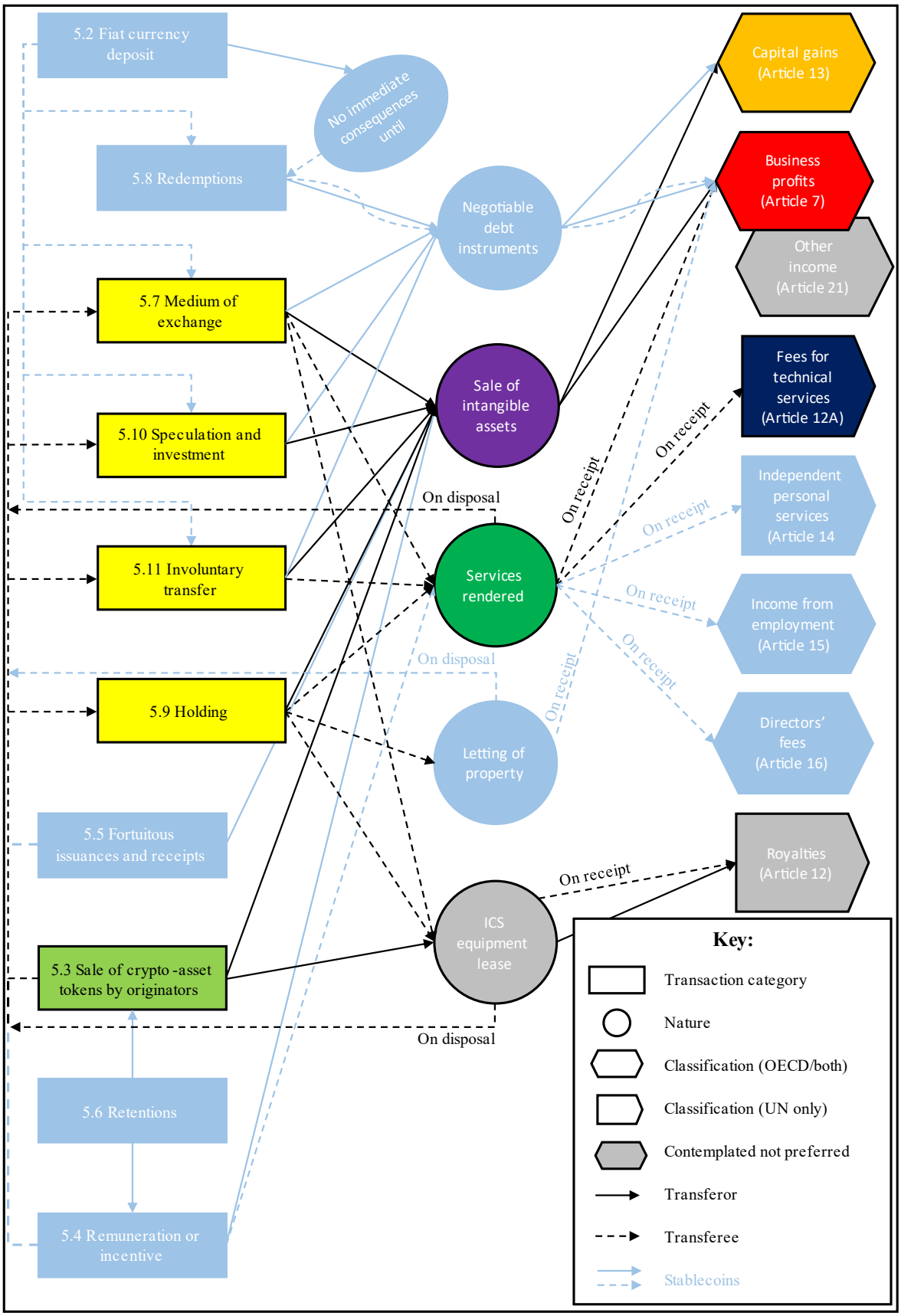

Figure 3: Diagrammatic representation of exemplar analysis

That all possible taxable events identified within the exemplar Polkadot white paper can be readily identified and classified within the existing proposals of this study without raising further considerations not already addressed by the study suggest that the proposals are appropriate and robust and that the study may be effective in functioning as a foundation for a globally coordinated approach to the taxation of crypto-asset transactions. However, it cannot necessarily be concluded that such proposals are complete in addressing all current and future crypto-asset tokens. Blockchain technology and the universe of crypto-asset tokens is a new and rapidly expanding field, and further developments may necessitate that the proposals continue to be revisited and potentially expanded in response.[518]

5.14. Observations on indirect tax consequences of crypto-asset transactions

5.14.1. Introduction

As already noted in Chapter 3, there appears to be greater consensus between jurisdictions as to the indirect tax consequences of crypto-asset transactions than to the direct tax consequences, although the scope of application and the robustness of the interpretations on which conclusions are based may be subject to challenge. Consensus to date has been limited to the virtual currency use case. Crypto-asset exchange services as well as exchanges between fiat currency and crypto-assets are in most cases exempt. This follows the adoption of such treatment by EU member states following the decision in *Skatteverket v David Hedqvist* and aims to create equity between crypto-asset and fiat currency payments. The interpretation of this exemption may reasonably be extended to payments in crypto-assets, although the ECJ ruling itself did not explicitly address this issue.[519] Most non-EU countries appear either to

[518] This caveat is consistent with the exclusion of certain classifications suggested by Kjærsgaard from the proposed classifications of this study on the basis that some of the presupposed characteristics of such token categories were not observed to be present within the sample analysed. See Kjærsgaard, "Blockchain Technology and the Allocation of Taxing Rights to Payments Related to Initial Coin Offerings."
[519] Kollmann, "The VAT Treatment of Cryptocurrencies."

have adopted a similar position or to be in the process of doing so, although some outliers continue to exist.

Individual jurisdictions currently favour the view that transaction validation falls outside the scope of indirect tax because of the lack of a legal relationship between parties and between the services rendered and consideration received, although this may not accurately represent the transaction validation process. An alternative view might be that such activities meet these requirements, but should be granted exemption from indirect tax on the basis of achieving fiscal neutrality with the processing of fiat currency transactions.[520] In addition, significant questions remain as to whether the exemption or exclusions determined to date do or should encompass other crypto-asset transactions not addressed in the ECJ ruling or by individual jurisdictions, or extend to all types of crypto-asset, especially where such transactions and crypto-assets are less comparable to fiat currency equivalents.

While direct tax forms the main focus of this study, brief consideration is given here to the possible indirect tax consequences, supported by the analysis of the preceding chapters. In particular, a number of obstacles to further resolving indirect tax consequences beyond those evident to date will be highlighted.

5.14.2. Origination by fiat currency deposit

In the preceding analysis it was proposed that the origination of stablecoins represents the creation of a negotiable debt instrument. Such a position creates a strong argument for the exemption granted to crypto-assets to date to be extended to stablecoin origination, spending and redemption.

[520] Kollmann.

5.14.3. Sale of crypto-asset tokens by originators

This transaction clearly satisfies the criteria of a legal relationship between originator and acquirer, and between the crypto-asset supplied and the consideration charged. Such transactions should therefore fall within the ambit of indirect tax. However, it is difficult to envisage a universally satisfactory approach to such transactions. Not all crypto-assets function as a medium of exchange. Exempting all sales of crypto-asset tokens by originators will undermine horizontal equity in some future use cases, while levying indirect tax universally will reintroduce the double-taxation conundrum where tokens are used in future as a medium of exchange.

Furthermore, the analysis performed in this study indicates that not only may different crypto-assets represent different future use cases, but a single crypto-asset may represent multiple use cases. For example, of the eight tokens identified as granting holders the right to participate in DPoS validation, six also function as a medium of exchange. Of the two that grant holders network usage rights, one also functions as a medium of exchange. This illustrates that the identity of the crypto-asset alone cannot necessarily be used as the decisive factor in determining whether the token will be used as a medium of exchange in future transactions. While future use as a medium of exchange would suggest exemption from indirect tax, other use cases have less equivalence to payments and financial services and should therefore in theory be subject to indirect tax. While in the case of single-use-case crypto-assets it may be possible to prescribe an appropriate indirect tax outcome, with multiple-use case crypto-assets the originator will have little insight into the intended future use of the acquirer, making attempts to determine an appropriate indirect tax outcome problematic.

5.14.4. Origination as remuneration or incentive

As already noted, the majority view appears to be that transaction validation falls outside the scope of indirect tax. An alternative view is that it meets the requirements of a taxable

transaction, but should be exempted on the basis of equivalence with fiat currency payment processing. The former view may withstand scrutiny with respect to block rewards, but is less likely to do so with respect to transaction fees (as will be demonstrated in due course). If the latter view is taken, the analysis conducted here demonstrates that not all transactions validated within the sample analysed are those of payments, and therefore may not qualify for any exemption extended on that basis. Furthermore, a single blockchain may support multiple transaction types, and a blockchain may even support other application-level blockchains (such as those built upon Ethereum). Either of these factors may mean that the transaction validator may not know the nature of the transaction that they are validating, and therefore whether such transaction fees should be exempt from indirect tax or not.

Origination of tokens in payment to developers or employees is a less complex situation. If it is accepted that crypto-asset payments should be exempt from indirect tax, then the payment of remuneration or other compensation is a specific payment transaction and should benefit from this exemption.

5.14.5. Fortuitous issuances and receipts

Since both hard forks and airdrops are fortuitous insofar as the recipient pays no consideration in return, such transactions should not be subject to indirect tax.

5.14.6. Retentions

As noted with respect to direct tax, since no transaction occurs when crypto-asset tokens are retained by an originator, no indirect tax consequences should result.

5.14.7. Medium of exchange

As noted in the analysis of developments to date, there is a reasonable assumption that the exemptions already granted should be extended to crypto-asset payments, and this in fact seems to be the approach of the majority of jurisdictions.

The one specific use case of crypto-assets as a medium of exchange is in the payment of transaction fees. As with block rewards, the majority view appears to be that transaction fees fall outside the scope of indirect tax because they are voluntary in nature and therefore there is a lack of connection between the fees and transaction validation services, although this view may be susceptible to challenge.[521] In support of this challenge, it is evident that this view is based on an understanding of transaction fees in the context of the Bitcoin network. The analysis conducted in this study suggests that transaction fees on other networks are not always discretionary. In some cases, they are mandatory. In some they are set by the network according to current usage, while in others they are set by individual transaction validators. Therefore, it seems unlikely that this can hold as a universal approach to transaction fees. If it does not, then the difficulties already highlighted with respect to block rewards – that not all transactions are equivalent to fiat currency payment processing and that the nature of transactions is not necessarily visible to the transaction validator – are equally problematic with respect to transaction fees.

5.14.8. Redemptions

Stablecoins were the only crypto-assets identified within the sample that embody a right of redemption. Due to their nature as negotiable debt instruments, any redemption should be exempt from indirect tax.

5.14.9. Holding

If tokens are acquired to pursue DPoS candidacy, the indirect tax consequences of the disposal of those tokens should be consistent with the indirect tax consequences of those activities. Likewise, the indirect tax consequence of any income from DPoS candidacy delegation should be consistent with those of DPoS validation activities. However, as noted with respect to both

[521] Kollmann.

block rewards and transaction fees, determining those indirect tax consequences is potentially problematic.

If tokens are acquired to secure network access, it is at least possible if not probable that such access would be in pursuit of activities subject to indirect tax. If this were indeed the case, any income from the delegation of such access rights, as well as from the eventual disposal of such tokens, should give rise to indirect tax consequences.

5.14.10. Speculation and investment

As noted in the preceding analysis, only stablecoins should qualify for classification as a financial instrument and therefore be exempt from indirect tax in all circumstances. Whether speculation and investment in other crypto-asset tokens should be exempt from indirect tax should in theory depend on the nature of those tokens. However, as already noted, ascribing a single nature to all tokens, or even a single nature to a particular token, may be highly problematic.

5.14.11. Involuntary transfer

Finally, it is submitted that since involuntary transfers do not result in any consideration received by the transferor, such transfers cannot give rise to indirect tax regardless of the nature of the token or the use case for which it was acquired.

5.14.12. Conclusion – indirect tax consequences of identified transaction categories

The above brief analysis illustrates the challenges that will need to be overcome in order to further develop consensus around indirect tax consequences of crypto-assets beyond the limited context and transactions that have been addressed to date. Extending the existing exemptions appears reasonable in creating fiscal neutrality where crypto-assets function as a medium of exchange and to supporting activities, but may undermine horizontal equity where other use cases exist. This creates significant difficulties in determining appropriate indirect tax

consequences for sales of crypto-asset tokens by originators, block rewards, transaction fees and income from the eventual disposal of tokens conferring benefits of holding.

Finally, as in the case of direct tax, anonymity poses challenges to the enforcement of indirect tax compliance. This may be exacerbated in the case of indirect tax by the need for the exchange of information and documentation between transacting parties to facilitate indirect tax compliance.

6. TAX OUTCOMES – COMPARISON TO OECD 2020 REPORT ON THE TAXATION OF VIRTUAL CURRENCIES

6.1. Introduction

On 12 October 2020, the OECD released its report titled *Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues*. The report is a significant step towards standardising tax treatment for crypto-asset transactions.[522] The report presents the findings of a questionnaire sent to tax authorities in 2018 and again in 2020, to which 53 countries responded. The questionnaire focuses on the indirect, direct and property tax consequences of crypto-assets in each jurisdiction. The OECD reports that 30 countries have issued guidance to taxpayers in respect of personal income tax, 27 in respect of company income tax, 24 in respect of capital gains tax, 26 in respect of VAT or GST, and five in respect of other taxes.[523]

The OECD report provides a valuable update to the country-by-country analysis presented in Chapter 3. The report however differs from that analysis as its primary source of data is from direct engagement with tax jurisdictions rather than an analysis of guidance documents, although it does include some consideration thereof. A comparison of the countries considered in Chapter 3 and by the OECD report may be presented as follows:

[522] Mehboob, "OECD Report Moves Crypto-Assets Closer to a Uniform Tax Framework."
[523] OECD, "Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues."

Considered both in Chapter 3 and by OECD report	Additional countries considered only in Chapter 3	Additional countries considered only in OECD report
Argentina	Iceland	Andorra
Australia	Romania	Belgium
Austria	Russia	Brazil
Bulgaria		Cote d'Ivoire
Canada		Colombia
Chile		Costa Rica
Denmark		Croatia
Finland		Czech Republic
France		Estonia
Germany		Georgia
Israel		Greece
Italy		Grenada
Japan		Hong Kong (China)
Malta		India
Norway		Indonesia
Poland		Ireland
Portugal		Korea
Singapore		Latvia
Slovakia/Slovak Republic		Lithuania
South Africa		Luxembourg
Spain		Malaysia
Sweden		Mexico
Switzerland		The Netherlands
United Kingdom		New Zealand
United States		Peru
		Saint Lucia
		Slovenia
		Turkey

The report focuses on the tax consequences of virtual currencies, which it describes as a subset of crypto-assets specifically used to facilitate payments. The other two main subsets identified are security and utility tokens. It acknowledges however that viewing each category as distinct and mutually exclusive may be problematic, and that some tokens may defy classification in any of the three categories or may exhibit characteristics of more than one category. Furthermore, differences in definition and application of such categorisations could lead to different tax consequences in different jurisdictions.[524]

[524] OECD.

While the report reflects on considerations such as whether virtual currency could be classified as fiat currency, its primary objective is to report on the degree to which tax consequences have been addressed and the extent of consensus or diversity that exists across respondent jurisdictions with respect to those consequences, rather than to recommend the adoption of particular tax positions. The report concludes by identifying key challenges facing jurisdictions and further actions that jurisdictions may wish to consider.[525]

According to the report, there is broad consensus that virtual currency is not a form of fiat currency. Nine respondent countries classify virtual currencies as intangible assets other than goodwill, and eight as financial instruments or financial assets. Japan classifies virtual currency as a legal payment method, while the US has not specified a particular classification. Four countries – Belgium, Cote d'Ivoire, Italy, and Poland – reported that they classify virtual currency as currency. This classification appears however to be as being comparable to currency (or foreign currency) rather than conferring fiat currency status on virtual currencies.[526]

Having noted instances in which guidance from jurisdictions is lacking, the report in concluding suggests that jurisdictions publish comprehensive guidance that includes the tax consequences of:

- "Creation of virtual currencies (via mining/forging[527], ITOs[528] and airdrops) and related expenses;
- Exchange with other virtual currencies, fiat currency, and for goods and services including valuation;
- Disposal via gift or inheritance;

[525] OECD.
[526] OECD.
[527] The term used by the report to refer to DPoS transaction validation
[528] Initial Token Offering

- Loss or theft;
- Emerging developments (hard forks, stablecoins, CBDCs, interest-bearing tokens);
- Related services (e.g. exchange services and wallets)".[529]

6.2. Direct tax - comparison of findings of this study to the OECD report

The findings of the OECD report in regard to direct tax are compared to the recommendations of Chapter 5 of this study in Table 9: Comparison of findings to the OECD report. The outcomes of the comparison have been identified as follows:

	Not considered by the OECD report
	Identified as not addressed or addressed by few jurisdictions, and/or future consideration recommended
	Consistent with recommendations of this study in some respects or some jurisdictions
	Consistent with recommendations of this study in most respects or most jurisdictions

[529] OECD, "Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues." At 53-54.

Table 9: Comparison of findings to the OECD report

	Conclusions of this study	Findings of OECD
Fiat currency deposits	Stablecoins in the sample should be treated as a negotiable debt instrument if they create an enforceable right of redemption for the holder. The origination of stablecoins creates no direct tax consequences for either the originator or the transferee where a right of redemption is created.	The OECD report notes that the emergence of stablecoins is a significant development in crypto-assets. There is little guidance available or evidence of consensus on the direct tax consequences of stablecoin transactions. The limited guidance available suggests that such transactions might give rise to the same direct tax consequences as for other crypto-assets. The report suggests that jurisdictions may need to consider distinguishing this subcategory in future, and that it may be appropriate to classify such transactions as pertaining to foreign currency or to securities.[530]
Sales of crypto-asset tokens by originators	The origination by sale (whether by ICO or otherwise) of all tokens within the sample other than qualifying stablecoins gives rise to a taxable event for the originator, being the sale of an intangible asset. Such income should be classified as Business Profits (Article 7 of the OECD Model Tax Convention). However, it may be possible that some jurisdictions applying the alternative interpretation to the Article 12 of the UN Convention might pursue classification as Royalties arising from an ICS equipment lease. Income arising should be recognised at the date of sale unless the transaction represents a prepayment in respect of a crypto-asset native to a blockchain that has not yet been launched. In such cases, recognition of income should be deferred until the date of launch and the conversion of the representative ERC-20 contract or other claim to the native token. Consideration of the deferral of income in respect of the sale of tokens representing future usage rights was considered but rejected. Since the timing of recognition of Business Profits is not prescribed by the model conventions, the proposed deferral of income may require amendment of domestic legislation.	Current treatment amongst individual jurisdictions is not considered by the report. ICOs are however included within the scope of the OECD's suggestions for comprehensive guidance.[531]

[530] OECD.
[531] OECD.

Remuneration or incentive	**Developer allocation; Remuneration and other incentives**	Such transactions represent a barter transaction. Income from the sale of intangible assets arises for the originator. Such income should be classified as Business Profits (Article 7), consistent with origination in return for fiat currency payment. Income arises for the transferee from the rendering of services. Such income should be classified as Income from Employment (Article 15) or Directors' Fees (Article 16) in the context of such relationships. In other contexts, such income should be classified as either Business Profits (Article 7) or Fees for Technical Services (Article 12A of the UN Convention). Incentives subject to restrictions should be taxed at their market value at the date of vesting. Since the OECD Commentary addresses vesting conditions only in the context of stock options and it is likely that this is equally the case for domestic legislation, this may require amendment either of the Commentary or of domestic legislation. Although not arising in the course of the sample, the same principles of classification would apply to transferees in respect of remuneration in crypto-asset tokens arising outside of the context of origination.	All respondent countries addressing this event treat the income of the transferee consistently with remuneration in fiat currency or as a fringe benefit.[532] Payments or allocations subject to restrictions are not considered in the report. Direct tax consequences for the transferor in the context of origination are not considered in the report.
	Third-party developers	Income arises for an originator only where there is a *quid pro quo* relationship between originator and transferee. In the absence of an identifiable originator or such a relationship, no direct tax consequences arise for any transferor. Income from the rendering of services arises for the transferee, even in instances where the award is determined by network consensus rather than by an identifiable originator. Such income should be classified as Business Profits (Article 7).	Not considered

[532] OECD.

	Block rewards	Block rewards do not give rise to direct tax consequences for a transferor, since they are a product of the blockchain network rather than an identifiable originator. Block rewards are best classified as the rendering of a service by the transaction validator, and should be recognised as Business Profits (Article 7) when granted. This classification is applicable to both PoW and DPoS transaction validation. Again, it may be possible that some jurisdictions applying the alternative interpretation to Article 12 of the UN Convention might pursue classification as Royalties. Income on the subsequent disposal of block reward tokens by the transaction validator should be determined consistently with income arising from the transaction categories pertaining to use and disposal below. Classification of DPoS block rewards as income from letting of property was considered but rejected. Income from transaction fees was considered separately as a Voluntary Transfer (below). Any exclusion for occasional or low-value income from transaction validation should be addressed by individual jurisdictions.	Some jurisdictions treat the first taxable event arising from block rewards as occurring on receipt, and others only on disposal. In a third group of jurisdictions the first taxable event depends on whether transaction validation is undertaken as a business. Where the first taxable event occurs on disposal, that event is most likely classified as a capital gain. Income on receipt is likely treated as revenue in nature. The OECD report discusses how countries' treatment often appears to be designed to address PoW validation, and may need to be further developed to address DPoS validation, which the report identifies as a significant emerging development. Australia and Finland are the only two countries identified as directly addressing DPoS block rewards. In both cases the approach is distinguishable from that applied to PoW block rewards. The report notes that DPoS income may be distinguishable from PoW income as a return on assets because of its dependence on existing token holdings, although the active participation required of the validator is also a relevant consideration.[533] The direct tax consequences of block rewards for any identifiable originator are not considered.

[533] OECD.

Fortuitous issuances and receipts		Neither airdrops nor hard forks give rise to income for any transferor, since the originator receives nothing in return in an airdrop, and no identifiable originator exists in a hard fork. For the transferee, both hard fork and airdrop are best first taxed on disposal. This addresses practical considerations such as determination of value and control over the tokens received. The nature of such income may be established based on the actions of the holder in the intervening period.	The report suggests that airdrops may involve denominations of little total value. It also notes that guidance in respect of hard forks is rare. Among countries that consider such events, the first taxable event may occur either at receipt or on disposal, or it may depend on whether the taxpayer uses virtual currencies in the context of a business. When the first taxable event arises on receipt, this is likely to give rise to revenue income, whereas where the first taxable event occurs on disposal this is more likely to be considered a capital gain. Price volatility and whether the taxpayer has control over those tokens received presents a practical challenge to levying tax at receipt. Hard forks are noted as one of the common challenges for policymakers and included within the scope of the OECD's suggestions for comprehensive guidance.[534]
Retained		No taxable event until first transfer of ownership.	Not considered
Voluntary transfer	**Medium of exchange - stablecoins**	Payment in stablecoins gives rise to income from a negotiable debt instrument for the transferor where the fiat currency against which the stablecoin is benchmarked differs from the local currency of the transferor. Whether such income is capital or revenue in nature will need to be determined in each instance, since it is possible to posit reasons other than trading or the pursuit of profit in which such tokens may be acquired. The model conventions do not prescribe how classification between Business Profits (Article 7) and Capital Gains (Article 13) should be determined, since both articles afford the same taxing rights, and this is therefore a matter to be determined according to domestic legislation. While classification of revenue income as Business Profits (Article 7) is preferred over Other Income (Article 21), it may be possible that classification as Other Income is favoured by some jurisdictions in some contexts. Payment may give rise to direct consequences for the transferee in terms of a barter transaction in which payment in crypto-asset tokens is accepted.	See *Fiat currency deposits* above.

[534] OECD.

	Medium of exchange – other crypto-assets	Voluntary transfer of crypto-assets as a medium of exchange represents a barter transaction in which the transferor disposes of an intangible asset. As with payment in stablecoins, income arising for the transferor may potentially be revenue or capital in nature, and should be classified in accordance with the application of domestic legislation. Again, while classification of revenue income as Business Profits (Article 7) is preferred, classification as Other Income (Article 21) may be favoured by some jurisdictions in some contexts. Whether such tokens are transferred or extinguished should not affect the direct tax consequences for the transferor. Tokens extinguished should be considered as disposed of at their market value. Payment in crypto-asset tokens may give rise to direct consequences for the transferee in terms of a barter transaction. The classification of the income of the transferee is not determined by the acceptance of payment in crypto-asset tokens, except where the transaction is in respect of transaction validation (that is, transaction fees). In such instances the income arising should be recognised as being in respect of services rendered and classified consistently with the classification of *Block rewards* (above).	Voluntary transfer is considered in exchange for fiat currency, goods and services, and other virtual currencies. Five countries do not consider any transfers of virtual currencies to give rise to a taxable event for the transferor, although in some jurisdictions this excludes speculative transactions. This represents a close alignment of virtual currency and fiat currency transactions. Four countries do not consider transfers in exchange for other virtual currencies tokens a taxable event. This appears to be either for pragmatic reasons or to support crypto-asset development within those jurisdictions. Most respondent countries consider all three transfers a taxable event for the transferor. Within this group, a not-insignificant minority of countries distinguish between business and occasional use and allow for possible classification as a capital gain, while the majority consider all such events revenue in nature.[535]
	Redemptions	Only stablecoins can be redeemed for fiat currency. Redemptions may give rise to direct tax consequences from the redemption of a negotiable debt instrument for both transferor and transferee (that is, the originator) where the fiat currency against which the stablecoin is priced differs from the party's local currency. The income of the transferor may be either revenue or capital in nature. The income of the transferee should be classified as Business Profits (Article 7).	Not considered

[535] OECD.

Holding	The exercise of access or usage rights by the holder does not give rise to income for the holder where such exercise does not require the transfer of tokens. Income arising from DPoS transaction validation block rewards should be treated consistently with PoW block rewards. While existing token ownership is a *causa sine qua non*, the act of transaction validation is the *causa causans*. Income arising from the delegation of DPoS participation rights should be regarded as arising from a partnership rendering services. Income from delegation of network usage rights should be treated as income from the rental of property, since the holder does not actively participate in the income-producing activity. Both should be classified as Business Profits (Article 7). Where originally acquired to obtain usage rights, the subsequent disposal of such tokens gives rise to Capital Gains (Article 13). However, since such tokens within the sample frequently facilitate multiple use cases, such classification cannot be determined based on the identity of the token alone.	The direct tax consequences of the exercise or delegation of usage rights is not considered by the OECD report. (the indirect tax consequences of the exercise of usage rights is however considered.) The increased use of DPoS transaction validation is noted as a significant emerging development that jurisdictions will need to address in future. The direct tax consequences arising from the delegation of earning opportunities associated with qualifying token ownership, and the subsequent disposal of such tokens, have not been considered. Providing guidance on the tax consequences of crypto-assets other than virtual currencies is also identified as a significant consideration for policymakers.[536]
Speculation and investment	Speculation and investment may give rise to income from the disposal of negotiable debt instruments in respect of stablecoins, or in respect of the disposal of intangible assets in all other instances. Such income may be either capital or revenue in nature, determined in accordance with domestic legislation and the interpretation thereof.	The report does not present speculation and investment as a separate transaction category, but considers such transactions among those discussed in *Voluntary transfer* (above). As noted above, some countries do not distinguish between tax consequences according to the identity or intention of the taxpayer, while others allow for the possibility of both revenue income and capital gains.[537]
Involuntary transfer — **Penalty**	Penalties arising within the sample should be considered a disposal of an intangible asset for consideration of nil and losses set off against either Business Profits (Article 7) or Capital Gains (Article 13).	Not considered

[536] OECD.
[537] OECD.

	Loss	The model conventions do not prescribe or provide guidance for determining whether a disposal occurs. Whether events such as the loss of cryptographic keys constitute a disposal must be determined according to domestic legislation, which may require further consideration. Where a disposal occurs, that disposal should be treated as occurring at nil value and set off against either Business Profits (Article 7) or Capital Gains (Article 13).	Few countries consider the direct tax consequences of such events, and there is a lack of consensus among those that do address this. Positions on whether a disposal has occurred and whether a loss can be claimed differ between the few jurisdictions that address this issue. Loss and theft are included within the scope of the OECD's suggestions for comprehensive guidance.[538]

[538] OECD.

6.3. Indirect tax – comparison of observations of this study to OECD findings

The position outlined in Chapter 3 of this study is largely confirmed by the recent OECD report. The report notes that VAT treatment is more consistent within the EU than among other countries. The majority approach is that the exchange of virtual currencies (that is, crypto-assets functioning as a medium of exchange) for either other virtual currencies, fiat currency or goods and services is not subject to VAT, although the supply of those goods and services would be subject to VAT as normal. Transaction validation is also not subject to VAT, with exceptions noted in France and Italy. Norway levies VAT on the supply of processing power by one taxpayer to another taxpayer engaged in mining.[539]

The OECD report identifies indirect tax consequences as one of the future considerations in addressing both stablecoins and DPoS transaction validation. While it hypothesises that current exclusions or exemptions from indirect tax would be extended to stablecoin transactions, it is less convinced that the rationale applied to the exclusion of PoW transaction validation would or should necessarily be extended to DPoS transaction validation.[540]

The OECD report observes that in excluding crypto-asset payments from indirect tax, such transactions are not treated as barter transactions. It lends its approval to this approach as creating horizontal equity.[541] However, notwithstanding the move towards consensus in this approach, it has been argued that the predominant treatment for indirect tax as equivalent to legal tender is at odds with approaches to classification for direct tax purposes,[542] as evidenced by the recommendations of Chapter 5.

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[539] OECD.
[540] OECD.
[541] OECD.
[542] Julie Cassidy et al., "A Toss of a (Bit)Coin: The Uncertain Nature of the Legal Status of Cryptocurrencies," *EJournal of Tax Research* 17, no. 2 (2020): 168–92, https://heinonline.org/HOL/Page?handle=hein.journals/ejotaxrs17&id=175&div=13&collection=journals.

The report suggests that the indirect tax consequences of crypto-assets functioning other than as a medium of exchange continue to be less comprehensively addressed to date, and that the levying of VAT on crypto-asset transactions in any context appears to occur only in very isolated instances. Whether this is evidence that the comprehensive resolution of indirect tax consequences remains at the early stages, or that obstacles such as those identified in this study stand in the way of further progress, remains to be seen. The current approach has already been acknowledged as encompassing considerations of pragmatism as well as technical correctness.[543] In addressing the remaining unresolved issues it may prove to be that crypto-asset transactions are singularly ill-suited to the levying of indirect tax.

6.4. Conclusion of comparison to OECD 2020 report

From the OECD's report, a number of pervasive observations may be made as to the current state of development in respect of the determination of tax consequences of crypto-asset transactions at jurisdictional level. These observations in comparison to the outcomes of this study further highlight the potential benefits of a globally coordinated approach.

The OECD report demonstrates the lack of consistency in the identity ascribed to crypto-asset tokens by individual jurisdictions. By contrast, this study concludes that qualifying stablecoins should be recognised as negotiable debt instruments, while all other crypto-assets within the sample analysed should be treated as intangible assets. This study concurs with the OECD report that crypto-asset tokens cannot be granted fiat currency status unless issued by a central bank.

The OECD report is primarily focused on virtual currencies, although it addresses other subcategories of crypto-asset to a limited extent, which is in itself evidence of the current state of development. The report notes that jurisdictional guidance may focus on a particular

[543] OECD, "Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues."

conceptualisation of crypto-assets (by implication, that of Bitcoin) and fail to address a full spectrum of possible taxable events. Jurisdictional guidance appears in particular to not yet fully consider the direct tax consequences of crypto-asset token origination, focusing on recipients and subsequent use cases, or of DPoS transaction validation, focusing on PoW validation. This study therefore supports the development of legislation and guidance covering a broader range of crypto-assets, and in particular those representing the largest market capitalisations and by implication the greatest potential direct tax consequences.

The OECD report highlights the significant discrepancies that exist between jurisdictions in terms of both the timing and nature of taxable events recognised. In some jurisdictions a first taxable event may occur systematically either on receipt or on disposal, and may be automatically categorised as either revenue or capital in nature, while in other jurisdictions both timing and nature of the taxable event may depend on the identity of the taxpayer or the nature of the particular transaction. Whether a transaction is considered a taxable event also varies considerably between jurisdictions. This is evident in respect of block rewards, fortuitous issuances and receipts, voluntary transfer in a number of contexts, and speculation and investment. This study proposes bases for achieving consistency in these respects. While providing considerations for determining whether income may be capital or revenue in nature, it does however in some instances note that this may depend on the manner in which this is determined in terms of domestic legislation.

The comparison identifies ten instances where transaction categories or subcategories are either not considered or considered by a limited number of countries. The present study therefore has the potential to support individual jurisdictions in their development of responses to a more comprehensive range of crypto-asset transactions, as indeed the OECD report recommends. This

study advances the discussion to focus not only on identification but also on the classification of such taxable events within the articles of the model conventions.

Finally, this study addresses the direct tax consequences of a number of transactions or contexts that the OECD report highlights as emerging developments worthy of consideration, such as other types of crypto-assets, hard forks, stablecoins, and DPoS transaction validation. This study also supports the establishment of horizontal equity between transactions involving crypto-assets and other comparable transactions, and communication of the rationale behind the direct tax outcomes determined, as suggested by the OECD report.

7. JURISDICTIONAL TAXING RIGHTS – CURRENT APPLICATION AND FUTURE CONSIDERATIONS

7.1. Current application

7.1.1. Introduction

The analysis of possible taxable events in Chapter 5 culminated with the proposed allocation of those transactions to six classifications within the model conventions – business profits (Article 7), capital gains (Article 13), independent personal services (Article 14 of the UN Model), income from employment (Article 15) and directors' fees (Article 16), as well as fees for technical services (Article 12A of the UN Model), as illustrated in Figure 2. Two further classifications were identified as possible but not preferred by this study – royalties (Article 12) where the UN Model construction is applied, and other income (Article 21). In addition, where included in a treaty and such taxes are levied by contracting states, crypto-assets might be subject to taxes on capital (Article 22).

This chapter examines the jurisdictional taxing rights over such transactions in the context of cross-border transactions in terms of the application of the current texts of the articles of the model tax conventions, and the extent to which the possibilities of base erosion may exist. It then considers the particular characteristics of those transactions that may need to be taken into account as new approaches to allocating taxing rights are pursued in response to the emergence of the digitalised economy.

Since the allocation of taxing rights within many articles of the model conventions, especially Article 7, is affected by the existence of a PE, the application of Article 5 is first considered.

7.1.2. Permanent establishment (Article 5)

Article 5 defines a PE as "a fixed place of business through which the business of an enterprise is wholly or partly carried on".[544] While the OECD Model contemplates the possible inclusion of a service PE by contracting states in its commentary, the UN Model includes this within its construction of Article 5. In both instances an enterprise would be considered to have a PE in the other state if it conducted business through an individual who is present there for at least 183 days in any twelve-month period. The OECD Commentary construction further requires that these activities either generate at least half of the income of that enterprise for the period from the other state or be in respect of the same or similar project. It also excludes services related to activities of a preparatory or auxiliary nature, which the UN Model does not exclude.[545]

The consideration of the presence of a PE is relevant in the context of crypto-assets in two particular respects. The first consideration is whether the recipient of income might create a PE in the jurisdiction of the counterparty. In this respect it is submitted that the distinctive crypto-asset transactions are such that a PE is not a prerequisite to engaging in such transactions. This lies at the heart of concerns over the erosive effect of the digitalised economy, as is evident from the consideration given to the possible expansion of the PE concept to encompass constructs such as significant economic presence, as well as the inclusion of Article 12A in the UN Model Double Tax Convention.[546]

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[544] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)." At M-19.

[545] OECD; United Nations, "Model Double Taxation Convention between Developed and Developing Countries"; Brian J. Arnold, "Article 5: Permanent Establishment - Global Tax Treaty Commentaries," Global Topics IBFD, 2019, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/gttc_article5_pe_s_2.

[546] Nana Ama Sarfo, "Finding Middle Ground over Unilateral Digital Taxation," *Bulletin for International Taxation, Journal Articles & Opinion Pieces IBFD* 72, no. 4a/Special Issue (2018), https://research.ibfd.org/#/doc?url=/document/bit_2018_4a_int_6; Lee A. Sheppard, "Digital Permanent Establishment and Digital Equalization Taxes," *Bulletin for International Taxation, Journal Articles & Opinion Pieces IBFD* 72, no. 4a/Special Issue (2018), https://research.ibfd.org/#/doc?url=/document/bit_2018_4a_int_10; Báez

The second consideration is whether the recipient of such income might establish a PE in a jurisdiction other than their country of residence through which to engage in such transactions for reasons other than to facilitate access to counterparties. Such reasons might include lower energy and computer hardware costs, or indeed more favourable tax treatment. The OECD Commentary specifically considers the existence of a PE in the context of electronic commerce. It distinguishes between the presence of a server and a website on that server, indicating that a server could potentially be a PE in the state in which it is located if it is owned or at the disposal of the taxpayer, while the presence of a website on a server owned by another party in that state could not in itself represent a PE. Therefore, it is the presence of the physical infrastructure rather than the storing of intellectual property thereon which must be considered. A website located on a server in terms of a hosting agreement could not represent a PE.[547] The server must also be fixed in that location to constitute a PE, meaning not that it cannot be moved, but rather that it in fact has not been moved and has a "degree of permanence" in that location.[548]

If a taxpayer owns or has a server at their disposal with a degree of permanence in another state, it could potentially be a PE if it carries on business through that server. This must be assessed on a case-by-case basis, considering "whether it can be said that, because of such equipment, the enterprise has facilities at its disposal where business functions of the enterprise are performed".[549] The absence of staff in that location does not necessarily mean that the server cannot be a PE if

Moreno, "The Taxation of Technical Services under the United Nations Model Double Taxation Convention: A Rushed – Yet Appropriate – Proposal for (Developing) Countries?"; Ekkehart Reimer, "Article 5: Permanent Establishment," in *Klaus Vogel on Double Taxation Conventions (Updated)*, ed. Ekkehart Reimer and Alexander Rust (Wolters Kluwer, 2020), http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/KLICCHICVogel2015Art05poheadingidO5Nggj4ReUyc1u44svaGw!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B72F8DA64-EB10-4765-964F-EE1A6CAA4BF0%7D--WKUS_TAL_9958%23teid-71?searchItemId=&da=WKUS_TAL_9958.

[547] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

[548] OECD. At C(5)-3.

[549] OECD. At C(5)-50.

staff are not needed for the activities to be conducted. This may be the case when those activities can occur automatically. What is important is that those activities must be "essential and significant" "core functions" and not merely "preparatory or auxiliary" in nature.[550]

It is necessary to note that the definition of PE within treaties is in a state of flux. The definition as it is presented in Article 5 of the 2017 Model Tax Convention incorporates amendments flowing from the recommendations of Actions 6 and 7 of the OECD's BEPS Project. These amendments introduce a number of anti-avoidance measures, including the limitation in all instances of the specific exclusions from the PE definition to activities of a preparatory or auxiliary character, changes to when the activities of an agent may represent a PE of the principal, and provisions addressing the artificial fragmentation of businesses and splitting up of contracts to avoid PE status. In addition, a measure to combat avoidance by means of a PE in a third jurisdiction with a low tax rate was introduced as Article 29(8).[551] Such amendments and the interpretation thereof are however intended to apply only prospectively, and will of necessity not appear in the wording of agreements based on previous versions of the Model Convention.[552] Such provisions may however be introduced into existing agreements where all parties to an agreement are also signatories to the OECD's Multilateral Instrument (MLI). However, this will depend on whether all parties have elected to include that agreement as a 'covered tax agreement', which elections each party has made in respect of each provision, and whether all parties to an agreement have made the same election with respect to a specific provision. The combined effect of these elections

[550] OECD. At C(5)-50. At C(5)-51.
[551] David G. Duff and Daniel Gutmann, "General Report," *Cahiers de Droit Fiscal International* 105, no. 1 (2020): 15–50, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/data/ifacahier/pdf/ifacahier_2020_volume1_general_report.pdf; OECD, "Multilateral Convention to Implement Tax Treaty Related Measures to Prevent Base Erosion and Profit Shifting," 2016, https://www.oecd.org/tax/treaties/multilateral-convention-to-implement-tax-treaty-related-measures-to-prevent-BEPS.pdf.
[552] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

means that the number of agreements to which these provisions will be applicable is far fewer than the number of agreements to which signatories to the MLI are a party.[553]

The assessment of the existence of a PE in the form of a server is unlikely to be impacted by the amendments in the 2017 Model Tax Convention (and associated MLI elections) to the exclusions of activities of a preparatory or auxiliary character in paragraph 4 of Article 5. The activities of a server most likely fall within exclusion (e) – "the maintenance of a fixed place of business solely for the purpose of carrying on, for the enterprise, any other activity" which is limited in both the 2014 and 2017 Model Tax Conventions to activities of a "preparatory or auxiliary character".[554] Likewise, the Commentary on Electronic Commerce was amended in the 2017 version only in respect of some rephrasing in respect of the role of agents.

While the presence and function of a server may be a relevant consideration in the context of crypto-asset transactions, the very nature of blockchain technology may also in certain instances frustrate that consideration. While in some instances a transaction may occur exclusively on the taxpayer's server and in other instances it may occur on a decentralised network hosted on hardware over which the taxpayer has no control, in yet others an element of the activity may occur on the taxpayer's computer that simultaneously acts as a contributor to what together constitutes the decentralised network. In such instances, distinguishing the role of the taxpayer's hardware from that of the decentralised network may be problematic for the purposes of identifying the physical infrastructure on which that digital activity occurs and the extent to which that infrastructure is under the taxpayer's control. In short, this may suggest that while the PE concept

[553] Duff and Gutmann, "General Report."
[554] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)", at M-19; OECD, "Model Tax Convention on Income and on Capital: Condensed Version 2014" (OECD Publishing, 2014), at 27, https://doi.org/10.1787/mtc_cond-2014-en.

is ill-suited to the digitalised economy in general it is particularly ill-suited to addressing blockchain technology and crypto-asset transactions.

7.1.3. Business profits (Article 7)

The majority of identified transactions were classified as business profits in this analysis, encompassing the sale of intangible assets in the context of business, whether by origination of tokens or when used as a medium of exchange in a business context, the rendering of services in transaction validation, both in respect of income from block rewards and transaction fees as well as from network development contributions outside of an employment relationship, income from the delegation of network access rights, revenue income from the transfer or redemption of stablecoins representing negotiable debt instruments due to movements in fiat currency exchange rates, and income from speculation.

In terms of Article 7, business profits are taxed exclusively in the state of the taxpayer's residence, unless the profits are attributable to a PE in the other contracting state.[555] The UN Model adds to the PE exclusion the sale of goods or conducting of activities similar to those sold or conducted by a PE.[556] The key to determining taxing rights in a cross-border transaction will therefore be identifying whether a PE exists in the other state.[557]

The interaction between Articles 5 and 7 in respect of the various transactions, that this study proposes should be classified as business profits, as illustrated in Figure 2, are now considered.

[555] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)"; Schwarz, "Chapter 9 Business Profits."
[556] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[557] United Nations.

7.1.3.1. *Negotiable debt instruments*

It is submitted that the income arising from the disposal of stablecoins as a medium of exchange (5.7), or on redemption (for either the holder or issuer) (5.8), or in speculation (5.10) cannot be attributable to a PE in another jurisdiction due merely to the operation of software located on a server owned by the taxpayer in that jurisdiction. For example, the redemption of stablecoins (5.8) requires the ongoing maintenance of operations including the acceptance of fiat currency deposits and redemption of tokens, compliance with regulatory requirements, the maintenance of sufficient reserves and the protection of the stable price of tokens, and may in these respects be comparable to the activities of a traditional financial institution.

In each of these transactions it is the actions of the taxpayer that are essential, significant and core to the business of the taxpayer and that give rise to such income, and which must therefore be the basis on which the existence of a PE is determined, in the absence of which income will be subject to tax in the country of residence.

7.1.3.2. *Sale of intangible assets*

As with negotiable debt instruments it is submitted that income arising from the disposal of crypto-assets fortuitously received (5.5), the disposal of other crypto-assets as a medium of exchange (5.7), in speculation (5.10) or from involuntary transfer (5.11), cannot be attributable to a PE in another jurisdiction due merely to the operation of software located on a server owned by the taxpayer in that jurisdiction. Here too it is the actions of the taxpayer that are essential, significant and core to the business of the taxpayer and that give rise to such income, while computer hardware plays at most an auxiliary part. Unless those actions create a PE in another country, income will be subject to tax in the country of residence.

In the subsequent disposal of such tokens by the transferee, it is the underlying transaction that defines whether a PE exists. Whether that income is attributable to a PE in another state may need to be determined with reference to whether a PE exists in the context of the preceding transaction in terms of which the tokens were acquired. For example, jurisdictional taxing rights over income from the subsequent disposal of crypto-asset tokens received in payment for the sale of goods need to be determined with reference to whether those goods were sold through a PE in another jurisdiction. However, it may also be possible for the link between the PE and the subsequent transaction to be broken depending on the context in which the subsequent disposal occurs. The role of any software in the transfer of such tokens is by comparison preparatory or auxiliary in nature, serving primarily to initiate and record the transactions in the permanent ledger of the blockchain. Furthermore, as a decentralised ledger the software is not located on the originator's server but on those of transaction validators, and therefore that server cannot be said to be a PE of the originator.[558]

To determine whether a server may represent a PE in the context of the sale of crypto-asset tokens by originators (5.3) or the payment by originators of remuneration and other incentives (5.4) may however be more challenging. Taken in their totality, the view may be that it is the identification of a selling proposition, the development of the new blockchain in line with that proposition, the marketing and bringing to market of the concept and the oversight of the sale of tokens that are essential and core to the sale of crypto-asset tokens by originators (5.3) or origination as remuneration and incentive (5.4). However, an alternative view may be that these activities are

[558] The exception to this final observation may be where validation functions are centralised. No instances of complete centralisation of transaction validation were noted in the sample; the closest example was in respect of NEO, where five of the seven validator nodes were operated by the token originator (see Appendix B.19 for consideration of the NEO validation process). Centralised validation is relevant here only insofar as it relates to income from sale of crypto-asset tokens by origination and the possible existence of a PE. Any income arising directly from transaction validation is considered separately under 7.1.3.3.

preparatory to the sale of tokens, and if the action of selling each new token is considered in isolation it may be the recording of that origination transaction that is the central action, and this is a function of the blockchain. While the current OECD Commentary provides little direct guidance in this regard, the position on what constitutes an automated digital service within future proposals (see 7.2 to follow) may lend credence to the latter approach. However, the problem then returns to that of the decentralised nature of the blockchain, in which case such function may not be considered to be performed by a PE of the taxpayer in any event. It is therefore submitted that a remote server is unlikely to be considered a PE in the context of the origination of crypto-asset tokens.

Notwithstanding that crypto-asset tokens representing the sale of intangible assets are unlikely to be attributable to a PE in another state by virtue of a remote server, they may still have a significant impact on traditional tax bases due to the global and borderless nature of crypto-assets and blockchain technology. This may allow the transferor taxpayer to be geographically separated from the transferee to a far greater extent than the transactions that they displace. Such impact may be particularly evident in the tax base traditionally attributable to financial services and investment industries, as crypto-asset start-ups gravitate towards supportive tax jurisdictions. The implications of this are considered further in 7.2 *Future considerations*.

7.1.3.3. ***Services rendered***

7.1.3.3.1. ***Block rewards and transaction fees***

The most distinctive context in which crypto-assets may be received for the rendering of services is in PoW and DPoS block rewards and transaction fees (considered within 5.4 and 5.7 respectively), as well as in the delegation of DPoS participation rights (considered within 5.9). Such income is the product of the computer processing power of the taxpayer rather than active

involvement at the individual transaction level. Such income may therefore be attributable to the transaction validation software located on a server or servers owned by the taxpayer, which may be considered essential, significant and core to the taxpayer's business. While it may be true that the business activities require active involvement by the taxpayer in the oversight of that software and management of that server and related infrastructure, this can surely be no more than in other contexts in which a server might represent a PE, as contemplated by the OECD Commentary. Therefore, it is submitted that a server may represent a PE in the context of block rewards and transaction fees. It is further submitted that the particular challenge of identifying a server as a PE within the context of a decentralised network is not relevant in this instance, since the successful validator's server plays a distinctive role in the process. Where a PE exists, the business profits arising will be subject to tax in the country in which that PE is located. In all other instances it will be subject to tax in the country of residence.

This is a potentially significant consequence of the growth of the crypto-asset industry. The validation of transaction records has the potential to displace more traditional business activities where physical presence has been a necessity of doing business in that jurisdiction, most notably within the financial service industry. In so doing this has the potential to erode the tax bases of those jurisdictions in favour of jurisdictions in which energy costs are low or regulation more favourable. The extent to which this may be addressed by measures to tax the digitalised economy is considered further in 7.2 *Future considerations.*

7.1.3.3.2. *As incentive for services outside of an employment relationship*

The second context in which income from services rendered may arise is in reward for contribution to blockchain development or improvements by developers falling outside an employment

relationship (considered within 5.4). Here it must be noted that where Article 12A of the UN Model is included that article will take precedence over Article 7.

In such instances a server could not in itself represent a PE of the taxpayer, since it is submitted that it is the actions of the taxpayer that are essential, significant and core to the earning of such income. The taxpayer could however set up a fixed place of business in a state other that its state of residence or of the source of such income from which to render such services. Such services may also represent a service PE where Article 5 of the UN Model or the alternative construction included in the OECD Commentary is employed. In the absence of a PE, such income will subject to tax in the country of residence, unless Article 12A is included in the relevant treaty.

While this outcome does not introduce any new considerations into the determination of jurisdictional taxing rights, the nature of services that may be rendered in this context may be particularly well-suited to performance in a different location to that of the recipient, and to this end they may contribute to the erosion of traditional tax bases. Again, this is considered further in 7.2 *Future considerations*.

7.1.3.4. ***Letting of property***

Income from the letting of property arises where a token holder leases the rights to network usage associated with their tokens (considered within 5.9). In such context, the income is not attributable to the leasing of a server, since the taxpayer does not lease any physical server or its computing power to another party, in much the same way that a website on a server does not create a PE in the jurisdiction in which that server is located if the owner of the website is not the owner of the server. The mere presence of a server in another jurisdiction on which the leased digital record is stored cannot therefore represent a PE in this context. Furthermore, the crypto-asset token records

are stored not exclusively on the owner's computer but on the servers of the entire decentralised network.

Where leasing operations require active participation by the taxpayer then it would seem more likely that the role of the software and server is preparatory or ancillary in nature. If, however, the leasing activities are such that opportunities may be automatically identified and contracted in terms of settings preselected by the token holder, there may be difficulty in determining the extent to which that software and selected settings exist either on the server of the holder or on the decentralised blockchain. This returns to the challenge particular to blockchain technology in determining conclusively whether a PE in the form of a server exists.

7.1.4. Royalties (Article 12)

As noted within 5.3 and 5.4, there is no sound basis for classification of income from crypto-asset transactions within the OECD Model construction of Article 12, and even where the UN Model construction of Article 12 is employed, classification of income from either the sale of crypto-asset tokens by originators or from block rewards and transactions fees as royalties from ICS equipment leasing is not supported by this study. However, it cannot be ignored that such classification may be pursued by jurisdictions that favour an interpretation of Article 12 of the UN Model that does not depend on a right of use of the equipment itself. Such classification is significant because, in terms of the UN Model, limited taxing rights over royalties are granted to the country of source in addition to the taxing rights of the country of residence.[559] This puts the outcome in contrast to that arising from classification as business profits, which would allocate taxing rights to the country of

[559] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."

residence in the absence of a PE in the other country. If, however, such a PE exists in the country of source then the outcomes are aligned.

The possible conflicts arising from both construction and interpretation in the classification of two such definitive crypto-asset token transactions draw further attention to what is already a controversial article that embodies the competing interests of source and residence jurisdictions.[560]

7.1.5. Fees for technical services (Article 12A)

The introduction of Article 12A is a specific response to concerns about base erosion arising from the growth of the digitalised economy, and specifically dissatisfaction as to the outcomes for source countries due to the thresholds created by the PE requirement contained in other articles.[561] Article 12A grants taxing rights to the country of residence, as well as limited taxing rights to the country of source. Such classification takes precedence over Article 7 as well as over Article 14 of the UN Model in the absence of a PE, fixed base, or service PE in the country of source. The presence of a PE or fixed base would result in full taxing rights being granted to the country of source, in which case Article 12A ceases to have effect.[562]

As concluded in 5.4, income from services rendered outside of an employment relationship, whether to the blockchain originator or by third-party developers to the blockchain community, may be classified as fees for technical services where these require sufficient levels of specialised skills. As noted in that discussion, what constitutes the minimum level of specialisation to fall

[560] Martín Jiménez, "Article 12: Royalties (OECD and UN Models) and Article 12A: Technical Services (UN Model (2017)) - Global Tax Treaty Commentaries."
[561] Martín Jiménez.
[562] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."

within the definition of technical services is something that the article and UN Commentary do not necessarily make clear.[563]

The inclusion of Article 12A within a treaty therefore has significant implications in the granting of additional taxing rights to the country of source that would not otherwise arise. Classification as fees for technical services therefore affects both taxing rights and the rates of taxation applicable to income from services such as participation in the development and application of blockchain technology. Whether and the extent to which such services fall within the definition of technical services is therefore a significant consideration not helped by the current lack of clarity as to the boundaries of Article 12A. It is therefore recommended that specific guidance be provided to address the context of crypto-assets.

7.1.6. Capital gains (Article 13)

Article 13 grants exclusive taxing rights to the country of residence over capital gains other than those arising from the disposal of specific assets, including moveable property that forms part of a PE in the source state.[564] The OECD Commentary clarifies that 'moveable property' in this context means all property other than immoveable property, and crypto-asset tokens would therefore fall within this definition.[565]

7.1.6.1. *Negotiable debt instruments*

Since in Chapter 5 it was concluded that either revenue or capital income might arise from stablecoins used as a medium of exchange (5.7), as an investment (5.10) or for the holder from

[563] Báez Moreno, "The Taxation of Technical Services under the United Nations Model Double Taxation Convention: A Rushed – Yet Appropriate – Proposal for (Developing) Countries?"
[564] Article 13 also makes special provision for immovable property, shares in companies the value of which is primarily based on immovable property, and ships and aircraft. Having concluded that no crypto-asset tokens in the sample should be considered equity instruments, none of the remaining special provisions are relevant considerations in this context.
[565] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

redemption (5.8), the factors considered in determining the presence of a PE in 7.1.3.1 are equally applicable where such income represents a capital gain. The distinction between revenue and capital has no bearing on taxing rights since the allocation of taxing rights is consistent between Article 7 and Article 13.

7.1.6.2. *Sale of intangible assets*

Likewise, since in Chapter 5 it was concluded that either revenue or capital income might arise from the disposal of crypto-assets fortuitously received (5.5), of other crypto-assets used as a medium of exchange (5.7), of crypto-asset token investments (5.10) and on involuntary transfer (5.11) the factors considered in determining the presence of a PE in 7.1.3.2 are equally applicable where such income represents a capital gain.

7.1.6.3. *On disposal of tokens held to earn block rewards and transaction fees*

Where crypto-asset tokens were originally held for the taxpayer to benefit either directly or indirectly from the associated DPoS candidacy rights (considered within 5.4 and 5.9) it was concluded that the income arising from subsequent disposal would be capital in nature. Whether such capital gain is attributable to a PE would be determined with reference to the considerations outlined within 7.1.3.3 pertaining to the taxpayer's DPoS activities. Unless attributable to a PE, such income would be taxed in the country of residence.

7.1.6.4. *On disposal of tokens held to for network usage rights*

Where crypto-assets were originally held either to benefit from network usage rights or to earn income from the delegation of those rights, it was concluded (in 5.9) that the subsequent disposal of such tokens would give rise to a capital gain. Whether such capital gain would be attributable to a PE would again depend on the considerations presented in 7.1.3.4.

7.1.7. Independent personal services (Article 14)

As noted in 5.4, the allocation of taxing rights over independent personal services in Article 14 of the UN Model is consistent with those over services classified as business profits within Article 7 of the OECD Model, except that whereas the OECD Model grants taxing rights to the country of source only if a PE is present, Article 14 refers instead to a 'fixed base', and also includes a time-based physical presence test. The OECD does not consider there to be a conceptual difference between a PE and a fixed base, which contributed to the deletion of Article 14 in the OECD Model.[566]

7.1.8. Income from employment (Article 15)

Services may also be rendered in the context of an employment relationship, in which case they will be classified as income from employment in terms of Article 15. In such instances exclusive taxing rights are granted to the state in which that employment is exercised, unless such employment is exercised in that state for less than 183 days and such income is paid neither by a resident nor a PE of a non-resident in that state, in which case exclusive taxing rights are granted to the taxpayer's state of residence.[567] What is significant in this respect is that the exercise of employment is determined solely with respect to physical presence, meaning that a taxpayer "who derived remuneration, in respect of an employment, from sources in the other State could not be taxed in that other State in respect of that remuneration merely because the results of this work were exploited in that other State".[568]

Determining taxing rights over income from employment according to physical presence in the context of the crypto-asset industry may result in the erosion of traditional tax bases to the extent

[566] OECD; United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[567] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."
[568] OECD. At C(15)-1.

that such employment may be exercised remotely. Such erosion would not be addressed by Article 12A of the UN Model, since that article excludes technical services rendered to an employer.[569] It may also be eroded to the extent that the business of that employer is such that it is able to transact remotely with its customers, thus potentially eroding the tax base of the state in which those customers are located not only with respect to its own income (as noted in 7.1.3.3) but also with respect to the income of its employees, which might traditionally be located in the same jurisdiction as its customers.

It should however be noted that any tax base erosion in this context arises due to differences between blockchain and traditional business models rather than between remuneration in crypto-assets and in fiat currency.

7.1.9. Directors' fees (Article 16)

Alternatively, income from services may be classified as directors' fees (Article 16) where relevant. In such instances taxing rights are granted to the country in which the company paying such fees is resident, although in this instance it is not an exclusive taxing right.[570] To the extent that the nature of the crypto-asset industry lends itself to separation of the paying company from the state in which such activities are undertaken or the state in which its customers are located this may again erode traditional tax bases.

7.1.10. Other income (Article 21)

As noted in 5.7, the absence of a conclusive definition within the model conventions of what constitutes business profits and other income may lead to conflicts in classification between Article 7 and Article 21. Where jurisdictions follow the OECD Model Tax Convention construction of

[569] United Nations, "Model Double Taxation Convention between Developed and Developing Countries."
[570] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)."

Article 21 this allocation may not cause any difficulty, since both it and Article 7 allocate taxing rights on a similar basis.[571] However, the exclusive taxing right granted by Article 21 is a source of controversy, with the UN Model following a construction that affords taxing rights to countries of source. Many countries have reserved their position on the OECD construction and followed the UN Model with respect to their articles on other income.[572]

Therefore, while in this study does not propose that any of the transaction categories analysed would rightly be classified within the intended definition of other income, it cannot be conclusively determined that such classification would not be pursued in practice given historical difference in interpretation and the tensions to which differences in allocation outcomes may contribute. This study therefore recommends that further clarity be given to the application of Article 7 and 21 to the identified crypto-asset transactions.

7.1.11. Taxes on capital (Article 22)

Article 22 follows the construction of Article 13 in its allocation of taxing rights, granting non-exclusive taxing rights to the country of source in respect of capital in the form of immoveable property and assets of a PE, and exclusive taxing rights to the country of residence in all other cases, but differs in respect of shares whose value is primarily attributable to immovable property. Allocations in terms of Article 22 will thus be consistent in this context with those under Article 13. The former may be of limited application at present giving that few countries currently have a general tax on capital, and in many instances this article is omitted from bilateral treaties. However,

[571] OECD.
[572] Schoueri, "Article 21 - Other Income - Global Tax Treaty Commentaries"; United Nations, "Model Double Taxation Convention between Developed and Developing Countries."

as the subject of wealth taxes attracts political interest from time to time, the article may remain a relevant consideration.[573]

7.2. Future considerations

7.2.1. Introduction

Crypto-asset transactions have the potential to significantly impact the tax bases of the jurisdictions in which they displace more traditional business activities due to the lack of need for physical presence in various contexts. To this extent they contribute to the much larger challenges of globalisation and digitalisation to the existing international tax system, which is largely based on concepts of physical presence. These challenges are recognised by the OECD in its Base Erosion and Profit Shifting (BEPS) Project which led to the release of its *Action 1 Report* in 2015. The project progressed towards the development of a two-pillar approach to addressing the challenges of digitalisation, culminating in the publication in 2020 of the OECD's *Report on Pillar One Blueprint* and *Report on Pillar Two Blueprint*. The reports reflect the progress achieved by 137 members of the Inclusive Framework to date,[574] while the two pillars together incorporate various elements each previously promoted by different countries.[575]

[573] OECD, "Model Tax Convention on Income and on Capital 2017 (Full Version)"; Masui, "Article 22 - Capital - Global Tax Treaty Commentaries"; Ekkehart Reimer, "Article 22: Capital," in *Klaus Vogel on Double Taxation Conventions (Updated)*, ed. Ekkehart Reimer and Alexander Rust (Wolters Kluwer, 2020), http://www.wkcheetah.com.ezproxy.uct.ac.za/#/read/kluwertaxlaw/KLICCHICVogel2015Art22poheadingidgKwBTR2v0WrPFreo348fA!csh-da-filter!WKUS-TAL-DOCS-PHC-%7B72F8DA64-EB10-4765-964F-EE1A6CAA4BF0%7D--WKUS_TAL_9958%23teid-245?searchItemId=&da=WKUS_TAL_9958#KLICC.

[574] OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar One Blueprint: Inclusive Framework on BEPS."

[575] Adriana Sánchez Castro, "Administrative Capability Analysis of OECD Proposals from the Perspective of Developing Countries," *Intertax* 48, no. 2 (2020): 218–32, http://www.oecd.org/tax/beps/public-comments-received-on-the-possible-solutions-.

The same challenge is also recognised by the alternative proposal of Article 12B by the UN, prepared by a Drafting Group consisting of 14 members of the UN's Committee of Experts on International Cooperation in Tax Matters and released for comment in 2020.[576]

The implications of these solutions, as at 30 June 2021, for the allocation of taxing rights over crypto-asset transaction are considered here.

7.2.2. Pillar One

Pillar one acknowledges that physical presence may no longer be a prerequisite to doing business in a particular jurisdiction, referred to as a 'market jurisdiction'. Market jurisdictions include not only the jurisdictional location of contractual counterparties but also of users whose usage or content is monetised. It therefore seeks to establish an alternative basis for allocating a share of taxing rights over the residual profit of a multinational enterprise to market jurisdictions. It refers to this allocation as 'Amount A'. It further seeks to establish a basis for determining the return on 'baseline marketing and distribution activities' conducted in a jurisdiction comparable to that of arm's length pricing. It refers to this allocation as 'Amount B'.[577]

Allocation of taxing rights under Pillar One focuses particularly on two types of business activities – Automated Digital Services (ADS) and Consumer Facing Businesses (CFB). Together with defining characteristics - essentially that such services are automated in nature and delivered digitally – it proposes a positive and negative list for ADSs. The positive list covers nine activities – "Online advertising services; Sale or other alienation of user data; Online search engines; Social media platforms; Online intermediation platforms; Digital content services; Online gaming;

[576] United Nations, "Tax Consequences of the Digitalized Economy – Issues of Relevance for Developing Countries," 2020, https://www.un.org/development/desa/financing/sites/www.un.org.development.desa.financing/files/2020-10/CITCM 21 CRP.41_Digitalization 10102020 Final.pdf.
[577] OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar One Blueprint: Inclusive Framework on BEPS."

Standardised online teaching services; and Cloud computing services".[578] In contrast to suppliers of ADSs, CFBs are those multinational enterprises (MNEs) that sell goods or services directly to consumers and are able to engage with those consumers without a physical presence in that jurisdiction. CFBs may be the owner of the goods or render of services, or they may be the contractual counterparty without being the owner or renderer. By way of example, the report indicates that online music streaming would be an ADS activity, while the online sale of a CD for physical delivery would be a CFB activity.[579] Although never stated, it must be apparent to the reader that Pillar One has the business models of digitalised-economy MNEs such as Apple, Facebook, Google, and Amazon in its sights.

Pillar One has clear potential implications for crypto-asset transactions. Although blockchain networks are not explicitly referred to in the Report, such transactions would very likely be in scope, most probably as cloud computing services. This category includes activities such as computing services, virtual servers, storage, and database management, which would seem to apply to blockchain networks. In particular, the sale of crypto-asset tokens by originators and block rewards and transaction fees arising from transaction validation would appear to fall within ADS. While the former might appear to involve more human intervention than the latter, the OECD proposal clarifies that it is not the human involvement in design or development that should be considered, but rather whether once developed such services can be delivered at scale with little or no marginal human involvement.[580]

Pillar One may therefore return to market jurisdictions some of the tax base eroded by the displacement of traditional intermediaries by remote processing of crypto-asset transactions.

[578] OECD. At 25.
[579] OECD.
[580] OECD.

7.2.3. Pillar Two

Pillar Two is intended to be complementary to Pillar One in addressing BEPS concerns. While Pillar One focuses on the allocation of taxing rights to market jurisdictions, Pillar Two focuses on minimum effective tax rates for MNEs.[581] Pillar Two seeks to address the extent to which the role of intangible assets within the digitalised economy has the potential to allow MNEs to shift profits to take advantage of low-tax jurisdictions. Pillar Two seeks to ensure that "large internationally operating businesses pay a minimum level of tax regardless of where they are headquartered or the jurisdictions they operate in".[582]

Pillar Two achieves this through four complementary measures – an income inclusion rule (IIR), an undertaxed payments rule (UTPR), a switch-over rule (SOR) and a subject to tax rule (STTR). Together, these rules ensure that MNEs pay a global minimum amount of tax, and limit their ability to take advantage of low-tax jurisdictions through a combination of effective tax rate determination, top-up tax and limitation of deduction of payments to entities in jurisdictions where they will be subject to low rates of taxation.[583]

As was evident in the preceding analysis, the nature of crypto-asset transactions potentially affords taxpayers opportunities to select the jurisdiction in which they will operate and be subject to tax. These opportunities exist through remote delivery, remote working and the creation of server operations representing PEs. Taxpayers who seek to use these opportunities to take advantage of low-tax jurisdictions not only with respect to automated elements but across a range of the

[581] KPMG, "BEPS 2.0 – Pillar One and Pillar Two Blueprints," Insights, 2020, https://home.kpmg/uk/en/home/insights/2020/10/tmd-beps-2-pillar-one-and-pillar-two-blueprints.html.
[582] OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar Two Blueprint: Inclusive Framework on BEPS." At 10.
[583] OECD.

transaction categories identified in this study may be impacted by the measures contained in Pillar Two and subject to tax to a greater extent in the country of source.

The approval and implementation of the measures proposed in Pillar One and Two will not however be without its challenges. In particular, complex measures may be prohibitive for developing countries with limited administrative capacity.[584] Furthermore, the details of the proposals are highly complex,[585] and those such as the requirement to distinguish between routine and non-routine profits may be all but impossible to apply in the context of crypto-asset transactions.[586]

7.2.4. Article 12B of the UN Model Double Tax Convention between Developed and Developing Countries

Article 12B of the UN offers a far simpler solution than the OECD's proposal.[587] It too acknowledges the challenges to the traditional PE concept posed by the digitalised economy, which may particularly effect developing countries.[588] Article 12B was proposed in 2020 and approved for inclusion in the 2021 version of the UN Model Double Tax Convention by the UN Committee of Experts on International Cooperation in Tax Matters on 20 April 2021.[589]

Consistent with the construction of Article 12A, in the absence of a PE of fixed base in the country of source, Article 12B allocates taxing rights over income from ADS to the country of residence, as well as limited taxing rights to the country of source. The UN Commentary recommends that

[584] Castro, "Administrative Capability Analysis of OECD Proposals from the Perspective of Developing Countries."
[585] Radhakishan Rawal, "Taxation of Digitalized Economy – Proposed UN Solution," *Asia-Pacific Tax Bulletin, Journal Articles & Opinion Pieces IBFD* 26, no. 3 (2020), https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/document/aptb_2020_03_u2_1.
[586] Christians and Tazeem, "Facebook's Libra: The next Tax Challenge for the Digital Economy."
[587] Rawal, "Taxation of Digitalized Economy – Proposed UN Solution."
[588] United Nations, "Tax Consequences of the Digitalized Economy – Issues of Relevance for Developing Countries."
[589] Sabrine Marsit, "UN Tax Committee Approves New UN Model Treaty Article 12B on Automated Digital Services," News IBFD, April 22, 2021, https://research-ibfd-org.ezproxy.uct.ac.za/#/doc?url=/data/tns/docs/html/tns_2021-04-22_u2_2.html.

this limit be set at three or four percent. Article 12B defines ADS as being income from any service delivered over the internet that requires minimal human input from the provider of that service. ADS excludes any service falling within the definitions of royalties (Article 12) or technical services (Article 12A). Article 12B prevails however over Article 7 in the absence of a PE. The UN Commentary provides the same nine examples of ADS as those of the OECD, and reproduces the OECD's commentary on each example with minimal cosmetic changes.[590]

Income from ADS is considered to arise in the country of source if the payer is a resident of or is borne by a PE or fixed base of the payer in that country, but not if the payment is borne by a PE or fixed base in the country of residence of the recipient. Article 12B does not set any tests or minimum thresholds for application, since these may be inappropriate to or circumvented by the nature of the digitalised economy.[591]

Alternatively, Article 12B offers the taxpayer the option of being taxed on its 'qualified profits' from ADS arising in the country of source. Qualified profits are determined by applying an internal profitability ratio to that income, and 30% of this amount being subject to tax in the country of source. The gross basis of tax and the formulaic alternative are intended to minimise complexity in support of implementation in developing countries.[592]

Given the consistency in definition of ADS between the OECD and UN proposals, it must be concluded that the same crypto-asset transaction categories would be addressed by both proposals. As concluded in the discussion of Pillar One, this would be of particular relevance to the sale of crypto-asset tokens by originators and to block rewards and transaction fees. Here however it must be noted that since Article 12B would be subordinated to Article 12, this would have no effect

[590] United Nations, "Tax Consequences of the Digitalized Economy – Issues of Relevance for Developing Countries."
[591] United Nations; Rawal, "Taxation of Digitalized Economy – Proposed UN Solution."
[592] United Nations, "Tax Consequences of the Digitalized Economy – Issues of Relevance for Developing Countries."

where a jurisdiction already pursued classification under the latter. Furthermore, it must be noted that while both Article 12B and Pillar One of the OECD would afford greater taxing rights to the country in which income from ADS arises, Article 12B would not further address other erosive elements of the digitalised economy and MNEs in the way that low-tax jurisdictions are addressed by Pillar Two of the OECD proposal.

7.2.5. Challenges to tax reforms

The consideration of challenges to the proposed tax reforms will be limited to those specific to crypto-assets rather than undertaking a comprehensive analysis of the proposed reforms.

It would seem that the proposed remedies, while varying in scope and complexity, are both well-suited to remedying possible base erosion resulting from the displacement of traditional business operations with crypto-asset transactions. However, the nature of these transactions poses some particular challenges to the potential efficacy of the proposed measures.

7.2.5.1. *Pseudonymity*

A key challenge to global tax reform measures posed by crypto-asset transactions is that of pseudonymity. Parties to a transaction are identifiable only by their public keys, and within the sample analysed some networks employ additional measures to further mask identities. A taxpayer therefore knows very little about the identity of the counterparty to a transaction.

The proposed measures focus on restoring taxing rights eroded by the digitalised economy in market jurisdictions. Its implementation therefore presupposes that the taxpayer is able to determine at least the location, if not the identity, of counterparties in a reliable manner. This may be possible where counterparties disclose personal information, where interactions occur on a country-specific website, or where the source of fiat currency remittances may be identified. Yet none of these identifiers are necessarily present in the crypto-asset context.

This study presupposes that, while desiring relief from the possible double taxation, taxpayers wish to be tax-compliant. (Where this presumption does not hold, significant further challenges arise.) However, it cannot be presumed that counterparties are so invested in the compliance of the taxpayer that they would be willing to share their personal details in support of this, or that blockchain networks support such sharing. Pseudonymity is a central ideological and pragmatic proposition of blockchain technology. It may therefore be impossible for taxpayers to identify the market jurisdictions in which they are transacting. While regulatory requirements that crypto-asset exchanges obtain personal information from parties may go some way towards addressing this issue, those requirements focus primarily on the regulatory and tax compliance of the transacting party. Using the information collected to support the tax compliance of a counterparty would take these measures a significant step further. In addition, crypto-asset exchanges are not an essential element of any particular transaction, and play no role in a number of transactions, perhaps most notably those of transaction validation. Requirements imposed on exchanges may therefore at best only partially address this challenge.

7.2.5.2. ***Disaggregation***

Another central proposition of blockchain technology is that traditional central intermediaries are displaced by a network of independent actors. While within the sample it was evident that in some instances proposals included a return to a degree of centralisation or the presence of disproportionately influential parties, it is reasonable to presume that in many instances, as the uptake of blockchain technology increases, there will be a reduction in concentration within disrupted markets. While it may be true that participants might in some instances come together to combine resources, such as in mining pools, it is unclear whether such arrangements would result in the creation of what might be regarded as a single enterprise for tax purposes or would be

considered comparable to a partnership (as was concluded with respect to the delegation of DPoS participation rights within 5.9).

The OECD's Pillar One and Two proposals aim to manage efficiency of implementation and ongoing compliance burdens by including a number of exclusions, carve-outs and minimum thresholds to their application. Perhaps most notable among these is the EUR 750 million revenue threshold for the application of Pillar Two.[593] Clearly, these measures are aimed at targeting a limited number of large MNEs. The disaggregation that blockchain technology facilitates may therefore place many participants outside the application of some or all of these measures. As a result, Pillar One and Pillar Two may have limited application in this context.

In contrast to this, since Article 12B does not set any minimum thresholds, disaggregation would not frustrate application. Rather, the challenge would be the administrability of levying a tax on a high volume of small value transactions undertaken by a large and geographically dispersed blockchain user base, and of crypto-asset originators and transaction validators pursuing remedies to double taxation arising across multiple jurisdictions. Pseudonymity is likely to further compound these challenges. Individual jurisdictions may of course choose to implement their own minimum thresholds to mitigate this, but the challenge then returns to disaggregation frustrating the intention of such thresholds.

7.2.6. Conclusion

Although the allocation of taxing rights flows consequentially from the classification of income within the articles, the analysis of the current application of the text of the articles of the model tax

[593] OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar Two Blueprint: Inclusive Framework on BEPS."

conventions highlights some significant considerations arising from the nature of crypto-asset transactions.

A significant challenge arises in determining whether a PE might exist in the context of various crypto-asset transactions. Specifically, should one consider all the activities of an originator in determining what constitutes a PE, in which case the role of the originator's server may be considered preparatory or auxiliary, or are the more manual and specific activities in fact preparatory to origination, in which case the originator's server may be considered core and essential to the isolated action of origination? Furthermore, can one consider a single server – whether in the context of the sale of crypto-asset tokens by originators, the block rewards of transaction validators or the income of token holders in delegating rights – in isolation in the context of a decentralised network when determining whether a PE exists? While this study takes a view in respect of each of these transaction categories, these considerations are by no means simple or conclusive, and potentially affect taxing rights across most of the articles considered thereafter.

The analysis also highlights the effect on taxing rights of the inclusion, construction, and interpretation of the articles in a particular treaty. Whether the OECD or UN Model's approach to royalties (Article 12) is followed determines both what constitutes a royalty and whether the country of source is afforded any taxing rights. While the position of this study is that no identified transaction category should be classified as a royalty in terms of either model, it is not impossible that attempts may be made to include some such transactions within the UN definition through the application of alternative interpretations already pursued by some jurisdictions in similar contexts. Where the UN Model's construction of Article 21 is present, similar attempts may be made by countries of source to reject classification as business profits (Article 7) in favour of classification

as other income (Article 21). Furthermore, the inclusion of Article 12A of the UN Model in a treaty would result in at least some income from services being subject to additional limited tax in the country of source rather than being considered business profits taxable in the country of residence. Here too, the limits of what constitutes a technical service may be difficult to define, especially in the context of a newly-introduced article, and may be vulnerable to the competing interests of residence and source countries. While none of these issues are unique to crypto-asset transactions, the nature of such transactions and their future proliferation may bring already-contested issues further to the fore.

In addition, the nature of crypto-asset transactions may contribute to base erosion, which is already a serious concern arising from the emergence of the digitalised economy. The erosion of traditional tax bases may occur through the lack of any need for physical presence by the taxpayer in the country of its customers. Both the sale of crypto-asset tokens and the service of transaction validation may be delivered from anywhere in the world, and will likely continue to gravitate towards jurisdictions with combinations of low tax rates, favourable regulation, a skilled workforce, and low energy costs. It may further occur through separation between the residence of the taxpayer and the location of its business activities, which may in some instances be conducted through a PE represented by a server in another country where the software located thereon automatically performs core business functions, such as transaction validation. It may also occur where the nature of the crypto-asset business model and blockchain technology allows employees (or those who render services outside the context of employment) to be separated in location either from their employer or their employer's customers.[594] Blockchain technology and

[594] This, however, is a product of the nature of the business model rather than the basis of remuneration and would apply equally to remuneration of such employees in fiat currency.

crypto-asset token transactions therefore have the potential to significantly contribute to base erosion as they displace traditional business models.

Looking ahead, blockchain technology and specifically the crypto-asset transaction categories analysed in this study embody many of the characteristics of the digitalised economy that both the Pillar One and Two measures of the OECD BEPS Project and the Article 12B alternative of the UN seek to address. A number of the most distinctive transactions would appear to fall squarely within the concept of ADS addressed by these measures. The further development and implementation of these measures will therefore need to be closely monitored by taxpayers engaging in crypto-asset transactions. At the same time, the very nature of blockchain technology may place such transactions outside of the scope of these measures, or at least frustrate their application. This may in fact be one of the attractive features of this technology in the future. As adoption of blockchain technology increases, policymakers will need to think carefully about whether such measures need to be adapted to address this subset of the digitalised economy. This is one of the challenges of attempting to develop tax reform measures in the midst of the rapidly evolving context of the digitalised economy.

8. CONCLUSION

8.1. Limitations of this study

The findings of this study should be interpreted in the light of its limitations. This study sought to address the question of the direct and indirect tax consequences of crypto-asset transactions. The study assumes that transacting parties wish to be tax-compliant and does not consider the utilisation of crypto-assets to evade taxation. There is however a popular association between crypto-assets and tax evasion.[595] The investigation thereof would represent a very different, although relevant, study.

The findings of this study are based on an analysis of a limited number of crypto-asset tokens, selected according to their market capitalisation at a particular point in time. This selection achieves significant coverage of the market of publicly traded tokens at that point in time, and the identification of possible taxable events reaches saturation within the sample. Notwithstanding the confirmatory results of the exemplar analysis, the findings cannot necessarily be interpreted as conclusively addressing all possible crypto-asset transactions. Particular characteristics (such as the ability to function as a medium of exchange) may predispose certain crypto-assets to achieving large market capitalisations, while more unique features may be created for or appeal to a particular niche market. Further developments in blockchain technology and its use cases may also give rise to new types of transactions. Such transactions may potentially fall outside the scope of this study.

The possible transactions that formed the basis of this study were identified from the analysis of crypto-asset white papers, supported by limited reference to other supporting documents and third-

[595] See for example Sarah Gruber, "Trust, Identity and Disclosure: Are Bitcoin Exchanges the Next Virtual Havens for Money Laundering and Tax Evasion," *Quinnipiac Law Review* 32, no. 1 (2013): 135–208, https://doi.org/10.3868/s050-004-015-0003-8; Adrian Blundell-wignall, "The Bitcoin Question: Currency Versus Trust-Less Transfer Technology," OECD Working Papers on Finance, Insurance and Private Pensions, 2014, http://dx.doi.org/10.1787/5jz2pwjd9t20-en%0D; Morten Bech and Rodney Garratt, "Central Bank Cryptocurrencies," *BIS Quarterly Review*, 2017, https://www.bis.org/publ/qtrpdf/r_qt1709f.pdf.

party commentaries. This reflects a particular approach that may not identify every possible transaction in every possible context. If a particular crypto-asset token was used in a way not contemplated in the original proposition thereof, or if the use thereof had further developed since the publication of the white paper proposition, that transaction may fall outside the scope of this study.

Lastly, the extent to which crypto-asset transactions and 'contracts', in other words, the instructions and conditions coded within the blockchain technology, may create rights and obligations that are legally binding and enforceable, is not considered by this study. This too represents a significant consideration within this emerging technology and is considered by other studies.[596]

8.2. Conclusion and recommendations

Since the creation of Bitcoin, crypto-assets have claimed a significant place within the digitalised economy and continue to grow in popularity and market capitalisation. New use cases and adoptions continue to emerge and enhance their credibility. This includes the recent announcement by payment platform giant PayPal that it would begin accepting Bitcoin payments.[597] In 2021, the price of Bitcoin doubled in the first three months of the year and its market capitalisation exceeded USD 1 trillion for the first time.[598]

Responses to addressing the tax consequences of crypto-asset transactions remain in the early stages of development. Few countries have provided comprehensive guidance on the tax

[596] On smart contracts and the law in the context of the 2016 DAO hack, see for example Usha R. Rodrigues, "Law and the Blockchain," *Iowa Law Review* 104 (2018), https://heinonline.org/HOL/Page?handle=hein.journals/ilr104&id=693&div=21&collection=journals.
[597] BBC News, "PayPal Allows Bitcoin and Crypto Spending," BBC News, 2020, https://www.bbc.com/news/technology-54630283.
[598] Billy Bambrough, "Bitcoin Price Prediction: Why Bitcoin Could Rocket To $400,000 In 2021," Forbes, 2021, https://www.forbes.com/sites/billybambrough/2021/04/08/bitcoin-price-prediction-why-bitcoin-could-rocket-to-400000-in-2021/?sh=421a380527a3.

consequences of such transactions within their jurisdictions. Many have provided limited responses, and many more have yet to respond. The responses to date suggest convergence in some respects, but contrasts and contradictions in many others. Much uncertainty remains. This was evidenced in the review of legislation and guidance in Chapter 3 of this study and was confirmed by the OECD report of 2020 considered in Chapter 6.

Rather than pursuing iterative improvements within domestic responses, this study has sought to establish a foundation for a globally coordinated response to the taxation of crypto-asset transactions. Such an approach is consistent with the approach evident in the OECD's BEPS Project. The outcomes have the potential to contribute to the greater debate on global tax responses to the digitalised economy.

Specifically, this study has sought to identify the possible taxable events arising from selected crypto-assets, and to develop a limited number of transaction categories from those events reflecting their distinct and similar characteristics. From an analysis of the white papers and other supporting documentation of 25 selected crypto-asset tokens, 32 transactions representing possible taxable events were identified. This is the first significant contribution of this study.

The 32 transactions identified were compared, contrasted, and grouped in Chapter 4, where they ultimately formed the basis for the development of ten transaction categories, each with distinct characteristics. Five of these categories encompass the various means of token origination identified within the sample, being origination in return for fiat currency deposits, the sale of crypto-asset tokens by originators, origination as remuneration or other incentive, fortuitous issuances and receipts, and retained tokens. The other five transaction categories cover the subsequent use and possible extinction of these tokens, and comprise use as a medium of exchange,

redemptions (of qualifying stablecoins), holding, speculation and investment, and involuntary transfers. This is the second significant contribution of this study.

In Chapter 5 the study then sought to determine the direct tax consequences arising from each transaction category, and to propose classification of each within the text of the articles of the model tax conventions. It concluded that it is possible to determine the direct tax consequences and to classify all the transaction categories developed within the articles of business profits (Article 7), capital gains (Article 13), income from employment (Article 15) and directors fees (Article 16) of the OECD Model Tax Convention. Where Article 12A of the UN Model Double Tax Convention is included, the analysis concluded that independent services rendered in the development or maintenance of the blockchain may be classified as fees for technical services in precedence over business profits. The proposed direct tax consequences and classification of the identified transaction categories is the third significant contribution of this study.

As its fourth significant contribution, this study identified a number of challenges to the identification of direct tax consequences or classification that should be addressed either within the model conventions or domestic legislation and guidance. In this respect, it concluded that the inclusion of Article 12A may give rise to challenges in determining the appropriate scope of the definition of technical services. The analysis concluded however that such scope should not extend to automated services such as transaction validation. The analysis further concluded that, while it would not be appropriate to classify income from either the sale of crypto-asset tokens by originators or from transaction validation as royalties, the nature of such transactions may mean classification within the UN Model's definition of royalties may not be universally rejected by individual jurisdictions. Likewise, while this study favoured classification as business profits, it

acknowledged the possibility that such classification might in some circumstances be rejected by some jurisdictions in favour of classification as other income (Article 21).

While such challenges to consistent interpretation of these articles predate consideration of crypto-asset transactions, the nature of such transactions may be predisposed to such challenges. Differences in approach in the interpretation of these articles may therefore be of increasing significance as crypto-assets play a more significant role in the digitalised economy in the future. This study therefore recommends that explicit consideration be given to the application of these articles in the context of crypto-asset transactions.

The most challenging transaction category to classify was perhaps that of fortuitous issuances and receipts. While this study proposed that such income be taxed only on disposal and classified on a case-by-case basis, that proposal was based primarily on considerations of simplicity and certainty rather than on conclusive evidence from the model conventions and their commentaries. It was conceded that valid alternative approaches might be favoured in this respect.

In Chapter 5 the study also identified a number of considerations that would be most appropriately addressed at the level of domestic legislation. These included considerations relating to the timing of taxation in the context of crypto-asset origination, remuneration in restricted crypto-assets and hard forks and airdrops, the setting of minimum thresholds for taxation, and the circumstances which might constitute a disposal in the context of loss and theft.

Chapter 5 concluded by testing the identified transaction categories with an exemplar of a crypto-asset token not included in the original sample. The possible taxable events identified within the exemplar could be placed within the existing transaction categories without difficulty, thus providing a demonstration of the robustness of the proposals of this study.

The potential contribution of the study as a foundation for a globally coordinated approach to the tax consequences of crypto-asset transactions was further demonstrated in Chapter 6 by means of a comparison of the proposals of the study to the findings of current practice among individual jurisdictions by the OECD in 2020. The comparison identified only one instance of a generally consistent approach among individual jurisdictions that was also broadly aligned with the proposals of this study. By contrast, in six instances the proposals of this study addressed transactions that were highlighted by the OECD for future consideration, and in a further four instances addressed transactions that were not considered in the OECD report.

Lastly, this study sought to determine the current jurisdictional taxing rights that arise from the classifications proposed by this study, as well as the possible impact of developments to address the taxation of the digitalised economy in the future. In Chapter 7 it concluded that while jurisdictional taxing rights flow consequentially from the classifications determined in the preceding analysis, the nature of crypto-asset activities is potentially at odds with the current focus of the model conventions on physical presence. This manifests both from the absence of a need for physical presence in the jurisdiction of the transaction counterparty (an issue already identified as a cause of base erosion in the digitalised economy) as well the particular difficulty of determining the existence of a permanent establishment in the context of a decentralised blockchain network. The nature of crypto-asset transactions further pits the competing interests of source and residence jurisdictions against one another, exacerbating the possible differences in interpretation of key articles in treaties already noted. This is the fifth significant contribution of this study.

The sixth and final significant contribution of this study was the consideration of crypto-asset transactions in the context of proposals to address the taxation of the digitalised economy. The

most definitive crypto-asset token transactions, being origination of crypto-asset tokens by originators and transaction validation, would seem to fall squarely within proposals to address the taxation of the digitalised economy in the future. While the OECD's Pillar One and Two proposals have a wider scope, they are more complex in nature and contain more exclusions than the UN's Article 12B proposal. Both proposals would see greater taxing rights afforded to the country of source without reference to considerations of physical presence and would therefore seem to address a number of the existing concerns identified by this study. However, the pseudonymity and disaggregation that blockchain technology facilitates may undermine the efficacy of both alternatives.

While the study focused primarily on direct tax consequences, the analysis supported some preliminary observation in respect of indirect taxes in Chapters 5 and 6. It noted that there is a lack of clarity as to the scope of indirect tax responses to date, and that some of the transactions identified in the study that do not relate to crypto-assets as a means of payment either are or may be outside of that scope. The nature of such transactions may mean that the extension of the existing responses to provide similar treatment for such transactions may not be consistent with the underlying bases of those responses. However, the specific challenges that crypto-asset transactions present may mean that pragmatic compromises may need to be accepted.

The outcomes of this study therefore make meaningful contributions to both the international tax system and to individual jurisdictions. These may be expressed in the following recommendations:

The first recommendation of this study is that the inconsistent identity ascribed to crypto-assets by individual jurisdictions be addressed through the adoption of explicit and globally consistent positions on identity. As concluded in this study, the crypto-assets analysed within the sample should be recognised as negotiable debt instruments if they incorporate an enforceable right of

redemption, and as intangible assets in all other instances. There should be an explicit and consistent position that crypto-asset tokens do not represent fiat currency. Individual jurisdictions should align themselves with these positions. Where designation of crypto-assets in other contexts, such as designation as a security for the purposes of regulation, makes these distinctions unclear, this should be clarified.

The second recommendation of this study is that a globally coordinated approach to the taxation of crypto-asset token transaction should be pursued by the international tax community. This might culminate in the publication by the OECD of an explicit position paper on the direct tax consequences of crypto-asset token transactions in the context of the international tax system, the findings of which could take into account the conclusions of this study. Global consistency would also be furthered by specifically addressing within the models and commentaries those crypto-asset transactions identified by this study as likely to exacerbate existing differences in the application of contentious articles such as those of royalties, fees for technical services and other income. Again, such considerations should take into account the conclusions reached in this study.

An alternative to pursuing these recommendations through the model conventions and commentaries may be through a supplementary protocol to the MLI addressing cryptocurrency. The MLI itself was intended as an efficient means of effecting changes to the existing network of treaties, and makes provision for the subsequent addition of supplementary protocols.[599] This approach will however only be effective to the extent that jurisdictions are signatories to the MLI. Perhaps most notably in this context, the USA is not currently a signatory to the MLI. In addition, many signatories have elected to exclude various existing treaties from their lists of 'covered tax

[599] OECD, "Multilateral Convention to Implement Tax Treaty Related Measures to Prevent Base Erosion and Profit Shifting."

agreements', as well as not to adopt certain provisions of the MLI. Indeed, the OECD has acknowledged that future multilateral efforts would benefit from increased consultation in order to achieve greater consensus prior to implication. Pursuing these recommendations through the MLI cannot therefore be used as a mechanism for bypassing the development of such consensus. In addition, whether the MLI will function as a permanent tool for multilateral treaty amendment or a temporary measure to efficiently address a particular need at a particular point in time remains to be seen.[600]

The third recommendation is that comprehensive guidance outlining the tax consequences of crypto-asset transactions be issued by individual jurisdictions that have not already done so, or that have limited the scope of their guidance to date. Such guidance should focus on addressing each of the ten crypto-asset transaction categories identified within this study, and locating individual transactions within those categories. While this may not address every conceivable current or future transaction, the basis on which this analysis was conducted suggests that it is likely to address those transactions that are most financially significant.

The fourth recommendation is that individual jurisdictions align their legislation and guidance, whether newly-issued in response to or pre-dating this study, to the direct tax consequences of each transaction category proposed in this study. Impetus for such alignment would be greatly strengthened by the adoption of the preceding proposals for a globally coordinated approach by the international tax community. Such alignment by individual jurisdictions would significantly contribute towards foundational principles of tax design such as increased horizontal and inter-

[600] Duff and Gutmann, "General Report."

nation equity, international coherence, stability, and certainty, all of which would in turn contribute to improved taxpayer compliance.

The fifth recommendation is that domestic legislation address considerations that are beyond those addressed by the model conventions. Since the model conventions do not address the timing of recognition of income, domestic legislation should address the timing of recognition of income from origination by sale of crypto-assets, from the payment by employers and receipt by employees of restricted crypto-asset tokens, and from fortuitous issuances and receipts. This study recommends that income from origination by sale be deferred where relevant until a holder's claim is converted to tokens native to the proposed blockchain. The proceeds on disposal by the employer, and remuneration of the employee, should be determined at the date that all restrictions over crypto-assets awarded as remuneration are lifted. Primarily for pragmatic reasons, this study recommends that income arising from a hard fork or airdrop be recognised only on disposal of any tokens received. Similarly, the model conventions do not provide a conclusive basis for distinguishing between capital and revenue income. This should therefore be addressed within domestic legislation and guidance. This study has demonstrated that with respect to most transaction categories a case may be made for either capital or revenue outcomes. These considerations should be reflected in domestic responses. Lastly, consideration should be given within domestic legislation to the extension of jurisdiction-specific concessions to isolated, low-value or non-trade crypto-assets in order to further promote administrability of responses.

Finally, this study makes a meaningful contribution to the greater discussion of responses to the digitalised economy. It demonstrates that under the existing approach, with its dependence on the concepts of physical presence and PE, crypto-asset token transactions have the potential to further contribute to the possible base erosion that is already the cause of much concern within the

international tax community. It also demonstrates that the nature of crypto-asset transactions and blockchain technology pose specific challenges to responses to the digitalised economy. The final recommendation of this study is therefore that crypto-asset token transactions be taken into account in further developing appropriate responses to the digitalised economy in order to ensure the efficacy of those responses.

8.3. Areas for future research

While this study has the potential to contribute significantly both to a global approach and to the development of domestic responses to the taxation of crypto-asset token transactions, it addresses only a small fraction of the tax considerations that may arise from the emergence of crypto-assets and blockchain technology. Rich opportunities for future research flow from this study in at least three areas:

8.3.1. Tax administration

As noted previously, this study does not consider issues of tax compliance and tax evasion. The impact of any tax reform, however, including those proposed in this study, depends on effective tax administration to ensure compliance. Meaningful contributions may therefore be made by further study of the extent to which regulatory approaches to crypto-assets may increase tax compliance.

With the growth in the market for crypto-assets has come increasing regulatory scrutiny. Lansky classifies crypto-asset regulation as ranging on a scale from 0 to 5, where 0 indicates no action, 1 the monitoring of developments by a state institution, 2 the issuing of recommendations, 3 the issuing of guidance, 4 the imposition of regulation, and 5 banning in various forms.[601] While one

[601] Jan Lansky, "Possible State Approaches to Cryptocurrencies," *Journal of Systems Integration*, no. 1 (2018): 19–31, https://doi.org/10.20470/jsi.v9i1.335.

of the central original propositions of crypto-assets has been freedom from regulation, opportunities to regulate crypto-assets exist and are being pursued in at least three significant areas.

Crypto-asset ICOs may fall within existing regulations. In his review of the 25 largest markets for ICOs, Kaal found that 12 countries other than the US regulated ICOs.[602] In the US, the Securities Exchange Commission (SEC) has indicated that ICOs would in general fall within securities regulation, although its exclusion of Bitcoin and Ethereum somewhat obscures the clarity of this position.[603]

Crypto-asset exchanges represent another opportunity for regulation. In their survey of over 100 crypto-asset companies, Hileman and Rauchs found that 52% of small exchanges and 35% of large exchanges held formal government licences.[604] The SEC has also provided guidance on the instances in which a crypto-asset exchange will fall within the same regulations as traditional security exchanges.[605]

Likewise, regulation may be pursued through crypto-asset wallet providers. Hileman and Rauchs found that 24% of wallet providers responding to their survey held formal licences, and that all wallets providing centralised exchange between fiat currency and crypto-assets held such licences and performed 'know-your-customer' (KYC) and 'anti-money laundering' (AML) procedures.[606]

[602] Wulf A. Kaal, "Initial Coin Offerings: The Top 25 Jurisdictions and Their Comparative Regulatory Responses (as of May 2018)," *Stanford Journal of Blockchain Law & Policy* 1, no. 1 (2018): 41–63, https://doi.org/10.2139/ssrn.3117224.
[603] David Floyd, "Is Ethereum a Security? SEC Chair Sows Confusion," Investopedia, 2019, https://www.investopedia.com/news/ethereum-security-sec-chair-sows-confusion/.
[604] Hileman and Rauchs, "Global Cryptocurrency Benchmarking Study."
[605] U.S. Securities and Exchange Commission, "Statement on Potentially Unlawful Online Platforms for Trading Digital Assets," 2018, https://www.sec.gov/news/public-statement/enforcement-tm-statement-potentially-unlawful-online-platforms-trading.
[606] Hileman and Rauchs, "Global Cryptocurrency Benchmarking Study."

Even as crypto-assets threaten to displace tax compliance measures within the traditional financial system, opportunities may exist to leverage crypto-asset regulation to promote and enforce tax compliance, such as by introducing mandatory tax reporting and integration with tax administration systems. This intersection between regulation and taxation presents an important area for future research in order to give effect to the recommendations of this study.

8.3.2. Blockchain technology

This study focuses on crypto-asset transactions, which form only a small part of the full potential of blockchain technology. In their book *Blockchain Revolution*, Tapscott and Tapscott explore the possibilities that this technology presents. These include the displacement of trusted institutions as intermediaries, the ability of individuals to truly own and monetise their creative content and even their own data, and the facilitation of a true sharing economy.[607] Any of these developments may provide fruitful areas for future research within the field of taxation.

8.3.3. Recognition of crypto-assets as legal tender

No countries considered in this study recognised crypto-assets as legal tender, and the outcomes of this study support this position. However, in June 2021 El Salvador announced that it was to be the first country in the world to grant Bitcoin legal tender status.[608] While the practical implications of this announcement are currently at an early stage, the tax consequences of this decision merit further research, especially if other countries adopt similar decisions.

[607] Tapscott and Tapscott, *Blockchain Revolution*.
[608] BBC News, "Bitcoin: El Salvador Makes Cryptocurrency Legal Tender," BBC News, 2021, https://www.bbc.com/news/world-latin-america-57398274; BBC News, "World Bank Rejects El Salvador Request for Bitcoin Help," BBC News, 2021, https://www.bbc.com/news/business-57507386.

8.3.4. Responses to the digitalised economy

Finally, as mentioned at the outset of this study, crypto-asset token transactions and blockchain technology represent a particular subset of considerations with respect to the significance of the digitalised economy within the field of taxation. "Reforming the international tax system to address the tax challenges arising from the digitalisation of the economy, restore stability to the international tax framework and prevent further uncoordinated unilateral tax measures has … been a priority of the international community for several years".[609] As is evident from this study, crypto-asset token transactions give rise to significant considerations within both the current and possible future approaches to the allocation of jurisdictional taxing rights. As the OECD's BEPS Project and similar undertakings continue to attempt to align the international tax system with current realities it is important that academic research give voice to these considerations, in order that the responses to the digitalisation of the economy do not themselves fail to take these rapid changes into account.

[609] OECD, "Tax Challenges Arising from Digitalisation – Report on Pillar One Blueprint: Inclusive Framework on BEPS." At 7.

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APPENDIX A: Country-by-country analysis

A.1 Indirect tax treatment of crypto-asset transactions within EU member states

Until recently, the view on the VAT treatment of crypto-assets varied considerably across EU member states. Initially, member states found themselves having to take individual responsibility for determining the appropriate application of the EU's VAT Directive (2006/112) to crypto-asset transactions. This led to significant inconsistency. For example, Belgium, Finland, the UK, and Spain for varying reasons concluded that crypto-asset payments were an exempt supply, while Estonia, Germany and Poland considered them to be a taxable supply.[610]

Consistency in the interpretation of the EU VAT Directive (2006/112) was addressed in the ruling in *Skatteverket v David Hedqvist*, where it was decided that the exchange of crypto-assets for fiat currency was an exempt supply in terms of Article 135(1)(e) of the VAT Directive, which extends to "transactions, including negotiation, concerning currency, bank notes and coins used as legal tender, with the exception of collectors' items, that is to say, gold, silver or other metal coins or bank notes which are not normally used as legal tender or coins of numismatic interest".[611] The court ruled that, although as an exception to the general principle of levying VAT on transactions the article must be interpreted strictly, to exclude crypto-assets on the basis that they are not legal tender when "those currencies have been accepted by the parties to a transaction as an alternative to legal tender and have no purpose other than to be a means of payment", would be to incorrectly "deprive it [Article 135(1)(e) of the VAT Directive] of part of its effect".[612]

[610] Bal, "Bitcoin Transactions : Recent Tax Developments and Regulatory Responses"; Stefano Capaccioli, "A Lawyer's Comment to the European Court of Justice Justice Judgment on Bitcoin VAT Exemption in Europe," 2015, https://cointelegraph.com/news/a-lawyers-comment-to-the-european-court-of-justice-judgment-on-bitcoin-vat-exemption-in-europe.
[611] Case C-264/14, Skatteverket v David Hedqvist, ECLI:EU:C:2015:718. At 6.
[612] Case C-264/14, ECLI:EU:C:2015:718. At 51.

The effect of the ruling is that the exchange of crypto-assets for fiat currency, and the payment of crypto-assets in exchange for goods and services, are exempt from VAT.[613] Following this ruling, various EU countries aligned their VAT approaches accordingly.

The ECJ ruling did not however explicitly address the VAT treatment of crypto-asset mining or the exchange of one crypto-asset token for another, which therefore remains for individual EU member states to determine. It is also limited to crypto-assets that function as virtual currencies. The ECJ ruling, therefore "by no means resolved all issues conclusively, but rather opened up the tax discussion".[614]

While not explicitly addressed, the implication of the ECJ ruling may be that the exemption cited should extend to the exchange of one crypto-asset for another. The characteristics of such an exchange suggest that this would be a supportable outcome.[615]

The majority view is that crypto-asset mining is exempt from VAT due to the lack of an identifiable consumer and the absence of a legal relationship between the supply and consideration. However, an alternative argument may be made that in addition to the network there are identifiable consumers in the form of the two parties to a particular transfer, and that the consideration is not voluntary but a prerequisite to prioritising the processing of the transfer. There may however be an argument that mining should qualify for exemption in terms of Article 135(d) in order to achieve fiscal neutrality with the facilitation of fiat currency transfers.[616]

If VAT is to be levied on crypto-asset transactions, a place of supply needs to be determined. As an electronic service, this will be where the customer is established. In terms of the EU's VAT

[613] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."
[614] Kollmann, "The VAT Treatment of Cryptocurrencies." At 170.
[615] Kollmann.
[616] Kollmann.

implementation regulation, this will be determined with reference to where the customer's landline is installed, the country code of the customer's SIM card, their billing address, the IP address of their device, or their banking details. However, if it is determined that both transferor and transferees are the beneficiaries of crypto-asset mining, determining the country in which they are established creates a complication. This could perhaps be resolved by considering the location of the platform used for the transaction. This would however create an easy opportunity to avoid VAT by selecting a platform in a particular jurisdiction.[617]

A.2 Argentina

Argentina does not recognise crypto-assets as legal tender. In December 2017 Argentina's Income Tax Law was amended to include 'digital currencies' as leading to the same income tax consequences as stocks and bonds. This has the effect of ring-fencing crypto-asset losses from being offset against income from other trades, and Argentine-source crypt-asset losses from being offset against foreign-source crypto-asset profits.[618]

There do not appear to have been any formal pronouncements to date on the indirect tax consequences of crypto-asset transactions in Argentina.

A.3 Australia

The guidance of the Australian Tax Office (ATO), with its clear language and use of examples, is put forward as an example of good guidance for taxpayers.[619] The guidance makes reference to 'cryptocurrency', which it states should be understood to refer to "Bitcoin, or other crypto or digital

[617] Kollmann.
[618] Graciela Rodriguez-Ferrand, "Regulation of Cryptocurrency: Argentina," *Law Library of Congress*, 2018, https://www.loc.gov/law/help/cryptocurrency/argentina.php; Ministerio de Justicia y Derechos Humanos, "Ley 27430 Modificación Del Impuesto a Las Ganancias [Law 27430 Amending the Income Tax Law]" (2017), http://servicios.infoleg.gob.ar/infolegInternet/anexos/305000-309999/305262/norma.htm.
[619] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."

currencies that have similar characteristics as Bitcoin".[620] The guidance addresses crypto-asset payments, exchanges of one token for another, crypto-asset investment, crypto-asset forks, crypto-assets used in business, and remuneration in crypto-assets. The guidance does not explicitly state that the ATO does not regard crypto-assets as fiat currency, but since it refers to the conversion of crypto-assets to fiat currency as a disposal event this is clearly implied.

Crypto-asset mining is not included in the main body of the guidance, but instead a cross-reference is provided to an "ATO Community" discussion thread. The status of this thread is unclear, although the primary contributors appear to be representatives of the ATO. According to this post, a miner must determine whether the activities undertaken constitute the carrying on of a business. If they do, crypto-assets received represent income, while costs incurred may be deducted and assets purchased depreciated. Crypto-assets received constitute trading stock.[621] Australian income tax law allows for both gains and losses on trading stock value movements to be taxed prior to realisation if the taxpayer elects the market selling value method.[622] Losses may be offset against other income, subject to the tests for ring-fencing contained in the 'non-commercial loss' provisions.[623]

A capital gains tax (CGT) disposal event arises from the sale of a crypto-asset for fiat currency or exchange for another crypto-asset, gifting of crypto-assets, or use in the payment for goods and services.[624] For individuals, only 50% of the capital gain is subject to tax if the crypto-asset was

[620] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[621] Australian Taxation Office, "Mining Cryptocurrency - ATO Community," 2019, https://community.ato.gov.au/t5/General-tax/Mining-cryptocurrency/ta-p/4599.
[622] Australian Taxation Office, "Income and Deductions for Business," 2019, https://www.ato.gov.au/Business/Income-and-deductions-for-business/Accounting-for-trading-stock/valuing-trading-stock/.
[623] Australian Taxation Office, "Mining Cryptocurrency - ATO Community."
[624] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."

held for more than 12 months.[625] Capital gains on the disposal of crypto-assets held mainly to purchase goods and services for personal consumption will qualify for exclusion from CGT as a personal use asset up to AUS$10,000. However, selling crypto-assets for fiat currency, or paying with crypto-assets through a "payment gateway or bill payment intermediary" will not qualify for the personal use asset exclusion. Crypto-asset disposals may also not meet this requirement if acquired a long time before the transaction, or if only a small percentage is used for such transactions. The longer crypto-assets are held the less likely they will qualify for the exclusion on disposal. All capital losses on disposal of personal use assets are disregarded.[626] Crypto-assets obtained in mining activities cannot meet the personal use asset requirements on disposal.[627]

The ATO views the theft of crypto-assets or the loss of a user's private key as a disposal in respect of which a capital loss may be claimed, subject to the provision of certain evidence.[628]

Transactions involving crypto-assets held as trading stock for sale or exchange in the ordinary course of business give rise to income rather than CGT. This would include trading businesses, mining businesses and exchanges. The cost of crypto-assets held as trading stock may be claimed as a deduction. No guidance is given as to what may be included in this cost (nor, indeed, as to what may be included in the base cost of crypto-assets held as capital assets). Considerations are provided in determining whether activities constitute a business, as well as in distinguishing investing from trading activity.[629]

[625] Australian Taxation Office, "Capital Gains Tax," 2018, https://www.ato.gov.au/General/Capital-gains-tax/Working-out-your-capital-gain-or-loss/Working-out-your-capital-gain/The-discount-method-of-calculating-your-capital-gain/.
[626] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[627] Australian Taxation Office, "Mining Cryptocurrency - ATO Community."
[628] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[629] Australian Taxation Office.

Businesses that accept crypto-assets in payment for goods and services must include their fair market value in income on receipt. Businesses that are not crypto-asset businesses but use crypto-assets to pay for goods and services must "account for cryptocurrency as you would for other assets or items used in your business".[630] What this practically means is not clarified. However, the cross-reference provided to guidance on the income tax consequences of barter transactions may suggest that any gain or loss on such transactions results in ordinary income.

The ATO also provides guidance on crypto-asset hard forks (which it refers to as 'chain splits'). Holders of crypto-asset investments have no immediate income tax consequences in the event of a hard fork, but recognise a new asset with a cost of nil in respect of the new crypto-asset received. The new crypto-asset may be subject to a CGT discount if held for more than 12 months prior to disposal.[631] There does not appear to be any imputation of the existing crypto-asset's holding period onto the new crypto-asset.

Crypto-assets received in a fork in respect of existing crypto-assets held as trading stock "must be brought to account at the end of the income year".[632] What this means in practice is not clarified.

The ATO guidance also includes an interesting example for determining which is the existing and which is the new crypto-asset in the event of a fork. The ATO views the existing crypto-asset as the one which retains the "same rights and relationships" as prior to the fork. In the ATO's example, Ether is identified as the new crypto-asset in the fork that gave rise to Ether Classic, because Ether Classic continued to recognise in its blockchain the holding of units linked to the so-called 'DAO hack' that were reversed in Ether's blockchain.[633] This view potentially has

[630] Australian Taxation Office.
[631] Australian Taxation Office.
[632] Australian Taxation Office.
[633] Australian Taxation Office; Güçlütürk, "The DAO Hack Explained: Unfortunate Take-off of Smart Contracts."

controversial consequences, since in this instance it is the more mainstream Ether that is assigned a base cost of nil, while the fringe Ether Classic assumes the original base cost. Ether currently trades at approximately 40 times the price of Ether Classic.[634]

Lastly, the ATO clarifies that crypto-assets received in remuneration by an employee should be treated as a fringe benefit and gives rise to tax withholding obligations for the employer.[635]

Australia had previously taken the view that crypto-asset transactions were subject to General Sales Tax (GST, conceptually similar to VAT). However, in 2017 purchases and sales of crypto-assets were excluded from the ambit of GST. However, the definition of 'digital currency' on which the exclusion is based does not encompass tokens which confers rights or privileges to "something else" upon the holder, or the value of which is linked to the value of something else (such a fiat currency).[636]

A.4Austria

The Austrian Ministry of Finance (the Bundesministerium Für Finanzen (BMF)) issued a notice on the taxation of crypto-assets on 25 July 2017. The BMF's notice uses complex language and is challenging to interpret.[637] The view of the BMF is that crypto-assets (or 'virtual currency') are not considered legal tender or financial instruments in Austria. The BMF considers them to be intangible assets, which may be either fixed or current according to the taxpayer's intention.[638]

Profits are generally treated consistently with profit on other operating assets, except in a particular circumstance envisaged by the BMF, in which crypto-assets are temporarily transferred to another

[634] CoinMarketCap, "CoinMarketCap," 2019.
[635] Australian Taxation Office, "Tax Treatment of Cryptocurrencies."
[636] Australian Taxation Office, "GST and Digital Currency."
[637] Bal, "Blockchain, Initial Coin Offerings and Other Developments in the Virtual Currency Market."
[638] Bundesministerium Fur Finanzen, "Steuerliche Behandlung von Kryptowährungen (Virtuelle Währungen) [Tax Treatment of Cryptocurrencies (Virtual Currencies)]; Law Library of Congress, "Regulation of Cryptocurrency Around the World."

user and a greater amount is returned, in which case the difference must be treated as interest. Crypto-asset mining is taxed as the production of an asset. Operating a crypto-asset exchange or automated teller machine (ATM) is taxed as a commercial activity.[639]

For VAT on crypto-assets, Austria follows the EU's 2015 ECJ ruling. It also holds that mining activities are not subject to VAT because of the lack of an identifiable recipient of the activities performed.[640]

A.5 Bulgaria

The Bulgarian courts have ruled that crypto-assets (referring specifically in this instance to Bitcoin) are not legal tender. According to letters issued by the Bulgarian National Revenue Agency, crypto-assets should be treated as financial assets, meaning that profits or losses on sale must be declared for income tax purposes.[641]

As an EU member country, the VAT treatment of crypto-asset transactions is likely to be exempt by virtue of the ECJ's decision in 2015,[642] although to date the Bulgarian tax authority does not appear to have communicated an official position in this regard.

A.6 Canada

On 27 June 2019, the Canada Revenue Agency (CRA) issued its *Guide for cryptocurrency users and tax professionals*. This states that crypto-assets (which it acknowledges as an alternative term

[639] Bundesministerium Fur Finanzen, "Steuerliche Behandlung von Kryptowährungen (Virtuelle Währungen) [Tax Treatment of Cryptocurrencies (Virtual Currencies)]"; Law Library of Congress, "Regulation of Cryptocurrency Around the World."
[640] Bundesministerium Fur Finanzen, "Steuerliche Behandlung von Kryptowährungen (Virtuelle Währungen) [Tax Treatment of Cryptocurrencies (Virtual Currencies)]"; Law Library of Congress, "Regulation of Cryptocurrency Around the World."
[641] Marin Marinov, "Legal and Tax Treatment of Bitcoin in Bulgaria," Ruskov & Colleagues Lawyers, 2017, https://www.ruskov-law.eu/bulgaria/article/legal-tax-treatment-bitcoin.html; Law Library of Congress, "Regulation of Cryptocurrency Around the World."
[642] Marinov, "Legal and Tax Treatment of Bitcoin in Bulgaria."

to Bitcoin, cryptocurrency (which is the default term of the guide) or virtual currency are digital assets that are not legal tender or Canadian securities, and should "generally" be treated as a commodity, giving rise to business income or capital gains. It gives examples of transactions that give rise to tax consequences, being selling, giving as a gift, trading, exchanging, or disposing of one crypto-asset for another, converting to fiat currency or using crypto-assets to pay for goods and services. Transactions using crypto-assets in payment or in exchange for other crypto-assets should be treated as barter transactions.[643]

The guide provides clarification on what might characterise business income or capital gains based on the activities undertaken. It lists examples of crypto-asset business activities, including crypto-asset mining, and examples of transactions leading to capital gains, including disposing of crypto-assets to purchase goods or exchanging them for other crypto-assets (although in the latter example it notes that this presupposes the crypto-assets were held as an investment, and that the transaction could lead to business income if the transaction occurred in the context of conducting a business).[644]

The CRA guide also addresses crypto-asset mining, and recognises both mined crypto-assets and transaction fees. Whether the product of mining activities is capital or revenue in nature depends on whether it is undertaken as a hobby or a business activity.[645]

While crypto-assets held at year-end that are capital in nature should be declared on an adjusted cost basis, crypto-asset trading stock on hand may be taken into account at either the lower of cost or fair market value at year-end, or simply at fair market value at year-end. 'Cost' may include "all reasonable costs" incurred. No guidance is given as to what the CRA might consider 'reasonable',

[643] Canada Revenue Authority, "Guide for Cryptocurrency Users and Tax Professionals."
[644] Canada Revenue Authority.
[645] Canada Revenue Authority.

although, since the CRA encourages records to be kept of the cost of mining hardware, power, pool fees and maintenance costs, presumably these might be considered 'reasonable'.[646]

Finally, the CRA guide addresses General Sales Tax or Harmonised Sales Tax (GST/HST) consequences. It notes that the GST or HST arising from the provision of goods or services should be based on the market value of the crypto-assets received, but does not comment on the GST or HST implications of disposing of crypto-assets.[647] In May 2019, Canada issued a draft amendment to its Excise Tax Act to add 'virtual payment instrument' (the definition of which is consistent with other definitions of 'crypto-asset' or crypto-currency') to its definition of 'financial instrument', thus exempting crypto-assets from GST or HST.[648] It is unclear what the GST or HST consequences of crypto-asset disposals would be prior to the enactment of this amendment.[649]

A.7 Chile

In 2018 the Chilean tax authority issued a letter outlining its position on Bitcoin, digital assets, and cryptocurrencies. It clarified that it did not view them as legal tender. The letter explained that the profits earned in crypto-asset trading were to be included in taxable income, but that crypto-asset transactions were not subject to indirect tax taking into account their incorporeal nature. It also confirmed that it did not view crypto-assets as fiat currency.[650] Specific reference to cryptocurrency was added to the Chilean tax return form in 2019.[651]

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[646] Canada Revenue Authority.
[647] Canada Revenue Authority.
[648] Government of Canada, Draft Legislation Relating to the Excise Tax Act.
[649] Frédéric Pansieri, "Are Bitcoin and Other Cryptocurrencies Subject to GST/HST?," Crowe Soberman LLP, 2019, https://www.crowe.com/ca/crowesoberman/insights/bitcoin-cryptocurrencies-subject-to-gst-hst.
[650] Servicio de Impuestos Internos, "Oficio N°963 - Tributación Que Afecta a Las Rentas Obtenidas En La Compra y Venta de Criptomonedas [Official Letter No. 963 - Taxation Affecting the Income Obtained in the Purchase and Sale of Cryptocurrencies]," 2018, http://www.sii.cl/normativa_legislacion/jurisprudencia_administrativa/ley_impuesto_renta/2018/ja963.htm.
[651] Cali Haan, "Cryptocurrency Gains Officially Taxable in Chile," 2019, https://www.crowdfundinsider.com/2019/01/143527-cryptocurrency-gains-officially-taxable-in-chile/.

A.8 Denmark

In Denmark, crypto-assets are not considered legal currency, nor as a claim, a debt, or a financial instrument, and should be regarded as an asset.[652] In Denmark, gains and losses on the disposal of capital assets are exempt from income tax unless they include a speculative purpose.[653] Guidance issued by the Danish tax authority (Skat) indicates that trading in crypto-assets is generally considered speculative in nature. Crypto-assets should be brought to account on a FIFO basis, although provision is made for possible exceptions. Profits and losses from transactions involving the same crypto-asset may be offset, while profits and losses from different crypto-assets must be separately disclosed. Ceasing to be tax resident in Denmark results in a deemed disposal of crypto-asset inventory on hand. The guidance encourages the obtaining of a tax ruling in areas of uncertainty regarding the taxation of crypto-assets.[654]

The Danish tax authority has communicated its stance on crypto-assets through the publication on its website of a number of advance rulings issued by the Danish Tax Board in regard to the taxation of crypto-assets. In 2014, it ruled that neither invoices nor tax filings could be denominated in bitcoins, since it was not Danish or foreign currency. Income and expenditure denominated in crypto-assets should be valued at the date earned or incurred. Since the Tax Board identified no business basis for the denomination of transactions in crypto-assets, the consequences of subsequent changes in their value as well as transaction fees incurred on conversion could not be considered business income or expenditure. Due to the nature of crypto-assets these gains or losses

[652] Skattestyrelsen, Gevinst ved afståelse af bitcoins [Gain on the disposal of bitcoins], SKM2018.28 skat.dk.
[653] Kjaersgaard and Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives."
[654] Skattestyrelsen, "Bitcoins Og Anden Kryptovaluta [Bitcoins and Other Cryptocurrencies]," 2019, https://skat.dk/skat.aspx?oid=8953.

do not fall within the Capital Gains Act, and since the crypto-assets were not acquired as part of business or speculation, they would not be subject to taxation.[655]

In 2015 the Tax Board ruled on a query from a Danish company that operated a video game within which purchases could be made using virtual currency (the decision does not clarify whether this constituted crypto-assets or some other form of virtual currency). The Tax Board decided that the server on which the game was located outside Denmark did not represent a permanent establishment outside Denmark, because the company acquired only the right of use of the server capacity in terms of the cloud computing rental agreement, and its responsibilities were limited to the content on the server rather than the operation of the server.[656]

In 2016 the Tax Board confirmed the ruling in *Skatteverket v David Hedqvist*, and indicated that because crypto-asset exchange transactions and the commission arising therefrom were exempt from VAT, such commissions should be subject to the payroll tax applicable to businesses in the financial sector. In determining whether a crypto-asset exchange operated in the financial sector, the Tax Board emphasised that the VAT treatment of crypto-assets should be considered rather than the income tax treatment, because of the close connection between VAT and the payroll tax.[657]

In 2017 the Tax Board ruled that the provision of data or 'hashing' capacity on a server, through which customers can store data or create their own blockchains, constituted the provision of an electronic service for VAT purposes. It also ruled that crypto-asset mining falls outside the VAT

[655] Skattestyrelsen, Bitcoins, ikke erhvervsmæssig begrundet, anset for særskilt virksomhed [Bitcoins, not commercially justified, considered separate business], SKM2014.22 skat.dk (2014).
[656] Skattestyrelsen, Fast driftssted - server [Fixed place of business - server], SKM2015.36 skat.dk (2015).
[657] Skattestyrelsen, Momsfritagelse og lønsumsafgift - Køb og salg af Bitcoins [VAT Exemption and Payroll Tax - Buying and selling Bitcoins], SKM2016.83 skat.dk (2016).

Act because of its element of competition and the lack of a counterparty to the transaction. However, it excluded the consideration of VAT on transaction fees from the scope of its ruling.[658]

In the same year the Tax Board ruled that transactions involving Bookcoins – crypto-assets backed by physical silver held in reserve and therefore dependent in value on the price of silver – were distinguishable in nature from bitcoins and should be taxed consistent with legislation applicable to financial contracts, rather than as the sale of commodities. Its reasoning was that although theoretically redeemable for physical silver bars, there was no evidence of the linking of particular silver bars to individual tokens prior to the receipt of a redemption request.[659]

The Board ruled that a taxpayer that had engaged in mining between 2011 and 2013 for the primary purpose of understanding the technology, and who had made a loss due to the high cost of electricity in comparison to the relatively low value at the time of the rewards earned (or would have made a loss if accurate records had been kept), had engaged in a 'hobby business', the result being that any losses could not be set off against other taxable income but only carried forward for future use. The profit arising on the subsequent disposal of the crypto-asset tokens earned would be subject to taxation.[660]

In the same year it also ruled that, even though a taxpayer may have had some other main intention for acquiring crypto-assets, if speculation was a not-insignificant intention, then the resultant profit on disposal was taxable. Whether this was the case should be decided on the objective facts, such as the nature of the asset acquired, the length of time held and the likelihood of earning a profit. In

[658] Skattestyrelsen, Bitcoin mining og tilrådighedsstillelse af datakapacitet - moms og godtgørelse af elafgifter [Bitcoin mining and data capacity provision - VAT and electricity tax reimbursement], SKM2017.45 skat.dk (2017).
[659] Skattestyrelsen, Digital valuta anset for struktureret fordring [Digital currency considered structured receivable], SKM2017.52 skat.dk (2017).
[660] Skattestyrelsen, Afståelse af bitcoins - erhvervet ved mining - hobbyvirksomhed [Divestment of bitcoins - acquired by mining - hobby business], SKM2019.7. skat.dk (2018).

this instance, the increase in crypto-asset prices over the time held was strong evidence of the presence of a speculative intention.[661]

Again considering speculative intention, the Tax Board decided that losses on crypto-assets incurred by a taxpayer purchasing bitcoins in December 2017 and selling them in February 2018 were deductible, because it was reasonable to accept that the taxpayer's motives included a speculative intention given Bitcoin price increases prior to the purchase date, even though no profits ultimately arose.[662]

The Tax Board ruled that a taxpayer who had won Numeraire crypto-asset tokens through participating in a prediction market should be taxed on the value of the award at its grant date, notwithstanding that the taxpayer in entering the prediction market was unaware that the tokens might be awarded. Furthermore, the Tax Board ruled that the Numeraire tokens awarded could not have a value of nil, even though they could not be traded at the date of the award. However, it ruled that the subsequent gain on disposal of the tokens in exchange for Bitcoin and Ether tokens was not taxable because the Numeraire tokens had not been acquired for speculative purposes, since the taxpayer had been unaware of his or her eligibility for the tokens at the time of participating in the prediction market. By contrast, the profit that the taxpayer earned in disposing of the Bitcoin and Ether tokens acquired was taxable, since their acquisition satisfied the 'not insignificant' speculative intention requirement, taking into account that they were not immediately disposed of, that they had no other use and that information as to their likely increase in value was publicly available. The Tax Board ruled that even those Bitcoin and Ether tokens used in payment shortly after their acquisition led to taxable gains. The Tax Board also ruled that

[661] Skattestyrelsen, Gevinst ved afståelse af bitcoins [Gain on the disposal of bitcoins], SKM2018.28 skat.dk.
[662] Skattestyrelsen, Tab ved afståelse af bitcoins [Loss on the abandonment of bitcoins], SKM2018.45 skat.dk (2018).

Bitcoin Cash tokens acquired by the taxpayer in a hard fork from Bitcoin had no tax consequences until disposed of, at which point the profit should be treated as speculative, consistent with the not insignificant speculative intention with which the associated Bitcoin tokens has been acquired. Finally, the Tax Board supported that the FIFO principle should not be applied where specific identification of tokens disposed of was possible. Where this was not possible, FIFO should be applied separately to each type of token disposed of.[663] It clarified in response to a follow-up query that the 'active-for-active' principle could be applied where specific identification was possible.[664]

In a ruling where the taxpayer was able to rebut the presumption of a 'not insignificant' speculative intention, the Tax Board ruled that two bitcoins received from the taxpayer's boyfriend could be disposed of without giving rise to tax consequences, since she had not requested them and was not aware of their value when they were received. As a result, they represented property "of a purely private nature" that had not been acquired for speculative or business purposes and qualified for exemption from income tax.[665]

Finally, the Tax Board ruled that crypto-assets acquired prior to a taxpayer becoming resident in Denmark should be regarded as having a cost equal to their market value on the date the taxpayer becomes resident (subject to any exclusions, such as the crypto-assets having been held by a permanent establishment in Denmark prior to this date).[666]

[663] Skattestyrelsen, Virtuelle valutaer - Bitcoins - Spillegevinst [Virtual currencies - Bitcoins - Gambling winnings], SKM2019.10 skat.dk.
[664] Skattestyrelsen, Virtuelle valutaer - Bitcoins [Virtual Currencies - Bitcoins], SKM2019.67 skat.dk (2019).
[665] Skattestyrelsen, Afståelse af bitcoins modtaget som gave [Abandonment of bitcoins received as a gift], SKM2019.16 skat.dk (2019).
[666] Skattestyrelsen, Værdiansættelse af bitcoins ved tilflytning [Valuation of bitcoins on migration], SKM2019.16 skat.dk (2019).

A.9 Finland

In 2019 Finland issued updated guidance on crypto-assets. In it the term 'virtual currencies' is used, and clarified as being any digital representation of value not issued by a central bank or other authority which can be used as a form of payment, encompassing all virtual currencies, cryptocurrencies and bitcoins. Much of the guidance is based on Finnish case law on crypto-assets. In its introduction, Vero Skatt states that it does not consider crypto-assets to be fiat currency (even if their value is linked to a fiat currency), nor as securities, and treats them as property for tax purposes consistent with case law.

The guidance clarifies that the payment in crypto-assets for goods and services is a realisation event. The cost of crypto-assets realised should be determined on a FIFO basis unless the taxpayer can provide evidence supporting specific identification.[667]

The guide also highlights case law that ruled that the exchange of one crypto-asset for another gives rise to a realisation event. The profit or loss should be determined according to the market value at the time of exchange. If this cannot be determined, the cost price of the crypto-asset given up should be used, and should be regarded as the cost price of the crypto-asset acquired, thus deferring the tax effects of the exchange.[668]

Finally, Vero Skatt clarifies that it considers crypto-asset mining to be a realisation event, meaning that tax consequences arise at acquisition.[669]

The guidance then explains that the calculation of taxable income in Finland depends on whether it is derived from a 'business source' (leading to the application of the *Act on Taxation of Income*

[667] Vero Skatt, "Beskattning Av Virtuella Valutor [Taxation of Virtual Currencies]."
[668] Vero Skatt.
[669] Vero Skatt.

from Business Activities), 'agricultural source' (leading to the application of the *Income Tax Act for farms*) or 'source of other business' (leading to the application of the *Income Tax Act*), which has particular bearing on the deductibility of losses.[670] While the taxpayer's legal form in theory has no bearing on this allocation, in practice the Income Tax Act is usually applied to individuals, while the activities of companies may fall under either Act according to their nature. The detailed guidance is therefore divided into sections for individuals and for companies.[671]

For individuals, the transfer of property gives rise to taxable capital income on any gains arising from the transfer. The exemption for small transfer profits up to EUR 1,000 (available only to natural persons and deceased estates) would extend to crypto-assets gains. In determining taxable income from transactions, individuals can use either the actual cost incurred, or the presumptive cost method, deducting 20% of the selling price, or 40% if the property has been held for at least 10 years.[672]

The guidance addresses both PoW and DPoS crypto-asset mining. Vero Skatt does not consider the rewards of PoW mining to be capital income from property, meaning that is treated as revenue income in terms of the Income Tax Act. However, the subsequent disposal of the tokens acquired is treated as a capital disposal.[673]

Because mining income accrues on acquisition, it should be determined using the market value of each token when received. However, Vero Skatt allows the application of daily or even monthly price averages, as long as the taxpayer's approach is consistent.[674]

[670] The guidance notes however that Finnish acquisition source rules are due to be revised in 2020, at which point its guidance will be updated - see Vero Skatt.
[671] Vero Skatt.
[672] Vero Skatt.
[673] Vero Skatt.
[674] Vero Skatt.

In contrast to PoW mining income, DPoS mining rewards are treated as income from property, leading to a capital gain at acquisition, to the extent that it is attributable to the taxpayer's existing holding in crypto-assets. The value of the tokens received then becomes their cost for the purposes of any subsequent disposal.[675]

Direct expenditure incurred may be deducted from mining income earned. The subsequent spending of mined crypto-assets will give rise to a capital gain on the transfer of property. The guidance includes some discussion on how the proportion of costs such as electricity and computer hardware directly attributable to mining activities should be determined.[676]

Vero Skatt's guidance mentions fees earned for transaction validation in mining activities, although no distinction is made between PoW and DPoS validation for income tax purposes.

Vero Skatt's guidance addresses a number of 'special case' acquisitions. In a crypto-asset hard fork resulting in the acquisition of a new type of crypto-asset, Vero Skatt indicates that the cost of the existing crypto-asset remains unchanged, and that the new crypto-asset tokens received have a cost of nil. Capital gains tax only arises on realisation through transfer. Dividends received in the form of crypto-assets are taxed as dividends in the same way as other *in specie* dividend. Tokens purchased in an ICO are treated as property for the acquiring taxpayer, again giving rise to capital gains only on transfer. Crypto-assets received as a gift or inheritance is taxed consistently with the provisions for the taxation of other forms of property received as a gift or inheritance.[677]

The Finnish guidance then addresses income tax consequences for companies whose crypto-asset transactions arise in the context of its business activities. These activities may include mining,

[675] Vero Skatt.
[676] Vero Skatt.
[677] Vero Skatt.

trading, or accepting crypto-assets in payment, and the resultant income can be categorised as attributable to financing, sales, investment, or fixed assets. For companies, it seems that both PoW and DPoS mining are considered revenue in nature, although the categorisation of that revenue may differ.[678]

Gains and losses for companies arising from crypto-assets held outside of its business activities are taxed as capital gains on property, but do not benefit from the EUR 1,000 exemption or the presumptive cost method. Losses on property may only be set off against gains from property, in either the same or the following five years.[679]

If crypto-assets are held as current assets, it is possible to recognise a write-down for decreases in value in certain circumstances.[680]

For VAT purposes, Finland's treatment is consistent with that of other EU member states.[681]

A.10 France

In 2018, the French Council of State (Conseil d'État) ruled that occasional transactions in crypto-assets give rise to capital gains for individuals, whether in exchange for fiat currency or goods or services, while trading profits fall within the 'industrial and commercial profits regime' and mining within the 'non-commercial profits regime'. It also expressed the view that crypto-assets (in this case bitcoins) were movable intangible property.[682]

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[678] Vero Skatt.
[679] Vero Skatt.
[680] Vero Skatt.
[681] Vero Skatt.
[682] Republique Francaise, "Conseil d'État, 8ème - 3ème Chambres Réunies, No 417809 [Council of State, 8th - 3rd Chambers Gathered, No 417809]," legifrance.gouv.fr, 2018, https://www.legifrance.gouv.fr/affichJuriAdmin.do?idTexte=CETATEXT000036845274; Finances Publiques - Impôts, "Création d'un Régime Fiscal Spécifique Applicable Aux Cessions d'actifs Numériques Réalisées à Titre Occasionnel, Directement Ou Indirectement, Par Les Particuliers [Creation of a Specific Tax Regime Applicable to the Sale of Digital Assets Carried out On," 2019, https://bofip.impots.gouv.fr/bofip/11978-PGP?branch=2.

In 2019, France's General Tax Code was amended to introduce provisions specific to 'digital assets', the definition of which includes tokens that are not financial instruments or certificates of deposit, and which are not guaranteed by a central bank or public authority. Digital assets are viewed as intangible property and not as fiat currency. The first significant consequence of the introduction of these provisions is that the exchange of one crypto-asset for another will no longer be viewed as a taxable event. The rationale provided is due to the "particularly liquid and fungible nature of these assets".[683] The second significant consequence is that annual disposal of less than EUR 305 are excluded from the capital gains tax provisions.[684]

No mention is made of VAT consequences in France, but as an EU member state it would presumably apply the 2015 ruling of the ECJ.

A.11 Germany

In 2018 Germany confirmed its alignment with the judgement in *Skatteverket v David Hedqvist*, and clarified that it viewed this exemption as extending to mining and transaction validation fees even if an identifiable counterparty exists (the former on the basis that it does not represent an exchange of services, and the latter on the basis that the fee represents a voluntary payment), as well as to fees for the provision of crypto-wallets. The fees earned by crypto-asset exchanges will be treated as exempt if the exchange acts as an intermediary, but not if it merely processes data.[685]

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[683] Finances Publiques - Impôts, "Création d'un Régime Fiscal Spécifique Applicable Aux Cessions d'actifs Numériques Réalisées à Titre Occasionnel, Directement Ou Indirectement, Par Les Particuliers [Creation of a Specific Tax Regime Applicable to the Sale of Digital Assets Carried out On."

[684] Finances Publiques - Impôts; Republique Francaise, "Loi N° 2018-1317 Du 28 Décembre 2018 de Finances Pour 2019 - Article 41 [Law No. 2018-1317 of December 28, 2018 of Finance for 2019 - Article 41]," legifrance.gouv.fr, 2019, https://www.legifrance.gouv.fr/affichTexteArticle.do;jsessionid=1504C675C9312E8EAFDB031F93604D44.tplgfr26s_2?idArticle=JORFARTI000037882392&categorieLien=id&cidTexte=JORFTEXT000037882341&dateTexte=.

[685] Bundesministerium der Finanzen, "Umsatzsteuerliche Behandlung von Bitcoin Und Anderen Sog. Virtuellen Währungen [VAT Treatment of Bitcoin and Other so-Called Virtual Currencies]," 2018, https://www.bundesfinanzministerium.de/Content/DE/Downloads/BMF_Schreiben/Steuerarten/Umsatzsteuer/Umsat

Germany also amended its VAT legislation to the effect that crypto-assets (it uses the terms 'virtual currencies' and 'cryptocurrencies') be treated as legal tender if they "serve no purpose other than use as a means of payment" (language borrowed from *Skatteverket v David Hedqvist*).[686] The context implies that this is for the purposes of determining the appropriate VAT treatment, rather than the recognition of crypto-assets as legal tender. The VAT consequences of crypto-assets that serve other purposes are not addressed.

The German tax authority does not appear to have issued detailed guidance on the income tax consequences of crypto-asset transactions.

A.12 Iceland

The Central Bank of Iceland announced in 2014 that crypto-assets (referring specifically to bitcoins) were not fiat currency. The only formal guidance available in Iceland on crypto-assets is contained within guidance to the 2019 tax return for individuals, stating that bitcoins must be included at their year-end market value within "other unlisted assets" on individuals' tax returns.[687]

There do not appear to have been any formal pronouncements to date on the VAT consequences of crypto-asset transactions in Iceland.

A.13 Israel

The Bank of Israel has indicated that is does not consider crypto-assets to be fiat currency.[688] The Israeli Tax Authorities (ITA) have issued two circulars on the taxation of crypto-assets – 05/2018 dealing with basic tax concepts, and 07/2018 dealing with utility tokens and initial coin offerings

zsteuer-Anwendungserlass/2018-02-27-umsatzsteuerliche-behandlung-von-bitcoin-und-anderen-sog-virtuellen-waehrungen.pdf?__blob=publicationFile&v=4.

[686] Bundesministerium der Finanzen.

[687] Ríkisskattstjóri, "Leiðbeiningar Skattframtal Einstaklinga [Instructions Tax Return for Individuals]," 2019, https://www.skatturinn.is/einstaklingar/framtal-og-alagning/framtalsleidbeiningar/2019/; Law Library of Congress, "Regulation of Cryptocurrency Around the World."

[688] Law Library of Congress, "Regulation of Cryptocurrency Around the World."

(ICOs). Unfortunately, both of these circulars are only available in Hebrew and cannot be readily translated, meaning that secondary sources must be relied upon.

In its first circular, the ITA clarified that crypto-assets would be treated as a financial asset, giving rise either to CGT on disposal, or to business income if arising in the context of business, and to VAT. Anyone engaged in crypto-mining is considered a 'dealer' and subject to VAT at 17%. A taxpayer trading in crypto-assets will be classified as a financial institution, meaning that they will be unable to claim VAT on expenses.[689]

In its second circular, the ITA indicated that crypto-asset companies could potentially qualify for preferential tax rates available to technology innovation companies. Companies issuing utility tokens should recognise income under applicable accounting principles, but such recognition may be deferred until the happening of certain events, such as the delivery of the service to which the token entitles the holder or the failure of the development. Utility tokens issued to employees may be taxed at their market value either when granted or when exercised. Utility tokens also fall under the existing VAT law, subject to exceptions, such as being recognised on the accrual basis if the consideration for the ICO was paid in digital tokens.[690]

A.14 Italy

In response to a specific query, in 2016 the Italian Revenue Agency confirmed its application of the ECJ's ruling on VAT exemption for crypto-asset exchange operations. It also indicated that

[689] Law Library of Congress; Matthew Kalman, "Israel Taxman's Guidelines Killing Cryptocurrency Boom?," Bloomberg Tax, 2018, https://perma.cc/J8DE-6AJQ.
[690] EY, "Israeli Tax Authorities Address Issues Regarding Issuance of Utility Tokens, Blockchain Technologies and Cryptocurrencies, Including Related Tax Benefits."

the profits or transaction fees arising from such operations should be subject to both Italy's corporate income tax and regional productions tax.[691]

The statement by the Italian Revenue Agency that taxable income would not arise for individuals engaging in spot transactions in crypto-assets without a speculative purpose has been liberally interpreted to mean that individuals are not taxed on crypto-asset transactions.[692] In response to a specific request the Italian Revenue Agency elaborated that in fact this is an application of CGT legislation to the effect that capital gains do not arise on foreign currency unless the transaction is a forward sale or the taxpayer has an average balance held by the taxpayer exceeds EUR 51,645.29 for at least seven working days within the year of assessment.[693]

A.15 Japan

Limited guidance is available in English from the Japanese National Tax Authority (NTA). However, secondary sources confirm that in December 2017 the NTA communicated to taxpayers the requirement to include crypto-asset profits as 'other income' in their tax returns. This means that such profits are not treated as capital gains, and also restricts the setting off of losses arising against taxable income in other categories.[694]

A.16 Malta

In 2018 the Maltese tax authority published guidance on the direct and indirect tax consequences of crypto-asset transactions. The guidance uses the term 'direct ledger technology' or 'DLT' rather

[691] Agenzia entrante, "Risoluzione N. 72 - Trattamento Fiscale Applicabile Alle Societa Che Svolgono Attivita Di Servizi Relativi a Monete Virtuali [Tax Treatment Applicable to Companies Performing Services Related to Virtual Coins]," 2016, https://www.finaria.it/pdf/bitcoin-tasse-agenzia-entrate.pdf.
[692] see for example the view in "Bitcoin and Taxes: How to Make a Tax Return?," 2018, https://www.mercati24.com/bitcoin-tasse.
[693] Cancelliere and Tardini, "The (Non-Public) Response to Request No. 956-39/2018: Tax Regime Applicable to Cryptocurrencies Held by Individuals Resident in Italy."
[694] Tyton Capital Advisors, "Japan And Tax On Cryptocurrency – Part 1," Tyton Capital Advisors, 2019, https://www.tytoncapital.com/investment-advice-japan/japan-and-tax-on-cryptocurrency-bitcoin/; Law Library of Congress, "Regulation of Cryptocurrency Around the World."

than referring to crypto-assets. The guidance distinguishes between 'coins', which function as a means of payment, and 'financial tokens', which may embody a variety of rights to payment or ownership in assets, and 'utility tokens', which embody rights to goods or services, or to conversion into another token. The guidance also notes that tokens may be a hybrid of these token categories, in which case the tax consequences must be determined according to use.[695]

The income tax consequences of payments received or made in coins, or any salaries paid in coins, are the same as for those made in fiat currency (although it should be noted that the guidance does not cover "electronic money that is representative of fiat currency"). Payments made in financial or utility tokens are treated as payments in kind. Profits from mining, a coin exchange business or coin trading is treated as taxable income, while coins do not fall within the provisions for capital gains. Profits from the transfer of financial or utility tokens in a trading transaction will also be treated as income. Payments received by the holders of financial tokens are treated as income.[696]

Capital transfers of financial tokens only fall within the provisions for capital gains if such tokens meet the definition of 'securities', which might be because they are entitled to payments beyond a fixed rate of return, represent units in a collective investment scheme, or because they are linked to the business of long-term insurance. Capital transfers of utility tokens and convertible tokens that are not financial tokens when they are issued do not fall within the provisions for capital gains.[697]

Funds raised in an ICO are not treated as income by the Maltese tax authority, and the provision of tokens in an ICO is not considered a transfer leading to capital gains tax consequences. The

[695] Office of the Commissioner for Revenue, "Guidelines on the Income Tax Treatment of Transactions or Arrangements Involving DLT Assets."
[696] Office of the Commissioner for Revenue.
[697] Office of the Commissioner for Revenue.

provision of the goods or services that form the basis of the obligation created in the ICO is however viewed as a taxable event, the profit on which leads to taxable income.[698] How such taxable income should be determined is not specified.

The Maltese tax authority's VAT guidance also distinguishes between coins, financial tokens, and utility tokens, although it notes that VAT consequences should ultimately be determined by purpose and context rather than categorisation. The Maltese VAT treatment of coins follows the ruling of the ECJ in *Skatteverket v David Hedqvist*, treating them "like traditional currency used as legal tender".[699]

Fees charged for the provision of a digital wallet will be exempt from VAT if the crypto-asset held in that wallet is a coin, but subject to VAT in other circumstances. A "mere technological service" would also not be exempt from VAT. For mining to be subject to VAT there must be a direct link between the consideration and the supply made by the miner, or reciprocal performance between supplier and recipient. This means that new coins issued to miners will not normally be subject to VAT, but transaction fees will be subject to VAT if charged to a specific counterparty.[700]

If financial token payments fall within the scope of VAT (here the reference to "dividends, interest payments or other rights" suggests that they might not), such payments made to holders may qualify for exemption from VAT if they fall within the definition of 'security transactions'.[701]

The Maltese VAT guidance disaggregates utility tokens into 'single-purpose' and 'multi-purpose' vouchers. The consideration paid for a single-purpose voucher for the supply of a good or service would give rise to VAT consequences if it were known at the time of issue that the place of supply

[698] Office of the Commissioner for Revenue.
[699] Office of the Commissioner for Revenue, "VAT Treatment of Transactions or Arrangements Involving DLT Assets."
[700] Office of the Commissioner for Revenue.
[701] Office of the Commissioner for Revenue.

(that is, of the good or service) would be in Malta. The guidance then states that a multipurpose voucher is one where the place of supply and VAT due are not known at the time of issue, and in this case any VAT consequences would arise only on redemption.[702]

Exchange platforms may be exempt from VAT on their services to the extent that they involve the exchange of 'currency' or 'securities', but would otherwise be subject to VAT.[703]

The Maltese tax authority states that the issue of tokens in an ICO to raise funds would not give rise to VAT consequences, either because the token is a security, or because it does not embody a right to future goods or services, or no value of supply can be established, or it is not possible to determine whether the project will be successful such that it will provide a return to investors. However, where the token issued establishes a right to goods or services, and the consideration can be established, the ICO may give rise to VAT consequences.[704]

A.17 Norway

The Norwegian tax authority (Skatteetaten) in 2013 expressed its view that crypto-assets are regarded as an asset and not as fiat currency, and that any profit from the disposal of crypto-assets is taxable while losses are deductible. Because it is not currency, any such profits do not benefit from the Norwegian exemption applicable to foreign currency used for tourist purposes. At the time, it also took the position that such transactions did not benefit from any exemption from VAT

[702] Office of the Commissioner for Revenue.
[703] Office of the Commissioner for Revenue.
[704] Office of the Commissioner for Revenue.

applicable to financial services.[705] However, in 2017 this position was amended in line with the 2015 ECJ ruling.[706]

In its guidance, Skatteetaten emphasises that its position on VAT applies to crypto-assets that can serve no purpose other than as a means of payment. It also refers to a binding private ruling where it was determined that merely renting out computer power to a miner did not constitute an exempt financial service, and to a statement from the Directorate of Taxes, which in turn refers to deliberations of the EU Commission's VAT Committee, and that expresses a non-definitive view that mining itself should be treated as an exempt financial service.[707]

Guidance on the Skatteetaten website is provided for individuals and for businesses. In the English versions of its guidance, Skatteetaten uses the terms 'digital currency' and 'virtual currency'.

In its guidance to individuals, Skatteetaten indicates that crypto-asset transactions give rise to tax consequences at the point of realisation, including in exchange for other crypto-assets, and therefore have no tax consequences at the date of purchase, unless the acquisition is paid for with other crypto-assets, in which case those crypto-assets given in payment are realised. The market value of all crypto-assets held at year-end must however be declared in the taxpayer's annual tax return. Skatteetaten even provides year-end translation rates for a number of crypto-assets on its website [708]. This declaration is significant, because Norway has an annual wealth tax of 0.7%

[705] Skatteetaten, "Bruk Av Bitcoins – Skatte- Og Avgiftsmessige Konsekvenser [Use of Bitcoins - Tax and Tax Consequences]," 2013, https://www.skatteetaten.no/rettskilder/type/uttalelser/prinsipputtalelser/bruk-av-bitcoins--skatte--og-avgiftsmessige-konsekvenser/.

[706] Skatteetaten, "Bitcoin Er Unntatt Fra Merverdiavgift [Bitcoin Is Exempt from Value Added Tax]," 2017, https://www.regjeringen.no/no/aktuelt/bitcoin-er-unntatt-fra-merverdiavgift/id2538128/.

[707] Skatteetaten, "Tax and VAT Relating to Bitcoin and Other Virtual Currencies"; Skattedirektoratet, "Utvinning Av Kryptovaluta [Cryptocurrency Recovery]," 2018, https://www.skatteetaten.no/en/rettskilder/type/uttalelser/prinsipputtalelser/utvinning-av-kryptovaluta/.

[708] Skatteetaten, "Virtuell Valuta (Kryptovaluta) [Virtual Currency (Cryptocurrency)]," 2019, https://www.skatteetaten.no/en/person/taxes/get-the-taxes-right/shares-and-securities/about-shares-and-securities/digital-currency/; Skatteetaten, "Tax and VAT Relating to Bitcoin and Other Virtual Currencies."

(municipal) and 0.15% (state) applicable to taxpayers with assets exceeding NOK 1.5 million (approximately USD 164 thousand).[709]

Individuals must also recognise income arising from both PoW and DPoS mining activities, less costs incurred and depreciation on assets with a value higher than NOK 15,000. However, individuals must assess whether their mining activities constitute a business, in which case they are redirected to the guidance for businesses.[710]

Gains and losses on disposal of crypto-assets must be included in taxable income, being the selling price, less cost and transaction fees, determined on a transaction-by-transaction basis. This applies equally to purchased and mined crypto-assets. In respect of the latter, the cost price is the market value of the crypto-assets on the date they were mined.[711] Skatteetaten's second guidance document states that there is no obligation to apply the FIFO basis for disposals.[712] While the specific identification is not explicitly stiplutated, this seems to be implied.

All declarations in respect of individuals not conducting a business must be included in the 'Gains, losses, dividends and assets on shares and other financial products' form.[713]

In determining whether the taxpayer has engaged in crypto-asset business activities, consideration is given to duration, scope, likelihood of profit and the bearing of expenditure and risk. Cryptocurrency trades would therefore have to be significant by frequency and value in order to constitute a business. The guidance notes that if the taxpayer trades on behalf of others the business tests are likely to be met more quickly.[714]

[709] Skatteetaten, "Wealth Tax," 2019, https://www.skatteetaten.no/en/rates/wealth-tax/?year=2019.
[710] Skatteetaten, "Virtuell Valuta (Kryptovaluta) [Virtual Currency (Cryptocurrency)]."
[711] Skatteetaten.
[712] Skatteetaten, "Tax and VAT Relating to Bitcoin and Other Virtual Currencies."
[713] Skatteetaten, "Virtuell Valuta (Kryptovaluta) [Virtual Currency (Cryptocurrency)]."
[714] Skatteetaten, "Tax and VAT Relating to Bitcoin and Other Virtual Currencies."

Whether crypto-asset mining is a business will depend on the taxpayer's investment in equipment and the extent of administrative activities performed either by the taxpayer or by someone to whom it is outsourced. Mining on the taxpayer's laptop or where no ongoing administrative follow-up is required is unlikely to be a business activity.[715]

Income from trading or mining conducted as a busines activity must be recognised as income for tax purposes, while costs incurred and losses arising are deductible. It appears that Skatteetaten accepts that crypto-assets mined in a business activity can give rise to a capital gain on their subsequent disposal. However this is not perfectly clear, and is somewhat further obscured by a later reference to an 'enterprise' paying tax on its accumulated net profit, which might be interpreted as arising both from mining and subsequent disposals.[716]

Finally, Skatteetaten states that the nature of ICOs is so diverse that each one must be considered individually in order to determine the correct VAT and income tax consequences.[717]

A.18 Poland

In April 2018 Poland's National Tax Administration (Krajowa Administracja Skarbowa or KAS), issued its interpretation of the application of existing legislation to crypto-assets. Income from the sale or exchange of crypto-assets (included for goods and services) must be declared either as income from property rights or as business income if undertaken by the taxpayer for profit on a continuous basis. Costs incurred to earn such income are deductible.[718]

[715] Skatteetaten.
[716] Skatteetaten.
[717] Skatteetaten.
[718] Krajowa Administracja Skarbowa, "Skutki Podatkowe Obrotu Kryptowalutami w PIT, VAT i PCC -[Tax Consequences of Cryptocurrency Trading in PIT, VAT and PCC]," 2018, https://mf-arch2.mf.gov.pl/en/krajowa-administracja-skarbowa/wiadomosci/aktualnosci/-/asset_publisher/2UWl/content/skutki-podatkowe-obrotu-kryptowalutami-w-pit-vat-i-pcc/pop_up?_101_INSTANCE_2UWl_viewMode=print.

Crypto-asset transactions are also subject to a 1% civil law transactions tax (Podatek od czynności cywilnoprawnych or PCC), unless they are subject to VAT. Poland treats crypto-asset sales and exchanges as an exempt financial service, with a footnote reference to *Skatteverket v David Hedqvist*. It does not clarify what implications this has for exemption from PCC. It does however remind taxpayers that this exemption means that input VAT on costs incurred may not be claimed.[719]

A.19 Portugal

Portugal was one of the countries identified as having communicated a position on the taxation of crypto-assets subsequent to the conclusion of The Law Library of Congress's 2018 study. In August, Partz reported in Cointelegraph that the Portuguese tax authority had ruled that "Bitcoin trading and payments are tax-free" in respect of both VAT and income tax.[720] This, however, seems to be a misinterpretation, as the Portuguese tax authority's ruling refers only to VAT, where it confirms its adoption of the ECJ's 2015 ruling, and extends its interpretation to apply also to crypto-asset mining.[721] No mention is made of income tax in the ruling (although it seems that this was one of the queries of the applicant).

The contrast between 'real' currency and cryptocurrency in the ruling suggests that the Portuguese tax authority does not regard cryptocurrency as fiat currency.[722]

[719] Krajowa Administracja Skarbowa.
[720] Helen Partz, "Portugal Tax Authority: Bitcoin Trading and Payments Are Tax-Free," 2019, https://cointelegraph.com/news/portugal-tax-authority-bitcoin-trading-and-payments-are-tax-free.
[721] Autoridade tributária e aduaneira, "Informação Vinculativa Processo: Nº 14436 [Binding Information Case No: 14436]," 2019, https://www.scribd.com/document/423673715/57-INFORMACAO-14436.
[722] Autoridade tributária e aduaneira.

A.20 Romania

Tax law in Romania was amended with effect from January 2019 to include gains on crypto-asset transactions as 'income from other sources', which is taxable at a rate of 10% . No specific mention appears to be made to crypto-asset mining, and it would therefore appear as if tax consequences only arise on realisation.[723]

No mention is made of VAT consequences in Romania, but as an EU member state it would presumably apply the 2015 ruling of the ECJ.

A.21 Russia

On its website, the Federal Tax Service of Russia clarifies the view that crypto-assets (the translated publication refers to 'cryptocurrency') are regarded in Russia as property rather than currency.[724] In an article drawing attention to a citizen including crypto-asset income in a tax return, the Federal Tax Service also explains that crypto-asset income should be calculated as the difference between the selling price and expenditure incurred in acquisition.[725]

Crypto-asset income has not yet been addressed in Russian tax legislation, although it seems understood that crypto-asset miners are required to pay tax on their income.[726] One approach that may be adopted in the future is to define crypto-asset mining income as finding a thing akin to 'treasure', which would clarify its taxability.[727]

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[723] KPMG Romania, "Tax and Tax Procedure Changes from 2019," KPMG Romania, 2019, https://home.kpmg/ro/en/home/insights/2019/01/schimbari-regim-fiscal-2019-legea-oug-25-2018.html.

[724] Federal Tax Service of Russia, "Налоговая Политика и Практика: Как Исчислить Налог На Прибыль Организаций с Помощью Криптовалюты [Tax Policy and Practice: How to Calculate Corporate Income Tax Using Cryptocurrency]," 2018, https://www.nalog.ru/rn77/news/activities_fts/7816631/.

[725] Federal Tax Service of Russia, "Житель Республики Алтай Впервые Заявил Доход От Купли-Продажи Криптовалют [A Resident of the Altai Republic for the First Time Declared Income from the Sale of Cryptocurrencies]," 2018, https://www.nalog.ru/rn04/news/activities_fts/7566830/.

[726] ICOnow, "Russians Owe 13% Tax on Their Crypto Incomes | ICO List and ICO Rating," 2019, https://iconow.net/russians-owe-13-tax-on-their-crypto-incomes/.

[727] Anatol Antonovici, "Cryptocurrency Might Be Treated as Treasure Under Russia's Tax Code," 2019, https://bitcoinist.com/cryptocurrency-might-be-treated-as-treasure-under-russias-tax-code/.

A.22 Slovakia

In June 2018 Slovakia amended its Income Tax Act to include income arising from crypto-asset (the preferred term in this instance is 'virtual currency') mining or exchange for other crypto-assets or goods or services. It appears that mining income may only be taxed on realisation. Expenditure incurred may be deducted, but may not create a loss. The accompanying guidance on the taxation of crypto-assets indicates that they are not viewed as fiat currency.[728]

As an EU member state Slovakia would presumably follow the ECJ's ruling in regard to VAT on crypto-asset transactions.

A.23 Singapore

In Singapore, crypto-asset transactions are currently subject to GST.[729] However, a draft guide suggests that they will be exempt from GST from 1 January 2020. Crypto-assets pegged in value to fiat currency will be excluded from the exemption, as will fees earned by crypto-asset exchange platforms. Mining services may be treated as a taxable supply where there is an identifiable counterparty, and excluded from GST in other instances.[730]

References to sale of crypto-assets for fiat currency suggest that the Inland Revenue Authority of Singapore does not view crypto-assets as fiat currency, although this is not explicitly stated.

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[728] Ministerstva financií Slovenskej republiky, "Metodické Usmernenie Ministerstva Financií Slovenskej Republiky č. MF/10386/2018-721 k Postupu Zdaňovania Virtuálnych Mien [Guideline of the Ministry of Finance of the Slovak Republic No. MF / 10386 / 2018-721 on the Procedure of Taxation of Virtual Curre," 2018, https://www.mfsr.sk/files/archiv/financny-spravodajca/4577/2/Usmernenie-k-virtualnym-menam.pdf; Finančné riaditeľstvo SR Banská Bystrica, "Informácia o Novele Zákona č . 595 / 2003 Z . z . o Dani z Príjmov v Znení Neskorších Predpisov [Information on the Amendment to Act No. 595/2003 Coll. on Income Tax, as Amended]" (2018), https://www.financnasprava.sk/_img/pfsedit/Dokumenty_PFS/Zverejnovanie_dok/Dane/Novinky_leg/Priame_dane_uct/2018/2018.08.21_Inf_novela_595_zak213_2018.pdf.

[729] Bal, "Bitcoin Transactions : Recent Tax Developments and Regulatory Responses."

[730] Inland Revenue Authority of Singapore, "IRAS E-Tax Guide (Draft) GST: Digital Payment Tokens," 2019, www.mof.gov.sg.

A.24 South Africa

In April 2018, SARS issued a media statement outlining its views on crypto-assets (the statement refers to 'cryptocurrency'). The statement is accompanied by a second document providing answers to 'frequently asked questions'.

According to the SARS statement, crypto-assets do not meet the definition of currency, but would be regarded as an intangible asset for income tax purposes. It indicates that crypto-asset transactions are subject to normal income tax rules, and that the distinction between capital and revenue income tax consequences must be "tested under existing jurisprudence".[731] It then proceeds to specifically contemplate three types of crypto-asset transactions.

In SARS' view, crypto-asset miners have an immediate accrual on any rewards from mining. Although the statement does not explicitly characterise the accrual as revenue in nature, this appears to be implied by the subsequent statement indicating that until such crypto-assets are disposed of they are held as trading stock.[732] It is however unclear whether this categorization is subordinate to the tests for distinguishing between capital and revenue. The reference within the frequently asked questions to someone who mines crypto-assets "as a trade or business" having revenue income[733] may suggest that not all mining income is automatically revenue in nature.

Purchases and sales of crypto-assets in exchange for local fiat currency are identified as the second possible crypto-asset transaction in the SARS statement.[734] No specific guidance is given as to SARS' view of the income tax consequences of such transactions. Consideration must in this instance presumably be given to whether the proceeds on disposal are capital or revenue in nature.

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[731] South African Revenue Service, "SARS's Stance on the Tax Treatment of Cryptocurrencies."
[732] South African Revenue Service.
[733] South African Revenue Service, "FAQs: Cryptocurrencies," 2018, https://www.sars.gov.za/AllDocs/Documents/Legal/FAQs - Cryptocurrencies.pdf.
[734] South African Revenue Service, "SARS's Stance on the Tax Treatment of Cryptocurrencies."

The third transaction is the use of crypto-assets as payment for goods and services. SARS indicates that this should be viewed as a barter transaction subject to the "normal barter transaction rules" for income tax purposes.[735] No guidance is given as to what these rules are, and guidance given by SARS on barter transactions in other contexts focuses primarily on VAT consequences.[736]

The frequently asked questions further clarify that crypto-assets received as remuneration from an employer are subject to employees' tax. They also put forward the view that since crypto-assets are not shares, their cost may not be determined using "the average of the year".[737] This is presumably a reference to paragraph 32 of the Eighth Schedule to the Income Tax Act, which allows the weighted average method to be applied in determining the base cost of financial instruments and participatory interests. The frequently asked questions do not give any guidance as to what costs are considered allowable in respect of base cost inclusions or crypto-asset trade-related deductions.

In 2019, two amendments specific to crypto-assets (although, again, using the term 'cryptocurrency') were made to the Income Tax Act.[738] The first was the inclusion of cryptocurrency within the definition of 'financial instrument'.[739] This has the effect of subjecting crypto-assets to a number of provisions specifically applicable to financial instruments.

Unlike other forms of trading stock, financial instruments (and therefore crypto-assets) held as trading stock may not be written down below cost while on hand; losses are recognised only on realisation. Deductions in respect of the donation of crypto-assets to charitable institutions will be

[735] South African Revenue Service.
[736] See for example South African Revenue Service, "Interpretation Note: No. 70," 2013, https://www.sars.gov.za/AllDocs/LegalDoclib/Notes/LAPD-IntR-IN-2013-03 - IN70 Supplies made for no consideration.pdf.
[737] South African Revenue Service, "FAQs: Cryptocurrencies."
[738] The Income Tax Act was amended in 2021 to refer to crypto-assets.
[739] South Africa, Taxation Laws Amendment Act.

disallowed in terms of section 18A(3B), unless the crypto-asset issuer is "an eligible financial institution as defined in section 1 of the Financial Sector Regulation Act", which seems unlikely at this stage. Expenditure incurred in the creation of crypto-assets cannot qualify for research and development tax incentives under section 11D. The designation as a financial instrument does not however necessarily mean that crypto-assets received for no consideration (as in the case of a crypto-asset fork) have a cost of nil in terms of section 40C, since that section refers to "share, option or right".[740] What the income tax consequences of such an event would be are not addressed.

Designation as a financial instrument also means that crypto-assets not held as trading stock cannot benefit from the personal use asset exclusion from CGT. Any crypto-assets held on capital account that are sold within 45 days before the end of a year of assessment and reacquired within 45 days of the following year of assessment are deemed to be disposed of and reacquired at base cost (see paragraph 42 of the Eighth Schedule to the Income Tax Act).[741] This prevents the realisation of losses prior to year-end, where the intention is to remain a holder of that the same financial instrument.

An interesting potential future development exists for the income tax consequences of crypto-asset transactions for banks and institutions covered by the Financial Markets Act. At present, such institutions may account for the income tax consequences of financial assets and liabilities at fair value if this is consistent with their accounting treatment in terms of International Financial Reporting Standards (IFRS).[742] The designation of crypto-assets as financial instruments does not draw them into the ambit of this provision, since it refers to 'financial assets' and 'financial

[740] South Africa, Income Tax Act.
[741] South Africa.
[742] Phillip De Jager, Shaun Parsons, and Jennifer Roeleveld, "A Commentary on SARS' Proposed Fair Value Tax on Financial Instruments," *South African Journal of Accounting Research* 26, no. 1 (2012): 165–84, https://doi.org/10.1080/10291954.2012.11435168.

liabilities', in respect of both of which it relies on IFRS definitions. However, if those definitions were amended within the applicable financial reporting standards to include crypto-assets, this would have the effect of changing the income tax consequences of crypto-assets for such institutions.

The second amendment to the Income Tax Act was the inclusion of the "acquisition or disposal of any cryptocurrency" within the so-called 'suspect trades' of section 20A of the Income Tax Act.[743] This means that crypto-asset trading losses are far more likely to be ring-fenced than previously. While this amendment was positioned in the accompanying memorandum as a clarification[744], there exists no basis on which crypto-assets could have been interpreted as being included within any of the other suspect trades listed prior to this amendment. The provision applies only to individuals who qualify to be taxed at the highest marginal tax rate and extends only to crypto-assets held as trading stock. It is unclear whether "acquisition and disposal" applies to mining activities, or only to trading in crypto-assets through purchase and sale.

The South African VAT Act has also been amended to add the "issue, acquisition, collection, buying or selling or transfer of ownership of any cryptocurrency" to the definition of 'financial services', which qualifying for exemption from VAT.[745] No basis for the amendment was provided, other than that the intention was to "clarify the existing provisions dealing with cryptocurrencies".[746] Fees charged in respect of crypto-asset exchanges will however be subject to VAT.[747]

[743] South Africa, Taxation Laws Amendment Act.
[744] National Treasury, "Explanatory Memorandum on the Taxation Laws Amendment Bill, 2018," 2018, http://www.sars.gov.za/AllDocs/LegalDoclib/Drafts/LAPD-LPrep-Draft-2018-50a - 2018 DRAFT EXPLANATORY MEMORANDUM TO THE 2018 DRAFT TLAB.pdf.
[745] South Africa, Taxation Laws Amendment Act.
[746] National Treasury, "Explanatory Memorandum on the Taxation Laws Amendment Bill, 2018."
[747] Geneva Group International, "The Taxation of Income from Cryptocurrencies in Various Jurisdictions."

A.25 Spain

The Spanish Supreme Court has ruled crypto-assets to be intangible assets rather than fiat currency.[748]

Spain has addressed the taxation of crypto-assets in a number of binding rulings issued by the General Directorate of Taxes, In a review of these rulings, Náñez Alonso notes that the disposal of crypto-asset investments held by individuals, including in exchange for other crypto-assets, gives rise to capital gains, while the undertaking of crypt-asset mining or the operating of a crypto-asset vending machine represent economic activities giving rise to taxable income.[749] Other binding rulings have indicated that the FIFO principle must be applied to crypto-assets, and that crypto-assets fall outside the Spanish exit tax on emigration.[750]

For VAT, Spain has confirmed in a binding ruling that it follows the ECJ ruling of 2015. Crypto-asset mining will also be treated as exempt from VAT due to the lack of a direct relationship between the services performed and the consideration received.[751]

For the purposes of Spain's wealth tax, crypto-asset holdings must be valued each year on 31 December.[752]

A.26 Sweden

The Swedish tax authority (Skatteverket) issued guidance in 2014 on the taxation of crypto-assets held by an individual not as part of a business activity. In it, Skatteverket indicated that crypto-assets were neither a foreign currency nor a right of claim but should be treated as an asset, which

[748] Náñez Alonso, "Activities and Operations with Cryptocurrencies and Their Taxation Implications: The Spanish Case."
[749] Náñez Alonso.
[750] Geneva Group International, "The Taxation of Income from Cryptocurrencies in Various Jurisdictions."
[751] Náñez Alonso, "Activities and Operations with Cryptocurrencies and Their Taxation Implications: The Spanish Case."
[752] Náñez Alonso.

it likened to fungible property such as gold and other commodities. The disposal of crypto-assets should therefore give rise to a capital gain, whether in return for fiat currency, goods, or services. The cost of crypto-assets disposed of should be determined using the average method.[753]

In 2015, Skatteverket followed this up with guidance on crypto-asset mining, indicating that income from mining would normally constitute a hobby activity, but might in exceptional circumstances be taxed as a business activity. Expenses incurred in a hobby activity can be deducted from income earned from the hobby, but losses are carried forward for up to five years rather than being set off against other income. Even if conducted as a business activity, income arising from subsequent disposal should "normally" be treated as capital in nature. Only if the subsequent disposal is itself conducted as a business activity will the associated income be treated as such.[754]

The defining characteristic of mining as a hobby appears to be that it is conducted to an extent and using equipment such that "profits cannot normally be considered achievable". The guidance gives as considerations the regularity of the operations and the cost-effectiveness of the manner in which they are conducted, the reasonable expectation of a profit over time, and whether the computational capacity is sufficient to produce 25 bitcoins per year.[755]

The 2015 guidance concludes with the view that mining activities are exempt from VAT.[756] This was further addressed in 2018 (and which replaced VAT guidance issued in 2017), when

[753] Skatteverket, "Beskattning Av Bitcoin Och Andra s.k. Virtuella Valutor i Inkomstslaget Kapital [Taxation of Bitcoin and Other so-Called Virtual Currencies in the Type of Income Capital]," 2014, https://www4.skatteverket.se/rattsligvagledning/327766.html?date=2014-04-23&q=virtuella+valutor.
[754] Skatteverket, "Beskattning Vid Mining Av Bitcoin Och Andra Virtuella Valutor m.m. [Taxation on Bitcoin Mining and Other Virtual Currencies Etc.]," 2015, https://www4.skatteverket.se/rattsligvagledning/338713.html?date=2015-04-24&q=virtuella+valutor.
[755] Skatteverket.
[756] Skatteverket.

Skatteverket expressed the view that this interpretation (which it links to the ECJ's 2015 ruling) applied only when the crypto-asset in question could serve no other purpose than as a means of payment. Transactions involving crypto-assets representing other potential use cases need to be separately considered. If the use case related to the provision of a good or service, the crypto-asset should be treated consistent with the treatment for single-function or multi-function vouchers, and may give rise to VAT. In order to represent a means of payment it should be accepted as such by several independent parties.[757]

In its guidance on hobby activities (wherein it repeats its 2014 guidance on mining), the operating of an exchange for crypto-assets is given as an example of a business activity involving crypto-assets.[758]

In 2018, Sweden's Supreme Administrative Court ruled that bitcoins did not represent shares or similar assets because their value did not depend on the economic activity of an underlying entity. Furthermore, it concluded that bitcoins could not be regarded as personal use assets, and therefore 70% of any losses arising were deductible.[759]

A.27 Switzerland

Switzerland is a preferred jurisdiction for the location of crypto-asset creators, particularly in Zug, often referred to as "Crypto Valley" [760]. The Swiss tax authority issued comprehensive guidance for the taxation of crypto-assets in August 2019. The guidance distinguishes between 'native

[757] Skatteverket, "Transaktioner Med Virtuella Valutor, Mervärdesskatt [Virtual Currency Transactions, Value Added Tax]."
[758] Skatteverket, "Verksamheter Av Hobbybetonad Karaktär [Activities of a Hobby-Based Nature]," 2019, https://www4.skatteverket.se/rattsligvagledning/edition/2019.7/331130.html?q=virtuella+valutor.
[759] Skatteverket, HFD, Case No. 2674-18. Divestment of bitcoin, skatteverket.se; Kjaersgaard and Arfwidsson, "Taxation of Cryptocurrencies from the Danish and Swedish Perspectives."
[760] Huber, Guler, and Dumont, "Switzerland By the Same Token: Swiss Tax Questions in the Context of Initial Coin Offerings."

tokens', 'asset-backed tokens' and 'utility tokens'. Although it does not explicitly state that it does not view crypto-assets as fiat currency, in its discussion of property tax it states that native tokens represent intangible assets, while all other tokens represent movable capital assets.[761]

'Native token' refers to a token intended to function as a medium of exchange. For income tax, Switzerland treats gains or losses of individuals utilising native tokens for private purposes as exempt from tax, consistent with the treatment of gains or losses from 'conventional' currencies. Trading gains and losses are however taxable, as is the product of mining if it meets the self-employment criteria.[762]

The guidance then deals with asset-backed tokens. The tax consequences of ICOs involving asset-backed tokens depend on the legal rights and obligations that the token establishes. The guidance disaggregates asset-backed tokens into borrowing tokens, which represent a right to repayment, equity tokens, which represent a right to a share of profits or proceeds on liquidation, and participatory tokens, which represent a right to a proportion of the size of the issuer.

The issuing of borrowing tokens in an ICO does not give rise to income tax consequences for the issuer or holder. Recurring payments or once-off payments on realisation exceeding the issue price must be treated as interest expenditure for the issuer and income for the holder. This also gives rise to withholding tax obligations. Any gains or losses on sale by an individual holding borrowing tokens for private purposes will be treated consistently with a similar gains or losses on traditional securities, being exempt from income tax. Trading gains or losses must be treated as self-employment income.[763]

[761] Schweizerische Eidgenossenschaft, "Kryptowährungen [Cryptocurrencies]."
[762] Schweizerische Eidgenossenschaft.
[763] Schweizerische Eidgenossenschaft.

The guidance makes the point that equity tokens create a right to an annual payment irrespective of whether that payment is actually made. The Swiss tax authority considers equity tokens to be derivative financial instruments. The issuer must recognise the funds raised in an ICO as income, but may recognise an offsetting provision for expenditure representing the obligation to deliver a specific project, as evidenced by its white paper. Once the project goes live, any unutilised provision must be reversed. The guidance also offers an alternative accounting for equity-token ICOs that appears to achieve similar outcomes.[764] There are no immediate income tax consequences for the token acquirer in the ICO. Payments to token holders represent income from moveable assets and are fully taxable. The issuer may deduct such payments, provided that it is able to establish the identity of the recipients. Any payment to the holder on liquidation is also taxable, since the holder does not have a contractual right to such payment (this seems to potentially contradict the Swiss tax authority's definition of an equity token). Payments are not subject to any withholding tax (traditional dividends are subject to a withholding tax of 35%[765]), subject to the proviso that not more than 50% of the tokens are held by shareholders of the issuer, and payments to token holders to do not exceed 50% of earnings before interest and tax. The Swiss tax authority indicates that this might be revisited due to the opportunity for tax evasion that this presents. As with borrowing tokens, capital or trading gains and losses are again treated consistently with those attributable to traditional securities.[766]

As with equity tokens, the Swiss tax authority emphasises that participatory tokens create a contractual right to an annual payment regardless of whether that payment is received, and are

[764] Schweizerische Eidgenossenschaft.
[765] PwC, "Switzerland - Corporate Withholding Taxes," Worldwide Tax Summaries, 2019, http://taxsummaries.pwc.com/ID/Switzerland-Corporate-Withholding-taxes.
[766] Schweizerische Eidgenossenschaft, "Kryptowährungen [Cryptocurrencies]."

regarded as derivative financial instruments. The ICO transaction, any subsequent payments and any capital or trading gains and losses are treated in the same manner as for equity tokens.[767]

The final category that the Swiss guidance addresses is utility tokens. These give the holder rights to services rather than to any payment, and the funds raised in an ICO are used by the issuer for developing those services. As for equity and participatory tokens, the ICO gives rise to income for the token issuer, against which a provision for the development costs of the project required to deliver the promised service may be set off. Any unutilised provision is released when the project goes live. If no payments are made to the holder no subsequent income tax consequences arise for issuer or holder. Any capital or trading gains and losses of the holder are treated in the same manner as for borrowing, equity, and participatory tokens.[768]

For the purposes of the Swiss cantonal wealth tax, all crypto-asset tokens are viewed as movable assets and must be valued annually.[769]

Any salaries received in the form of any type of crypto-asset must be treated as taxable income valued at the time of the inflow.[770]

The Swiss tax authority has not issued any formal position on the VAT implications of crypto-asset transactions. Although Switzerland is not an EU member state, the ruling in *Skatteverket v David Hedqvist* may still be influential in determining VAT treatment.[771]

[767] Schweizerische Eidgenossenschaft.
[768] Schweizerische Eidgenossenschaft.
[769] Schweizerische Eidgenossenschaft.
[770] Schweizerische Eidgenossenschaft.
[771] Huber, Guler, and Dumont, "Switzerland By the Same Token: Swiss Tax Questions in the Context of Initial Coin Offerings."

A.28 United Kingdom

The HMRC issued revised guidance on crypto-assets for individuals in December 2018. The guidance addresses only individuals outside of the context of business, with guidance for businesses and companies due to follow. The comprehensive guidance considers mining, investing, what constitutes a disposal, allowable costs, crypto-asset airdrops and crypto-asset forks, crypto-assets as remuneration, as well as the application of specific capital gains tax provisions. The guidance makes reference to 'crypto-assets', but restricts its scope to the subset of exchange tokens (those intended to function as a medium of exchange), thereby excluding other use cases. The guidance focuses primarily on the application of the existing CGT rules to crypto-assets, with crypto-asset trading falling within the business rules still to be published.[772] The guidance indicates that a trade in crypto-assets would share characteristics similar to those of a trade in shares or securities, and takes the view that only in "exceptional circumstances" is an individual likely to be conducting such a trade.[773]

HMRC considers it possible to engage in mining outside of the definition of a trade, in which case earnings of either reward or transaction fees will be taxed as 'miscellaneous income'. Subsequent disposal of the tokens earned will give rise to capital gains (again assuming this is not conducted as a trade).[774] Interestingly, HMRC's 2018 guidance makes the explicit statement that it does not consider engaging in crypto-asset transactions to be the same as gambling.[775] This is a reversal of a comparison made with respect to mining in its 2014 guidance.[776]

[772] Guidance for businesses was subsequently issued on 20 December 2019, and deals with a range of considerations, including translation, trading, mining, staking, and acceptance in payment. See HMRC, "Cryptoassets Manual."
[773] HMRC, "Cryptoassets for Individuals."
[774] HMRC.
[775] HMRC.
[776] HMRC, "Revenue and Customs Brief 9 (2014): Bitcoin and Other Cryptocurrencies."

Buying and selling crypto-assets other than as a trade would represent an investing activity, leading to capital gains tax on any gains realised on disposal. The guidance clarifies that 'disposal' includes selling for either fiat currency or other crypto-assets, as well as exchanging for goods or services or giving crypto-assets away, but excludes losing access to crypto-assets due to losing a private key or due to fraud or theft. Where crypto-assets previously held as trading stock become capital assets, they are deemed to have been disposed of at market value and reacquired at the same value.[777]

The HMRC guidance also addresses what costs may be added to the cost of a crypto-asset. These include the consideration paid, as well as transaction costs, contract costs and valuation costs, but exclude costs incurred in mining (here too, other than as a trade), since they are not incurred wholly and exclusively to acquire the crypto-asset. The guidance also explains that as a capital asset, crypto-asset costs should be pooled for each type of crypto-asset, as is required for shares and securities, rather than tracked for each individual unit. For example, the cost of all bitcoin tokens held should be pooled, and the cost of all ether tokens should be separately pooled. However, if units of the same crypto-asset are disposed of and reacquired within 30 days, the cost of those units must be kept separate from the pool.[778] The pooling examples in the guidance use exchange tokens, which is consistent with the scope of the guidance, and one may therefore question whether it is not contradictory that HMRC considers legislation that in other contexts applies only to securities to be applicable in this instance to crypto-assets that do not present a security use case.

HMRC's guidance also deals with the income tax consequences of crypto-asset forks. Where a fork results in the holder of an existing crypto-asset owning both the existing and a new crypto-

[777] HMRC, "Cryptoassets for Individuals"; HMRC, "Appropriations from Stock in Trade," Capital Gains Manual - HMRC internal manual, 2016, https://www.gov.uk/hmrc-internal-manuals/capital-gains-manual/cg69220.
[778] HMRC, "Cryptoassets for Individuals."

asset after the fork, the holder's costs pooled in respect of the existing crypto-asset must be apportioned "on a just and reasonable basis" between the existing and new crypto-assets.[779]

Tokens received through an airdrop will not have immediate tax consequences unless they are received in return for or in the expectation of the provision of something in return, in which case miscellaneous income would be recognised. The disposal of such tokens will however lead to capital gains tax. The tokens received in an airdrop will form part of a separate cost pool, unless the recipient already holds units of that crypto-asset, in which case they will be added to the existing cost pool.[780]

Crypto-assets received as remuneration by employees are subject to income tax and give rise to withholding obligations for the employer, as well as any third-party making payment in connection with employment. If the employer is unable to withhold the full amount of tax from the remuneration to be paid, the employer must pay the amount due to HMRC, and the employee must reimburse the employer within 90 days. If, however, the crypto-asset forming the basis of remuneration does not qualify as a 'readily convertible asset', tax does not need to be withheld, and is the obligation of the employee. HMRC does not give an example of a crypto-asset that would fall outside of this definition, but suggests that bitcoins would fall within the definition as they are traded on exchanges. The subsequent disposal of any crypto-assets received as remuneration may give rise to capital gains tax.[781]

Disposals of crypto-assets to connected persons may trigger a deemed disposal at market value, as well as the possibility of the ring-fencing of any losses.[782]

[779] HMRC.
[780] HMRC.
[781] HMRC.
[782] HMRC; HMRC, "Capital Gains Manual," 2019, https://www.gov.uk/hmrc-internal-manuals/capital-gains-manual.

One anomaly that the guidance introduces is that it allows for the possibility that crypto-assets may fall within the scope of so-called 'negligible value claims', where the holder may realise a loss by electing for an asset to be deemed to have been disposed of and reacquired at a price occurring in the market within the current or previous two tax years.[783] This provision ordinarily extends only to shares or securities where the underlying companies meet very specific criteria (such as having conducted business wholly or mainly in the UK throughout the duration of the shareholding),[784] and it is unclear why the guidance would extend this to crypto-assets without the imposition of any similar criteria, especially as the stated scope of the guidance excludes security tokens, and given the potential for abuse that this may present in the context of the significant fluctuations that occur within market prices for crypto-assets.

UK companies and individuals operating a crypto-asset business for the present have only HMRC's 2014 guidance available, although the inconsistencies in comparison to the more recent guidance for individuals suggest that HMRC may reconsider its position on a number of issues when new guidance is issued for businesses.

HMRC advises companies that gains and losses on movements in crypto-asset priced (in this instance the guidance refers exclusively to 'Bitcoin') give rise to income tax consequences similar to fiat currency exchange gains and losses that would arise on differences between a company's functional currency and other currencies.[785] The implication of this appears to be that gains and losses for companies are taxable prior to realisation, although this is not explicitly stated. It is unclear how this interpretation interacts with the statement in 2018 that crypto-assets are not

[783] HMRC, "Cryptoassets for Individuals."
[784] HMRC, "Capital Gains Manual."
[785] HMRC, "Revenue and Customs Brief 9 (2014): Bitcoin and Other Cryptocurrencies."

viewed as fiat currency.[786] Crypto-asset transactions outside of trading profits will be treated as chargeable gains subject to corporation tax.[787]

The only income tax guidance given in 2014 to UK individual taxpayers operating a crypto-asset business is that transactions will be subject to the "normal IT [income tax] rules".[788]

The only income tax guidance given in respect of mining is that it is possible that "a transaction may be so highly speculative that it is not taxable or any losses relievable" with the comparison to gambling being made.[789] This is presumably the view that HMRC has attempted to retract through its 2018 guidance, although the latter is addressed to a different audience, and it is therefore unclear whether this remains a relevant consideration for companies and individuals engaging in mining as a business.

For VAT, the UK follows the ECJ's ruling with respect to the exemption of the exchange of crypto-assets for fiat currency. It also views mining as being not subject to VAT due to an insufficient link between the services performed and the consideration received. Transaction fees, crypto-asset disposals in exchange for goods and services and intermediary fees are also considered exempt from VAT. A caution offered by HMRC, however, suggests that these positions are open to further development.[790]

[786] HMRC, "Cryptoassets for Individuals."
[787] HMRC, "Revenue and Customs Brief 9 (2014): Bitcoin and Other Cryptocurrencies."
[788] HMRC.
[789] HMRC.
[790] HMRC, "Money (Including Transfer of Money) and Related Services: Examples of Services and Products Falling within Item1: Bitcoin and Similar Cryptocurrencies," VATFIN2330 - VAT Finance Manual, 2016, https://www.gov.uk/hmrc-internal-manuals/vat-finance-manual/vatfin2330.

A.29 United States of America

At least in earlier years, the USA was the country most engaged with the tax consequences of crypto-assets.[791] In 2014, The Internal Revenue Service (IRS) issued guidance on the taxation of crypto-assets (although the guidance used the term 'virtual currency'). The IRS's 2014 guidance took the format of a series of 'frequently asked questions' covering the income tax consequences of buying and selling crypto-assets, transacting in crypto-assets in exchange for goods and services, crypto-asset mining and remuneration in crypto-assets, together with definitions and administrative obligations.[792]

The IRS advises that receipts of crypto-assets in exchange for goods and services must be included in gross income and provides a cross-reference to guidance on barter transactions. The amount of the inclusion is the fair market value of the crypto-assets on the date of receipt. Similarly, where payments are made in crypto-assets in exchange for goods and services, the receipt of those goods and services must be included in gross income and the cost of the crypto-asset deducted. In this instance the cross-reference provided is to guidance on 'Sales and Other Dispositions of Assets' rather than to barter transactions.[793]

The extent of the income tax consequences of crypto-asset transactions depends on the intention with which the crypto-assets are held. Gains and losses on either the disposal or exchange of crypto-assets held as capital assets (that is, not as trading stock) benefit from a reduced tax rate if held for more than one year.[794] Crypto-assets held for trading are not treated as capital assets and their disposal results in ordinary gains or losses.[795]

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[791] Bal, *Chapter 14 - How to Tax Bitcoin?*
[792] Internal Revenue Service, "Notice 2014-21."
[793] Internal Revenue Service.
[794] Bal, "US Regulatory Framework for Cryptocurrency Transactions."
[795] Internal Revenue Service, "Notice 2014-21."

The view of the IRS is that mining activities give rise to gross income that must be included on receipt. The IRS also advises that remuneration in crypto-assets is subject to income tax withholding requirements, implying also that such receipts are taxable.[796]

The IRS's 2014 guidance was supplemented in 2019 with Rev. Rul. 2019-24 on hard forks and airdrops, and with answers to a further 43 'frequently asked questions'. Both documents continue the use of the term 'virtual currency'. The general principle applied to hard forks and airdrops is that tax consequences will arise from an 'accession to wealth' when the taxpayer has control over new tokens, and will be measured at the market value of the tokens on receipt. The ruling only considers airdrops in the context of hard forks, being the distribution of the new crypto-asset created in the fork. Not every hard fork will result in an accession to wealth, for example in the case where the exchange managing the taxpayer's crypto-wallet does not support the new crypto-asset.[797]

The IRS's 43 frequently asked questions confirm that the IRS views crypto-assets as property and not fiat currency. The questions then deal with short-term and long-term capital gains and losses on realisation in exchange for fiat currency and the calculation thereof, crypto-assets as remuneration, crypto-assets received or paid in return for goods and services, and the exchange of one crypto-asset for another. It also reiterates the ruling on hard forks and airdrops, adding that any amounts taxed become the subsequent tax base of any crypto-assets received.[798]

Crypto-assets received as a gift do not give rise to income tax consequences until disposal, at which point the determination thereof is based on the donor's cost (or the lower of that cost and the market

[796] Internal Revenue Service.
[797] Internal Revenue Service, "Rev. Rul. 2019-24."
[798] Internal Revenue Service, "Frequently Asked Questions on Virtual Currency Transactions," 2019, https://www.irs.gov/individuals/international-taxpayers/frequently-asked-questions-on-virtual-currency-transactions.

value when received if the determination will result in a loss) plus any gift tax paid by the donor. The holding period is the combined period of the donor and donee. Donations of crypto-assets to charity do not give rise to gains or losses but qualify for deduction based either on the donor's cost or lower of cost and market value if held for less than one year.[799]

The FAQs also address valuation for transactions occurring outside of an exchange and the allowed use of both the specific identification and FIFO methods of accounting for cost.[800]

On 25 July 2019 a bill was proposed in the House of Representatives to exempt the exchange of one crypto-asset for another from the income tax consequences applicable to barter transactions with effect from 1 January 2015. The bill was referred to the House Committee on Ways and Means.[801]

[799] Internal Revenue Service.
[800] Internal Revenue Service.
[801] Ted Budd, "H.R.3963 - To Amend the Internal Revenue Code of 1986 to Allow Exclusion of Gain or Loss on like-Kind Exchanges of Virtual Currency," Pub. L. No. H.R.3963 (2019), https://www.congress.gov/bill/116th-congress/house-bill/3963/text.

APPENDIX B: Analysis of white papers by crypto-asset

B.1 Bitcoin (BTC)

Concept: "…an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party".[802]

Bitcoin remains by a significant margin the largest crypto-asset by market capitalisation. The concepts contained in the Bitcoin white paper are largely familiar, being the crypto-asset on which most analyses of the topic, including those within the field of tax, appear to be based.

Since Bitcoin is the original crypto-asset that introduced blockchain technology into the mainstream and gave birth to the modern proliferation of crypto-assets[803], it is unsurprising that much of the white paper focuses on the technical functionality of the blockchain, together with concepts of decentralisation and transaction validation.

The Bitcoin proposition and the Bitcoin crypto-asset are inextricably linked, being a decentralised peer-to-peer network that facilitates payment in the form of pseudonymous crypto-asset transfers without the need for a trusted third-party intermediary. The Bitcoin crypto-asset token acts as an alternative to traditional forms of money, and the Bitcoin blockchain is a record of all transactions involving the transfer of those crypto-asset tokens.[804]

In addition to functioning as a form of payment, the other two possible taxable events identified from an analysis of the Bitcoin white paper were the introduction of new bitcoins into the ecosystem through the mining process as incentive to miners (commonly referred to as a 'block

[802] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System." At 1.
[803] Marsh & McLennan Companies, FireEye, and Circle, "Crypto-Assets and Blockchain Technology: On the Brink of Legitimacy?"
[804] Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."

reward'), and the incentive offered by Bitcoin users to miners for transaction validation in the form of voluntary transaction fees paid in bitcoins. While block rewards will ultimately come to an end once a finite number of bitcoins have been introduced, transaction fees will continue to function indefinitely as the incentive to miners to support the functioning of the blockchain.[805]

Bitcoin does not have any actions or mechanisms that reduce the supply of tokens in issue. However, if a holder were to lose their private key or the hardware on which their wallet was stored, they would be unable to access any tokens in their wallet, which would effectively remove those tokens from circulation.[806]

B.2 Ethereum/Ether (ETH)

Concept: "The intent of Ethereum is to merge together and improve upon the concepts of scripting, altcoins and on-chain meta-protocols, and allow developers to create arbitrary consensus-based applications that have the scalability, standardization, feature-completeness, ease of development and interoperability offered by these different paradigms all at the same time".[807]

The Ethereum white paper devotes significant discussion to the technicalities of the Bitcoin blockchain. Ethereum white paper author Vitalik Buterin describes Bitcoin as a "state transition system" [808], which takes the system from one state, in which A is the holder of a number of bitcoins, to another, in which A no longer holds those bitcoins and they are instead held by B, to whom they were transferred based on a transaction instruction. Since the complexity of an instruction

[805] Nakamoto.
[806] Bal, "Bitcoin Transactions : Recent Tax Developments and Regulatory Responses."
[807] Buterin, "Ethereum White Paper." At 13.
[808] Buterin. At 5.

increases its size, and the maximum size of a single Bitcoin block is 1Mb, the Bitcoin network is in a practical sense limited to the processing of simple instructions.[809]

Ethereum, by contrast, is designed to harness blockchain technology to process complex instructions – so-called 'smart contracts' and 'decentralised applications'. For this reason, the Ethereum network is sometimes referred to as "the world computer".[810] The Ethereum white paper discusses many use cases of the Ethereum blockchain, which it categorises into financial, semi-financial, and non-financial applications. One important application of the Ethereum blockchain is in acting as a platform for the creation of other crypto-asset tokens.[811]

The function of Ethereum's native crypto-asset, Ether, is to facilitate payment for processing on the Ethereum blockchain. As with Bitcoin, Ethereum instructions are processed by miners. Users pay 'gas' to miners to process transactions. Because instructions can vary in complexity, and could potentially run indefinitely, the payment of gas is mandatory and proportional to the size in bytes of the transaction. Ether is used to pay for gas. While the price in gas for the processing of a transaction instruction of a particular size is fixed, the conversion of Ether to gas fluctuates with the market price of Ether. Ether can also be transferred between parties in a transaction as a medium of exchange.[812] However, it is important to return to the proposition that not all Ethereum applications are financial, and therefore not all transactions involve the transfer of Ether between parties (and indeed, not every financial application need involve the transfer of Ether). Thus, while the Bitcoin proposition and crypto-asset are inseparable, Ethereum is a much broader proposition than the Ether crypto-asset.

[809] Buterin; Bo, "Cracking the Ethereum White Paper."
[810] Bo, "Cracking the Ethereum White Paper."
[811] Buterin, "Ethereum White Paper."
[812] Buterin; Bo, "Cracking the Ethereum White Paper."

Like Bitcoin, new Ether tokens are introduced into the system through the mining process as block rewards. Unlike Bitcoin, Ether is also introduced through other means, including sale, allocation to early contributors, and to an endowment to fund long-term development. While the supply of new Ether tends towards zero over time, it does not have a finite limit.[813] Like Bitcoin, no formal mechanism exists for reducing the supply of Ether in circulation.

B.3 XRP (XRP)

Concept: "RippleNet is a decentralized, global network of banks that send and receive payments via Ripple's distributed financial technology – providing real-time messaging and settlement of transactions".[814]

Ripple's technical white paper of 2014 focuses on the consensus algorithm used by the Ripple ledger, and makes no direct reference to crypto-assets. It does however state its intention to "function as a fast and low-cost global payment network".[815] Its proposition of high-speed transaction processing is rooted in the use of a network of 'trusted nodes' (elsewhere referred to as 'trusted validators') to perform consensus transaction validation, rather than the PoW and DPoS validation used in other blockchains.[816] The Ripple network and XRP use cases are however not discussed in detail in the white paper.

The Ripple network use cases are further elaborated upon in the company's *Solution Overview* document. The company's aim is to create "a single, frictionless experience for global payments" through a "single, global network of banks that send and receive payments via Ripple's distributed

[813] Buterin, "Ethereum White Paper."
[814] Ripple, "Solution Overview: A Comprehensive Business Overview for Financial Institutions on RippleNet," 2017, https://ripple.com/files/ripple_solutions_overview.pdf. At 3.
[815] David Schwartz, Noah Youngs, and Arthur Britto, "The Ripple Protocol Consensus Algorithm," 2014, https://arxiv.org/abs/1802.07242. At 8.
[816] Schwartz, Youngs, and Britto.

financial technology" using Ripple's xCurrent software [817]. The network facilitates both the high-speed clearing of transactions and the transfer of accompanying information, such as know-your-customer (KYC) information and exchange rates. The ecosystem consists of network members (banks and payment providers) and network users (platform businesses, corporate treasury functions, banks and payment providers, and consumers). The document emphasises the low cost and real-time clearing of international transfers, and the technology's data protection capability and elements of banking regulation compliance.[818]

Ripple's *Solution Overview* makes only one reference to XRP, the ecosystem's crypto-asset, stating that it can be used to reduce costs and "access new markets".[819] Further information about XRP is available on the XRP Ledger website. The scope of the comparative analysis for XRP was therefore expanded to include not only the Ripple white paper and *Solution Overview*, but also the 58 subpages on the XRP Ledger site grouped under the *Concepts* tab.

XRP is native to the XRP Ledger. Ripple "acts as a steward" of the ledger rather than owning it, as the ledger has no central authority. XRP is designed to be a "desirable bridge currency that can facilitate trades in any other currency", and Ripple describes it as "part of a new class of money which includes Bitcoin and other cryptocurrencies". XRP can also be sent from one address to another, as well as used to pay for transaction fees incurred in using the Ripple network. Account holders must maintain a minimum balance which cannot be transferred or withdrawn. It can however be consumed by transaction fees.[820]

[817] Ripple, "Solution Overview: A Comprehensive Business Overview for Financial Institutions on RippleNet." At 3.
[818] Ripple.
[819] Ripple. At 24.
[820] Ripple, "XRP Ledger Concepts."

The Ripple network can be used to make both XRP-to-XRP transfers and cross-currency payments, as well as to create cheques and to set aside XRP in escrow until specific conditions are met. In cross-currency payments, XRP may be automatically used to create liquidity between order books in different currencies through a process referred to as 'auto-bridging'. Cheques facilitate deferred payment, and may be either cashed, cancelled, or expire, or may be rejected due to insufficient funds. Unlike cheques, escrow sets aside XRP until the escrow is finished or expires.[821]

Each transaction on the Ripple network incurs a transaction fee, which serves to prioritise transaction processing based on network load, and to discourage 'spamming' the network in an attempt to have invalid transactions recognised. This fee is not paid to any party but is 'destroyed' (although the rate of destruction means that the supply would last for 70 000 years). Transaction senders choose how much to pay in fees, subject to minimum transaction fees. Trusted validators do not receive a fee for validating transactions and maintaining the blockchain ledger, the non-competitive process of which is significantly more efficient than PoW validation. Network participants must select a number of trusted validators, and a transaction occurs only once it is confirmed by 80% of the selected trusted validators. There is therefore no block reward process facilitating the issuance of new XRP. Rather, there is a finite supply of 100 billion XRP. 80 billion XRP was transferred from the individuals behind its creation to Ripple, who in turn placed 55 billion XRP in escrow, to be issued to the market by Ripple at up to 1 billion XRP per month.[822]

The XRP Ledger can be used to transfer currencies other than XRP, which can be either fiat currency or other crypto-assets. Financial institutions act as XRP Ledger Gateways to 'issue currencies' – essentially digital asset IOUs for currency held outside the XRP Ledger, which can

[821] Ripple.
[822] Ripple.

then be transferred to and claimed by the holder of the digital IOU. In such instances the issuer can charge a transfer fee. However, such fees do not apply to XRP, since XRP is native to the system and does not require an issuer. It is also possible for financial institutions to create and charge other fees for transactions that occur outside the XRP Ledger.[823] No mention is made of such fees being payable in XRP.

B.4 Bitcoin Cash (BCH)

Concept: "Bitcoin Cash brings sound money to the world, fulfilling the original promise of Bitcoin as 'Peer-to-Peer Electronic Cash'".[824]

Like Bitcoin, Bitcoin Cash functions as an alternative to fiat currency. Bitcoin Cash is the product of a hard fork from Bitcoin, through which holders of Bitcoin at the time of the fork automatically became holders of Bitcoin Cash tokens.[825] The Bitcoin Cash fork in August 2017 centred on two issues, both related to increasing the ability of the Bitcoin network to accommodate a larger volume of transactions efficiently: unhappiness with the Seqwit2x scaling proposal to be introduced into the Bitcoin code, and support for an increase in block size from 1MB to 8MB.[826] Bitcoin Cash does not have an available white paper, although it provides a link to the Bitcoin white paper, and in numerous places on its website emphasises its connection to Bitcoin.[827]

While Bitcoin Cash has continued to evolve and therefore to further distinguish itself from Bitcoin[828], the underlying proposition and use case remains the same. The crypto-asset therefore

[823] Ripple.
[824] BitcoinCash, "Bitcoin Cash."
[825] BitcoinCash.
[826] Hertig, "Bitcoin Cash: Why It's Forking the Blockchain And What That Means."
[827] BitcoinCash, "Bitcoin Cash."
[828] BitcoinCash.

does not introduce any new potential taxable events that are not already represented in the Bitcoin analysis, except for the hard fork event from Bitcoin.

B.5 Litecoin (LTC)

Concept: "With substantial industry support, trade volume and liquidity, Litecoin is a proven medium of commerce complementary to Bitcoin".[829]

Founded by former Google employee Charlie Lee, Litecoin was released in 2011 and was one of the first forks from Bitcoin.[830] It purports to be able to process transactions faster than Bitcoin due to more frequent block generation.[831]

Litecoin offers improvements to Bitcoin in scalability due to faster block processing times, lower transactions costs, and a total supply limited to four times that of Bitcoin. It also reduces concentration in the mining process [832].

As with Bitcoin Cash, Litecoin does not offer any additional use case propositions to Bitcoin, and therefore does not introduce any new possible taxable events into the analysis other than the hard fork creation event.

B.6 Binance Coin (BNB)

Concept: "Binance will build a world-class crypto exchange, powering the future of crypto finance".[833]

The Binance proposition is the development of a crypto-asset exchange that addresses many of the perceived weaknesses of existing exchanges.[834] Much of the supporting white paper outlines the

[829] Litecoin Project, "Litecoin - Open Source P2P Digital Currency."
[830] Alex Moskov, "What Is Litecoin (LTC)?," 2018, https://coincentral.com/what-is-litecoin/.
[831] Litecoin Project, "Litecoin - Open Source P2P Digital Currency."
[832] Moskov, "What Is Litecoin (LTC)?"
[833] Binance, "Binance Exchange Whitepaper v1.1." At 3.
[834] Binance.

properties of the proposed exchange, as well as the credentials of the founders. According to its website, as of 2020 the Binance exchange supported crypto-asset purchases for fiat currency, crypto-for-crypto exchanges, crypto-asset futures, crypto-asset lending, and crypto-asset staking, which allows holders to participate in DPoS reward systems within the native network of the staked tokens.[835, 836]

The Binance exchange generates (or has the potential to generate) revenue for its corporate owners from exchange, withdrawal, listing, margin, and other fees. While these fees do not have to be paid with the Binance Coin crypto-asset, doing so will qualify for a fee reduction.[837]

The Binance Coin initially utilised the Ethereum blockchain, and subsequently migrated to the native Binance blockchain. The supply of Binance Coins is limited to 200 million. Half of these coins were issued in the Binance ICO on 1 July 2017, 40% are set aside for the founding team (20% of which would be issued up-front, with a further 20% being issued annually over four years), and 10% were issued to angel investors. Binance claims that nine out of ten employees receive a portion of their remuneration in Binance Coins.[838]

Payment of exchange fees in Binance Coins qualifies for a reduced fee structure, which begins at 50% and halves annually over four years, and which ceases in the fifth year.[839] Unlike Ripple, there is no suggestion that Binance Coins used to pay for fees are 'burned' or otherwise

[835] Binance, "What Is Staking?," Binance Academy, 2020, https://www.binance.vision/blockchain/what-is-staking; Binance, "Binance.Com," 2020, https://www.binance.com/en.
[836] For more on the concept of 'staking' and 'staked tokens' see the discussion of EOS below.
[837] Binance, "Binance Exchange Whitepaper v1.1."
[838] Binance Exchange, "10 Ways To Use BNB (Binance Coin)," Medium, 2018, https://medium.com/binanceexchange/10-ways-to-use-bnb-binance-coin-15fe2fbae1ab; Binance, "Binance.Com"; Binance, "Binance Exchange Whitepaper v1.2."
[839] Binance, "Binance Exchange Whitepaper v1.1."

permanently removed from circulation, and are presumably available to the owners of the Binance exchange to be resold.

The 2017 Binance white paper includes the commitment that "Every quarter, we will use 20% of our profits to buy back BNB and destroy them, until we buy 50% of all the BNB (100MM) back".[840] However, Cointelegraph writer Helen Partz noted that in 2019 Binance issued version 1.2 of its white paper, in which it replaced this statement with "Every quarter, we will destroy BNB based on the trading volume on our crypto-to-crypto platform until we destroy 50% of all the BNB". [841, 842] This statement makes no reference to repurchasing coins or the use of profits to do so.

Although these quarterly repurchase events have occurred to date, resulting in a reduction of nearly 11 million tokens by January 2019, commentator Arjun Balaji observes that what is referred to in version 1.2 of the white paper as 'the burn' is not an open market repurchase, nor is it an enforceable commitment to repurchase crypto-assets, nor is there transparency in the determination of the profits on which the reduction in tokens is purportedly based. In addition, these reductions will cease once the total token supply is reduced to 100 million. For these reasons, in Balaji's opinion Binance Coins should not be considered akin to equity instruments.[843]

Once the quarterly reductions in supply cease and the discount in fees expires, it would appear that the Binance Coin will effectively have lost all its unique features. It will presumably still be accepted as payment for fees on the Binance exchange, although not at a discount. Binance also proposes some other possible uses for its crypto-asset, such as use in payment for goods and

[840] Binance. At 9.
[841] Binance, "Binance Exchange Whitepaper v1.2." At 9.
[842] Partz, "Binance Updates White Paper to Reword Section on Quarterly Manipulations with BNB."
[843] Balaji, "So, Is Binance Coin Actually Worth Anything?"

services or "having fun … on social media platforms".[844] Use of Binance as a means of payment has been at least theoretically achieved through its integration with CoinPayments, which facilitates the acceptance of more than 1 000 crypto-assets by more than 2 million participant merchants.[845] However, none of these additional use cases are unique to Binance Coin, and some are clearly tenuous. It would therefore seem that the main function of the Binance Coin is as a source of capital for the development of the Binance exchange,[846] and that its useful life may be limited.

B.7 Tether (USDT)

Concept: "A digital token backed by fiat currency provides individuals and organizations with a robust and decentralized method of exchanging value while using a familiar accounting unit. … we propose a method to maintain a one-to-one reserve ratio between a cryptocurrency token, called tethers, and its associated real-world asset, fiat currency".[847]

The Tether white paper proposes the creation of fiat currency-backed crypto-assets called 'tethers'. Such crypto-asset tokens are typically referred to as 'stablecoins'. While tethers could in theory be issued on the Tether network in respect of any fiat currency, the primary crypto-asset contemplated is the USD Tether (USDT), representing US Dollars, and it is this crypto-asset that is included in the sample for this study. Because the crypto-asset serves to represent an equivalent holding in fiat currency, one unit of the crypto-asset will be equivalent in value to one unit of the equivalent fiat

[844] Binance Exchange, "10 Ways To Use BNB (Binance Coin)."
[845] John P. Njui, "CoinPayments Integrates Binance Coin, BNB Now Accepted by 2.3 Million Merchants - Ethereum World News," 2018, https://ethereumworldnews.com/coinpayments-integrates-binance-coin-bnb/.
[846] Balaji, "So, Is Binance Coin Actually Worth Anything?"
[847] Tether Limited, "Tether: Fiat Currencies on the Bitcoin Blockchain." At 1.

currency.[848] This was found to be the case for USDT according to the price quoted by CoinMarketCap on the date the sample for this study was selected.[849]

USDT tokens (or any other tethers) are issued when a deposit is made with Tether Limited, and USDT tokens may be redeemed for fiat currency from the company. While in circulation, the proposition is that they be used as a payment solution, combining the stability of fiat currency prices with the advantages of crypto-assets, such as cryptographic security, low transaction costs and pseudonymity. While the white paper highlights advantages for users, it also highlights the value proposition for both crypto-asset exchanges and merchants, where the use of USDT could remove the need for those parties to deal directly with fiat currency.[850] USDT cannot be mined,[851] and is removed from circulation when redeemed for fiat currency. Redeemed USDT is held as "authorised but not issued" by Tether Limited. One instance of a notice of the destruction of a portion of such tokens held was identified among the company's announcements.[852] It is not clear why this permanent reduction in supply was made, since supply has no effect on the market price of USDT.

Much of the Tether white paper focuses on the proof of reserves concept necessary to give credibility to the concept of a fiat currency-backed crypto-asset. Tether Limited proposes that it will publish a record of its bank account, which will be audited, while the balance of USDT in circulation can be obtained from the blockchain. That these two balances are equal will serve as proof that the USDT in issue is fully backed by an equivalent holding in fiat currency. The white paper acknowledges the inherent weakness of an asset-backed crypto-asset being the centralisation

[848] Tether Limited.
[849] CoinMarketCap, "CoinMarketCap," 2019.
[850] Tether Limited, "Tether: Fiat Currencies on the Bitcoin Blockchain."
[851] CoinMarketCap, "CoinMarketCap," 2019.
[852] Tether Limited, "Upcoming USDT Redemption – October 24th, 2018."

of risk upon the issuing entity and the associated reintroduction of the need for trust, and discusses its attempts to mitigate such risks.[853]

As part of this study, further investigation of Tether's proof of reserves proposition was conducted. On the 'transparency' page of the Tether website a reconciliation of crypto-assets in issue (USDT, as well as tethers for Euro and Yuan) was present, and indicated either an equivalent holding or a small surplus in 'total assets'. The reconciliation was not dated (although elsewhere the site indicates that a daily reconciliation is published), and presented USD 4.77 billion USDT in circulation in comparison to the USD 4.63 billion according to CoinMarketCap on the same date.[854]

The Tether website also included a link to a lawyer's statement indicating that a comparison of the company's bank account to its crypto-assets in issue had been performed on 1 June 2018 and had been found to be in excess of the USD 2.5 billion of crypto-assets in issue. It is unclear whether any more recent verification has been performed in the intervening period. The lawyer's statement highlights that the procedure did not constitute an audit, and that the total crypto-assets in issue were determined by means of a sworn statement from Tether Limited's Chief Financial Officer and from the company's own website.[855] The fact that the procedures were performed by a legal firm and not by auditors may be linked to the termination in January 2018 of the services of the auditors engaged to perform such procedures. Tether Limited stated that this was due to the company's frustration at the level of detail that the auditors were pursuing.[856]

[853] Tether Limited, "Tether: Fiat Currencies on the Bitcoin Blockchain."
[854] CoinMarketCap, "CoinMarketCap," 2020; Tether Limited, "Tether."
[855] Tether Limited, "Tether."
[856] Marc Hochstein, "Tether Confirms Its Relationship With Auditor Has 'Dissolved,'" 2018, https://www.coindesk.com/tether-confirms-relationship-auditor-dissolved.

Critics of Tether have questioned whether the company is in fact operating on a fractional reserve basis, and draw attention the company's terms of service. They highlight that the Tether website changed its description of reserves backing its crypto-assets in issue from being exclusively fiat currency to "including traditional currency and cash equivalents and, from time to time, may include other assets and receivables from loans made by Tether to third parties, which may include affiliated entities".[857] They also draw attention to stipulations in the company's terms of service that holders do not have a legal or contractual right to enforce redemption of their tokens.[858] However, these terms appear to have been subsequently revised, now stating in 2020 that

> "The right to have Tether Tokens redeemed or issued is a contractual right personal to you. Tether reserves the right to delay the redemption or withdrawal of Tether Tokens if such delay is necessitated by the illiquidity or unavailability or loss of any Reserves held by Tether to back the Tether Tokens, and Tether reserves the right to redeem Tether Tokens by in-kind redemptions of securities and other assets held in the Reserves".[859]

It therefore appears clear that Tether does not hold fiat currency reserves equal to the value of crypto-asset tokens in issue. It is perhaps less clear to what extent token holders have an enforceable right of redemption, and in what form that redemption might be. An announcement on the Tether site dated 27 November 2018 states that direct issuance and redemption from the company's site may be performed, but for a minimum amount of USD 100,000. Withdrawal fees are charged on a sliding scale, increasing from 0.4% to 3% with the size of withdrawal.[860] Clearly,

[857] Tether Limited, "Tether."
[858] Hay, "What Is Tether USDT - A Beginner's Guide."
[859] Tether Limited, "Tether."
[860] Tether Limited, "Tether Reopens Account Verification and Direct Redemption of Fiat from Its Platform."

these limitations prohibit redemption for smaller users, and discourage redemption of the largest amounts.

B.8 EOS (EOS)

Concept: "The EOS.IO software introduces a new blockchain architecture designed to enable vertical and horizontal scaling of decentralized applications. This is achieved by creating an operating system-like construct upon which applications can be built".[861]

The objective of the EOS project centres on the development of a platform that supports the development of decentralised applications.[862] In much the same way as a centralised application requires the processing power of the device on which it is located, decentralised applications require processing power to perform the validation of transactions on a blockchain. For this reason, EOS is sometimes referred to as "an operating system for the blockchain".[863] This operating system is referred to in the EOS.IO white paper as the "EOS.IO software", and on the EOS website as EOSIO.[864] Much of the white paper focuses on the features of this software.

While the concept of facilitating decentralised applications is not unique, EOS purports to offer several advances over rivals such as Ethereum. The most significant of these is the ability to validate larger volumes of transactions at speed and therefore to scale more effectively than PoW blockchains, within which validation occurs through competitive PoW mining. It achieves this speed using validation through DPoS by 'block producers', who provide the processing capacity

[861] block.one, "EOS.IO Technical White Paper V2." At 1.
[862] block.one.
[863] Reed, "What Is EOS and How Does It Work?"
[864] block.one, "EOS.IO Technical White Paper V2"; block.one, "EOSIO - Blockchain Software Architecture," eos.co, 2020, https://eos.io/.

of the EOS blockchain.[865] In each cycle, 21 block producers are selected to non-competitively validate transactions, for which they are rewarded with new EOS crypto-asset tokens. Selection of block producers occurs through a continuous voting system in which all EOS token holders are entitled to participate according to their 'stake', or number of tokens held.[866] In this way, the EOS blockchain is decentralised insofar as all token holders determine who will validate transactions, but partially centralised insofar as there are a limited number of block producers at any one time, validating transactions in a scheduled order.[867]

Although not specifically mentioned in the white paper, EOS crypto-assets were initially distributed through a year-long ICO, which was one of the largest to date.[868] Since the EOS blockchain had not yet been launched, these crypto-assets were created as ERC-20 contracts on the Ethereum blockchain. Holders of these tokens were required to register them, and were then able to exchange them for tokens on the EOS blockchain once it was launched in June 2018, utilising the EOS.IO software. It is these tokens (rather than the ERC-20 tokens that functioned as an advance sale) to which the EOS white paper refers.[869] Subsequent to the ICO, EOS crypto-asset token supply continues to increase through rewards to block producers.[870]

Holders of EOS tokens are entitled to a proportional amount of the EOS blockchain block producers' computational power to run the decentralised applications that they have developed on the platform. Unlike Ethereum, it is token ownership rather than token payment that entitles one

[865] block.one, "EOS.IO Technical White Paper V2."
[866] block.one.
[867] Christine Masters, "EOS Block Producers: Who Are the 21 Large Entities to Secure the Network?," 2018, https://cryptovest.com/news/eos-block-producers-who-are-the-21-large-entities-to-secure-the-network/.
[868] BitDegree, "EOS vs Ethereum: Is EOS a Better Ethereum Alternative?," 2020, https://www.bitdegree.org/tutorials/eos-vs-ethereum/.
[869] Bluabaleno, "EOS Whitepaper Walkthrough: Note and Disclaimer," 2018, https://steemit.com/eos/@bluabaleno/eos-whitepaper-walkthrough-note-and-disclaimer.
[870] block.one, "EOS.IO Technical White Paper V2."

to use of the network. Block producers are therefore rewarded only in the form of new tokens, not in transaction fees from users. This model, the white paper argues, creates a separation between transaction cost and token value, which fluctuates according to market forces, since holding tokens allows the holder indefinite access to the network. Access to proportional capacity of the network is dependent on the number of tokens owned, and users whose capacity entitlement is in excess of their requirements are able to delegate or rent their excess capacity to others.[871]

EOS tokens may be earned for the creation of 'worker proposals', which are developments that benefit all EOS users. Rewards for worker proposals are in the form of new tokens, the allocation of which is determined in voting by EOS holders.[872]

No mention is made in the EOS white paper of token destruction or planned reductions in supply.

B.9 Bitcoin SV (BSV)

Concept: "It restores the original Bitcoin protocol, will keep it stable, and allow it to massively scale. Bitcoin SV will maintain the vision set out by Satoshi Nakamoto's white paper in 2008…".[873]

Bitcoin SV is the third direct derivative of Bitcoin in the selected sample of crypto-assets. It is the product of a hard fork from Bitcoin Cash (itself the product of a hard fork from Bitcoin) on 15 November 2018. The split was led by controversial personality Craig Wright, who claims to be the person operating behind the pseudonym 'Satoshi Nakamoto' and the founder of Bitcoin, although these claims are unproven.[874] 'SV' refers to amendments that purportedly return the

[871] block.one.
[872] block.one.
[873] Bitcoin SV, "BitcoinSV," 2020, https://bitcoinsv.io/.
[874] Ben Brown, "Today's Bitcoin Cash Fork, Explained," 2018, https://blockexplorer.com/news/what-is-bitcoin-cash-fork-november/.

blockchain to ‘Satoshi’s Vision’, and Bitcoin SV positions itself as “the original Bitcoin”.[875] The amendments include the re-enabling of the smart contract functionality disabled within Bitcoin, enhancing stability through limiting the number of changes to network protocols, increasing capacity through larger block size limits, improving security, and pursuing safe instant transactions.[876] Bitcoin SV does not have a white paper of its own, but provides links to the Bitcoin white paper.

Of the distinctive features of Bitcoin SV, only the hard fork event and the enabling of smart contract features exhibit the potential to introduce additional taxable events beyond those arising from the use of Bitcoin, from which its blockchain is derived. Its primary function may therefore be taken to be to act as a payment solution, with the ancillary function of enabling smart contracts. To this end, a third-party analysis of activity on the Bitcoin SV blockchain conducted in July 2019 suggested that over 94% of transactions on the blockchain were the product on an application called ‘WeatherSV’, which collects weather data and captures it on the Bitcoin SV blockchain, using script that facilitates the recording of non-financial information.[877] The WeatherSV website indicates that for a fee of USD 2 a user can receive regular weather updates for a selected location for a period of time. Use of the fee is split between transaction fees and “infrastructure and development”, and the duration of the subscription is therefore dependent on changes in Bitcoin SV prices and transaction fees over time.[878] The payment of the subscription fee appears to take place outside the blockchain, while the on-chain transaction relates to fees for information processing.

[875] Bitcoin SV, “BitcoinSV.”
[876] Bitcoin SV.
[877] Jacob Franek, “Coin Metrics’ State of the Network: Issue 8,” 2019, https://coinmetrics.substack.com/p/coin-metrics-state-of-the-network-4e0.
[878] WeatherSV, “WeatherSV,” 2020, https://weathersv.app/find.

B.10 Monero (XMR)

Concept: "… we study and propose solutions to the main deficiencies of Bitcoin".[879]

Monero is the crypto-asset created using the 'CryptoNote' technology that forms the subject-matter of the CryptoNote white paper. Bytecoin was the first crypto-asset developed using CryptoNote. However, it was alleged that Bytecoin had been secretly pre-mined (that is, its creators had been able to set aside tokens for themselves in advance). This was resolved in 2014 through a hard fork that resulted in the creation of Monero. However, unlike in other hard forks, it appears that Bytecoin holders did not receive Monero tokens, but rather that Monero began from a new genesis transaction while using the same technology underlying Bytecoin.[880] The hard fork would therefore not in this instance represent a possible taxable event and will not be coded as such in this analysis. Subsequent to its creation, Monero has itself been subject to a number of hard forks.[881]

Monero itself is never referenced by name in the CryptoNote white paper. CryptoNote's value proposition is the provision of a solution to a number of perceived weaknesses in the design of Bitcoin. The primary perceived weakness is Bitcoin's inability to facilitate truly untraceable transactions, which CryptoNote claims to offer. Secondary perceived weaknesses that CryptoNote purports to address are the disproportionate control that those with specialised hardware exert within the mining community, the changes in behaviour that the periodic scheduled halving of

[879] Saberhagen, "CryptoNote." At 1.
[880] Jamie Holmes, "Monero's Third Birthday: A Complex History, Promising Future," 2017, https://btcmanager.com/moneros-third-birthday-a-complex-history-promising-future/?q=/moneros-third-birthday-a-complex-history-promising-future/&.
[881] Matthew Willemsen, "5 Monero (XMR) Forks Down, MoneroV (XMV) Soon To Make It 6," 2018, https://cryptocoinspy.com/5-monero-xmr-forks-down-monerov-xmv-soon-to-make-it-6/.

mining rewards cause, the difficulty in changing hardcoded constraints such as block size limits, and the use of 'bulky' script to complete simple operations.[882]

Almost all of the CryptoNote white paper focuses on a technical discussion of the ways in which CryptoNote addresses these shortcomings, such as the use of 'one-time ring signatures' to sign transactions in a way that makes them anonymous and unlinkable (that is, not only are senders and recipients anonymous, but individual transactions cannot be traced to common senders or recipients), and of a memory-bound algorithm applied to PoW mining.[883]

While the CryptoNote white paper is technically complex, the technology does not appear to introduce any new possible taxable events beyond those already identified in other payment solution crypto-assets. Rather than introducing new use cases, the value proposition of Monero clearly relates to its claim to facilitate anonymous and untraceable transactions. For this reason, Monero is a preferred crypto-asset in ransomware attacks, where access to victims' computer systems is held to ransom by attackers. In 2018 it was reported that 44 percent of the demands in ransomware attacks were for payment in Monero.[884]

B.11 Stellar (XLM)

Concept: "This paper introduces a new model for consensus called federated Byzantine agreement (FBA). FBA achieves robustness through quorum slices—individual trust decisions made by each node that together determine system-level quorums. … We also present the Stellar Consensus Protocol (SCP)… Compared to decentralized proof of-work and proof-of-stake schemes, SCP has modest

[882] Saberhagen, "CryptoNote."
[883] Saberhagen.
[884] Kate Rooney, "$1.1B in Cryptocurrency Was Stolen This Year, and It Was Easy to Do," CNBC, 2018, https://www.cnbc.com/2018/06/07/1-point-1b-in-cryptocurrency-was-stolen-this-year-and-it-was-easy-to-do.html.

computing and financial requirements, lowering the barrier to entry and potentially opening up financial systems to new participants".[885]

The Stellar white paper is authored by Professor David Maziéres of Stanford University (although the paper emphasises that this is not in his role as a faculty member), and is very much in the style of an academic paper, with a series of hypotheses and proofs. The objective is to state the case for the Federated Byzantine Agreement (FBA) as applied in the Stellar Consensus Protocol (SCP) as an improvement to PoW and DPoS validation of transactions. The central concept is to allow nodes to be grouped into 'slices' based on their own choices of which other nodes to trust, and for these 'slices' to bring the entire network to consensus.[886]

The Stellar white paper does not discuss what would incentivise participation as a node, and it is therefore unclear whether the SCP creates any novel possible taxable events. Likewise, the paper does not discuss or mention the Stellar crypto-asset or its possible use cases. The only possible taxable events that may be alluded to in the paper are that the existing financial system is fragmented and exclusionary, and that the SCP network might have applications beyond financial transaction validation to validation of other records, such as certificate authorities for websites.[887]

The Stellar website is much more explicit – it states that "Stellar is an open network for storing and moving money" and that its mission is to pursue "Economic stability for everyone".[888] Stellar was founded by Jed McCaleb, who was a co-founder of Ripple , and the two networks share many similarities. Like Ripple, Stellar facilitates the exchange of fiat currencies, with Stellar Lumens acting as the bridge currency when necessary. Transaction validation in Stellar is however not

[885] David Mazieres, "The Stellar Consensus Protocol: A Federated Model for Internet-Level Consensus," 2016, http://www.scs.stanford.edu/17au-cs244b/notes/scp.pdf. At 1.
[886] Mazieres.
[887] Mazieres.
[888] Stellar Development Foundation, "Stellar - an Open Network for Money."

dependent on trusted validators, and transaction fees are lower, which allows it to target developing markets and users for whom the traditional banking system is prohibitively expensive. Stellar also facilitates the exchange of crypto-assets.[889]

Transacting with Stellar incurs a variable transaction fee depending on network capacity, the minimum cost of which is currently 0.00001 XLM. Transaction fees determine the prioritisation of processing when capacity is constrained and are intended to discourage spam transactions. Users are advised to specify the maximum transaction fee that they are willing to pay, and Stellar processes the transaction at the minimum fee necessary to process the transaction, being the lesser of the current transaction fee and the maximum set by the user. Since 28 October 2019 fees collected are retained in the fee pool and are no longer redistributed (although they do not appear to be destroyed). Stellar Nodes do not appear to receive fees or any reward for transaction validation, with the appeal being to non-financial incentives such as direct access to data and support for the growth of the network. A small minimum balance in Stellar Lumens is also required to hold an account.[890]

The total supply of Stellar Lumens amounts to 100 billion tokens, which were created at inception.[891] The Stellar website explains that there was also an annual inflationary increase in supply for a period of time, and that subsequently the overall supply was reduced by vote to 50 billion Stellar Lumens. Of these, about 20 million are available in the market, while the remaining balance are held by the Stellar Lumen Foundation and will be released into the market over time to fund development and the Stellar concept. Stellar Lumens cannot be mined.[892]

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[889] Stellar Development Foundation; Rakesh Sharma, "What Is Stellar Blockchain?," Investopedia, 2019, https://www.investopedia.com/news/what-stellar/.
[890] Stellar Development Foundation, "Stellar - an Open Network for Money."
[891] Stellar Development Foundation.
[892] Stellar Development Foundation, "Stellar Lumens."

The Stellar network also supports the creation of other crypto-assets. The examples given are for the creation of tokenised fiat currencies, much like those facilitated through Ripple. In addition, while acknowledging that Ethereum is traditionally the preferred platform for ICOs, the Stellar network may be used for simpler ICOs that do not require smart contracts.[893]

B.12 UNUS SED LEO (LEO)

Concept: "LEO will be the utility token at the heart of the iFinex ecosystem. Token holders will experience benefits across the entire portfolio and are expected to obtain benefits from future projects, products, and services, …".[894]

The LEO crypto-asset token is a creation of iFinex Inc., which owns the Bitfinex crypto-asset trading platform. Much of the white paper is devoted to establishing the credibility and discussing the many projects undertaken by the company.[895]

While the white paper talks in general terms about the benefits that LEO token holders will receive in respect of current and future iFinex products, the examples provided relate in every instance to reductions in various BitFinex or other iFinex trading platform transaction costs.[896] In this regard, the LEO token is much like the Binance Coin. However, unlike the Binance Coin, fee reductions are granted based on LEO tokens held at the time of the transaction, and the tokens themselves are not used in payment for the transaction fees. This is evidenced by the Bitfinex website, which quotes fees as a percentage of transaction values in USD, and provides reduced percentages according to LEO token holdings.[897]

[893] Stellar Development Foundation, "Stellar - an Open Network for Money."
[894] iFinex Inc., "Initial Exchange Offering of LEO Tokens." At 15.
[895] iFinex Inc.
[896] iFinex Inc.
[897] Bitfinex, "Bitfinex."

LEO tokens were distributed in a private token sale, which the white paper refers to as an Initial Exchange Offering (IEO), on 11 June 2019 at 1 USDT per LEO. (It is interesting to note that both the white paper and the Bitfinex fee page refer to LEO values in USDT rather than USD). Other than with respect to the restriction of participants, this event appears to be indistinguishable from an ICO. However, it has been suggested that IEOs represent the next iteration of the ICO concept.[898] If fewer than 1 billion tokens were taken up, iFinex would reserve the balance for sale by other means.[899] Commentary however suggests that the full allocation of tokens was taken up in the sale.[900]

LEO tokens are to be repurchased and permanently removed from circulation (that is, burned) over time. The monthly repurchase rate will be based on 27% of iFinex's gross revenue in the previous month.[901] Again, this is much like repurchase plans for the Binance Coin. However, unlike the Binance Coin, the white paper proposes that all LEO tokens will ultimately be repurchased, which by implication means that they must be repurchased on the open market. Live tracking of LEO repurchases on the Bitfinex website suggest that this commitment is being honoured at present.[902]

Interestingly, the Bitfinex platform suffered both a hack in 2016, resulting in a loss of a significant number of bitcoins, and the freezing of funds held by a payment processor called 'Crypto Capital' in 2018, both of which the white paper discusses, together with the company's actions in response. In addition to its revenue-based repurchase rate, the white paper commits to repurchase LEO tokens using 95% of any amounts recovered in respect of its Crypto Capital losses, and 80% of any amounts recovered in respect of the bitcoin hack.[903] The frozen funds held by Crypto Capital

[898] Phillips, "Bitfinex LEO Token: The Full Investor's Guide."
[899] iFinex Inc., "Initial Exchange Offering of LEO Tokens."
[900] Phillips, "Bitfinex LEO Token: The Full Investor's Guide."
[901] iFinex Inc., "Initial Exchange Offering of LEO Tokens."
[902] Bitfinex, "Bitfinex."
[903] iFinex Inc., "Initial Exchange Offering of LEO Tokens."

purportedly amounted to USD 850 million, although this amount was not disclosed in the white paper itself.[904]

LEO tokens exist on both the Ethereum and EOS networks.[905]

B.13 Cardano (ADA)

Concept: "… a provably secure proof of stake system".[906]

At the time it was proposed, Cardano purported to be the first DPoS blockchain. Its white paper focuses on proving the viability and integrity of "Ouroboros", the underlying DPoS algorithm.[907] The paper does not mention either Cardano or the associated ADA crypto-asset token by name, and makes no mention of the introduction of a network-specific token. The paper is written in an academic style and is highly technical, which is perhaps understandable given the proposal of a significant shift in transaction processing technology, and is consistent with the originators' underlying philosophy of being scientific and research-based in their approach.[908] Much of Cardano's credibility comes from its co-founder Charles Hoskinson, who was also a co-founder of Ethereum.[909] As with Ethereum, Cardano is intended to be a platform for smart contracts and decentralised applications.[910]

While not discussing the introduction of a crypto-asset token, the white paper does discuss how those involved in transaction validation will be rewarded in a manner comparable to PoW miners. Because transaction validation is randomly assigned rather than competed for, the computational

[904] Phillips, "Bitfinex LEO Token: The Full Investor's Guide."
[905] Phillips.
[906] Kiayias et al., "Ouroboros: A Provably Secure Proof-of-Stake Blockchain Protocol." At 2.
[907] Kiayias et al.
[908] Input Output HK Limited, "Cardano," 2020, https://iohk.io/projects/cardano/.
[909] BitDegree, "Cardano Mining: Complete Guide on How to Mine Cardano Cryptocurrency," 2020, https://www.bitdegree.org/tutorials/cardano-mining/.
[910] Cardano Foundation, "Cardano.Org," 2020, https://www.cardano.org/.

power and energy demands of a DPoS blockchain are significantly less, and its ability to efficiently process large volumes of transactions is improved. Participants will be rewarded for fulfilling the roles of either 'slot leader' or 'slot endorser' during a period of time referred to as a 'slot'. A slot leader issues a new block to be added to the blockchain, while a slot endorser endorses the input to be included in that block. Participants' chances of being chosen to fulfil either of these roles is proportional to their ADA token stake at the time. While roles are assigned in proportion to ADA token holdings, holdings can be delegated to another participant to increase their chances of reward and to reduce the risks associated with fragmentation of the network.[911] Delegation is comparable to joining a mining pool in order to increase one's chance of sharing in a collective reward.[912] Rewards are funded solely by transaction fees from users; no new tokens are introduced into the system through transaction validation.[913]

A 'pre-launch sale event' of ADA tokens was held between September 2015 and January 2017, and was divided into five tranches. The sale was in the form of what Cardano's website refers to as 'vouchers' that could be exchanged for ADA tokens once the Cardano network was launched.[914] The total number of tokens sold is equal to the current circulating supply of ADA tokens quoted by CoinMarketCap.[915]

The primary use of ADA tokens is stated on the Cardano website as sending and receiving digital funds.[916] Transaction fees for Cardano network use are also charged in ADA.[917]

[911] Kiayias et al., "Ouroboros: A Provably Secure Proof-of-Stake Blockchain Protocol."
[912] BitDegree, "Cardano Mining: Complete Guide on How to Mine Cardano Cryptocurrency."
[913] Lars Brünjes, "How Cardano's Transaction Fees Work," 2017, https://cardanofoundation.org/en/news/how-cardano-transaction-fees-work/.
[914] Cardano Foundation, "Cardano.Org."
[915] CoinMarketCap, "CoinMarketCap," 2019.
[916] Cardano Foundation, "Cardano.Org."
[917] Brünjes, "How Cardano's Transaction Fees Work."

There is no suggestion evident of any planned actions, such as a token redemption, that would result in an intended reduction in supply of ADA tokens.

B.14 TRON (TRX)

Concept: "TRON is … dedicated to the establishment of a truly decentralized Internet and its infrastructure. The TRON Protocol, …, offers public blockchain support of high throughput, high scalability, and high availability for all Decentralized Applications (DApps) in the TRON ecosystem".[918]

The TRON proposition of decentralising the internet through the creation of a platform for decentralised applications is very similar to that of Ethereum, and in fact the TRON blockchain code is based on that of Ethereum. Where TRON distinguishes itself from Ethereum is in the implementation of DPoS rather than PoW transaction validation, which increases processing speed and capacity. Two specific use cases of the TRON platform are a native decentralised exchange and the facility to launch new application-level tokens.[919] While TRON's proposition may be a platform for decentralised applications, it appears to be particularly aligned to one particular use case through its acquisition in 2018 of BitTorrent, a decentralised file sharing platform that is a successor to Napster.[920]

The native crypto-asset of the TRON network is the Tronix (TRX) token.[921] TRX tokens were originally created on the Ethereum network as ERC-20 contracts, and redeemed in exchange for native tokens on the TRON blockchain when it was launched. An ICO was held from 31 August to 2 September 2017, during which the sale of 40% of the total supply of TRX raised approximately

[918] TRON Foundation, "Advanced Decentralized Blockchain Platform Whitepaper." At 4.
[919] TRON Foundation.
[920] Crypto Briefing Analyst Team, "What Is Tron? Introduction To TRX."
[921] TRON Foundation, "Advanced Decentralized Blockchain Platform Whitepaper."

USD 70 million.[922] TRX is intimately involved in the process of DPoS mining. TRX holders who 'freeze' their holding for three days are entitled to vote in the election of 27 'super representatives', who take turns to produce blocks for the network. Election of super representatives occurs every six hours. 336,384,000 new TRX tokens are received annually by super representatives in this process. Among other things, super representatives may choose to distribute these rewards to voters. In addition, 168,192,000 TRX are distributed annually to the top 127 super representative candidates in proportion to the votes they received across elections in that year. In order to stand for election as a super representative, the candidate must pay 9,999 TRX, which are burned. In addition to block formation, super representatives also perform governance functions, for example by voting on proposed changes to protocols.[923]

Transactions on the TRON network incur Bandwidth Points (BP). Each account holder receives 5,000 free BP per day, and may acquire further BP by freezing their TRX. If the BP held is insufficient to cover the cost of the transaction, the network will deduct the shortfall from TRX. In addition to funding transfers and candidacy as a super representative, TRX is also needed for account and exchange pair creation within the TRON decentralised exchange, and for creating and issuing a new crypto-asset token on the TRON network. It also functions as a payment solution within the TRON network.[924]

The TRON website lists a number of benefits accruing to TRX holders. In addition to voting and obtaining BP, TRX may be used as a payment solution in a number of contexts – to make purchases on various websites or using the Spend Visa card (although in fact the Spend card converts crypto-

[922] Crypto Briefing Analyst Team, "What Is Tron? Introduction To TRX."
[923] TRON Foundation, "Advanced Decentralized Blockchain Platform Whitepaper."
[924] TRON Foundation.

assets to and from fiat currency to facilitate transactions[925]) to make transfers using the TRX ATM machine, or to purchase new crypto-asset tokens launched on the TRX network. TRX can also be earned by participating in the 'Tronics Support Plan' (about which no further information is available). Finally, TRX holders will be eligible to receive BitTorrent (BTT) tokens in airdrops facilitating the launch of a token specifically targeted at facilitating peer-to-peer payment within the file-sharing platform.[926]

B.15 Dash (DASH)

Concept: "… we propose a series of improvements to Bitcoin resulting in a decentralized, strongly anonymous crypto-currency, with tamper-proof instant transactions and a secondary peer-to-peer network incentivized to provide services to the Dash Network".[927]

Dash is the product of a hard fork from Bitcoin in January 2014.[928] It purports to be an improvement to Bitcoin, focusing specifically on transaction processing and anonymity. The use case for the Dash crypto-asset token itself is not discussed in detail, although it is clear that it is intended to function as a payment solution comparable to Bitcoin.[929]

Dash increases transaction processing times through a secondary network of 'masternodes'. Traditional miners validate the sending and receiving of crypto-assets, for which they participate in 45% of the new tokens issued as block rewards. Masternodes perform the other transactional and governance functions that distinguish the Dash network, and must provide a specified minimum level of service to the network. For this they are rewarded approximately 45% of each

[925] Spend, "Spend Visa Card," 2020, https://www.spend.com/cards/.
[926] Crypto Briefing Analyst Team, "What Is Tron? Introduction To TRX"; TRON Foundation, "TRX."
[927] Duffield and Diaz, "Dash: A PrivacyCentric CryptoCurrency." At 1.
[928] Dash, "Frequently Asked Questions," 2020, https://www.dash.org/faq/.
[929] Duffield and Diaz, "Dash: A PrivacyCentric CryptoCurrency."

total block reward. Rather than competing with one another as in PoW mining, task allocation among masternodes is determined using a pseudo-random algorithm, and their participation is referred to by Dash as 'proof-of-service' (PoSe). To become a masternode, a node must deposit 1,000 Dash tokens, which are returned when the node ceases to be a masternode. At the date of the white paper, there were approximately 2,400 active masternodes.[930]

The remaining 10% of mining block rewards are allocated to the 'budget system'. These tokens are not created until the end of each month, when they are allocated to any proposed improvement to the Dash network that has received at least 10% approval from masternodes, In this way, improvement of the Dash network is self-funded.[931]

Rather than periodically halving its mining rewards, as Bitcoin does, Dash mining rewards are reduced by 7% per annum. As there is a fixed supply of Dash tokens, this means that the supply of new tokens will run out in 2150.[932]

Dash transaction anonymity may be increased through the use of its 'Darksend' protocol, which essentially mixes Dash tokens in the background to obscure their history so that their use cannot be traced. This action is one of those performed by the masternodes.[933] In current documentation from Dash this feature appears to have been renamed 'PrivateSend'.[934] Dash also features an elective facility through which instant transactions may be made.[935]

Standards transactions on the Dash network can in theory be made for free, although a voluntary transaction fee increases the likelihood of inclusion of the transaction by miners in a block. Other

[930] Duffield and Diaz; Dash Core Group Inc, "Mining."
[931] Dash Core Group Inc, "Governance."
[932] Duffield and Diaz, "Dash: A PrivacyCentric CryptoCurrency."
[933] Duffield and Diaz.
[934] Dash Core Group Inc, "Features."
[935] Duffield and Diaz, "Dash: A PrivacyCentric CryptoCurrency."

transactions like PrivateSend incur mandatory fees, while mixing requests within the PrivateSend function are randomly charged a set fee to discourage spamming.[936]

There is no evidence of any planned reduction in the permanent supply of Dash crypto-asset tokens at any point.

B.16 Chainlink (LINK)

Concept: "We propose a solution to the smart contract connectivity problem in the form of ChainLink, a secure oracle network. … Making smart contracts externally aware, meaning capable of interacting with off-chain resources, is necessary if they are going to replace the digital agreements in use today".[937]

The proposition of smart contracts is that they can execute a predetermined action based on the happening or non-happening of some future event, without the intervention of a trusted third party. However, existing networks do not have the ability to interface directly with evidence outside the network to verify the outcome of such events (at least at the date of the Chainlink white paper), meaning that some external intervention is necessary to give effect to the contract. This reintroduces the element of trust and centralisation to the transaction in question. Chainlink proposes a means by which decentralised Chainlink nodes act as 'oracles' that independently interact with the outside world to provide external information to network users. The Chainlink network compares and aggregates the information provided by these nodes to determine the accuracy of information provided. Chainlink was originally built on the Ethereum network, although its website states that it can now interface with a number of different blockchains.[938]

[936] Dash Core Group Inc, "Features."
[937] Ellis, Juels, and Nazarov, "ChainLink: A Decentralized Oracle Network." At 3.
[938] Ellis, Juels, and Nazarov; Chainlink, "Chainlink," 2020, https://chain.link/.

To obtain information from nodes, a user must specify the parameters of a service level agreement (SLA), which nodes can then choose to accept. While the potential for off-chain contracting between users and nodes is envisaged, the initial state of the network seems to focus on the on-chain matching of users and nodes based on the specified parameters of the SLA.[939]

Once the nodes that will act as oracles are determined, they report information to the network, which aggregates this information and reports an aggregated result to the user. The information is also used to update various reputation metrics that allow users to select what they consider to be reliable nodes. Nodes accepting an SLA may be required to deposit an amount which they may forfeit as a penalty for 'misbehaviour' in terms of the SLA[940], although it appears from forum discussions that this feature is not yet active.

Nodes are compensated by users for their service with Link crypto-asset tokens.[941] Link tokens are created as ERC-20 contracts on the Ethereum network. The maximum supply is 1 billion Link tokens, of which 350 million were sold in an ICO in September 2017. A further 350 million tokens were set aside for distribution to node operators, and 300 million for future sale.[942] The current quoted circulating supply suggests that no further tokens have been issued since the ICO.[943] There is no evidence of any planned permanent reductions in supply.

B.17 Tezos (XTZ)

Concept: "Tezos's most powerful feature is its ability to implement protocol capable of self-amendment. … Much like blockchains start from a genesis hash, Tezos starts with

[939] Ellis, Juels, and Nazarov, "ChainLink: A Decentralized Oracle Network."
[940] Ellis, Juels, and Nazarov.
[941] Ellis, Juels, and Nazarov.
[942] Analyst team, "What Is Chainlink? Introduction to LINK Token," 2019, https://cryptobriefing.com/what-is-chainlink-link-token/.
[943] CoinMarketCap, "CoinMarketCap," 2019.

a seed protocol. This protocol can be amended to reflect virtually any blockchain based algorithm".[944]

The Tezos white paper appears to contain a number of concepts that are not fully developed, as well as significant revisions from the original version that are highlighted in red in the current version. This may be attributable to the controversy surrounding Tezos and the significant delay between its proposition in 2014, ICO in July 2017 (when USD 232 million was raised) and eventual blockchain deployment in September 2018. This delay arose from a dispute between founding developers Arthur and Kathleen Breitman and the Tezos Foundation. The Tezos ICO was structured such that it was undertaken by the Swiss-registered Tezos Foundation, which received what it was careful to refer to as 'donations' in support of the project, in return for which donors received tokens as an expression of appreciation. The Foundation would then disburse funds to the developers in terms of an arm's length contractual relationship, and eventually would acquire the developed blockchain. However, a dispute between the Breitmans and the board of the Tezos Foundation resulted in a delay in the release of funds and progress in development. This dispute was largely resolved in 2018, but was sufficient in scale to be dubbed "The crypto world's biggest scandal".[945]

Tezos is another blockchain proposition for the facilitation of smart contracts, with potentially differentiating features. The first differentiating proposition contained in Tezos's white paper is for a blockchain with an on-chain process for suggesting and agreeing on changes to the blockchain's protocols. This is intended to address the issue of disagreements around proposed changes to protocols that lead to hard forks, most notably in the case of Bitcoin. Essentially, the

[944] Goodman, "Tezos – a Self-Amending Crypto-Ledger." At 6 and 8.
[945] Lewis-Kraus, "Inside the Crypto World's Biggest Scandal."

calendar year is divided into quarters or 'cycles', with changes going through processes of proposal, various rounds of voting, development and implementation over four quarters. Holders of Tezos crypto-asset tokens are entitled to vote in these decisions.[946]

The second proposition is DPoS transaction validation. Tezos token-holders are randomly selected to either mine or sign new blocks, with their probability of selection linked to the size of their Tezos holding.[947] Although not mentioned in the white paper, Tezos now refers to the validation process on its website as 'baking', and validators as 'bakers'.[948] In order to be eligible for selection, a candidate must post a security bond, which is held for a cycle and may be forfeited in the event of double-mining or double-signing errors. At the end of the cycle, the bond is returned together with a block reward, as well as transaction fees paid by users. The selection process proposed in the white paper contains particular features that purport to provide protection against manipulation and bad actors in the process.[949] In contrast to other DPoS blockchains, any Tezos holder may participate in validation. If they do not wish to participate, they may delegate their stake to another Tezos holder, and in return may share in rewards received.[950]

In addition to rewards, transaction fees and storage fees are also levied. While transaction fees go to miners, storage fees are burned. This appears to be the only action causing a reduction in supply of Tezos tokens, and it is unclear from the white paper whether there is any maximum limit to the

[946] Goodman, "Tezos – a Self-Amending Crypto-Ledger."
[947] Goodman.
[948] Tezos, "Tezos."
[949] Goodman, "Tezos – a Self-Amending Crypto-Ledger."
[950] Tezos, "Tezos"; Mitra, "What Is Tezos? The Most Updated Deep Dive."

supply of tokens.[951] In January 2020 Tezos announced that they were introducing a 'faucet' to allow developers to obtain real tokens for testing and development purposes.[952]

The third proposition of Tezos is the use of particular programming languages for its network and smart contracts.[953] These features do not appear to introduce any new potential taxable events.

B.18 Ethereum Classic (ETC)

Concept: "… a common vision to continue the original Ethereum blockchain that is truly free from censorship, fraud or third party interference. In realizing, that the blockchain represents absolute truth, we stand by it, supporting its immutability and its future".[954]

Ethereum Classic is the product of a hard fork from Ethereum arising out of the infamous 'DAO Hack' of 2016. When a flaw in the code of a smart contract on the Ethereum blockchain allowed USD 50 million in Ether tokens to be misappropriated, the decision to reverse transactions added to the blockchain in order to return these funds caused a rift within the Ethereum community, with one faction arguing that the essence of the blockchain was that transactions could not be negated by central intervention irrespective of the motivation. This faction chose to fork from Ethereum and continue the unaltered blockchain as Ethereum Classic.[955]

Rather than a white paper, the Ethereum Classic community has published a 'Declaration of Independence', in which they list their grievances, the principle of which is the violation of the principles of immutability of transactions and fungibility of crypto-asset tokens. They also commit

[951] Goodman, "Tezos – a Self-Amending Crypto-Ledger."
[952] Tezos Foundation, "Tezos Foundation Faucet Release," 2020, https://tezos.foundation/news/tezos-foundation-faucet-release.
[953] Goodman, "Tezos – a Self-Amending Crypto-Ledger."
[954] Ethereum Classic Community, "The Ethereum Classic Declaration of Independence." At 1.
[955] Lewis-Kraus, "Inside the Crypto World's Biggest Scandal"; Güçlütürk, "The DAO Hack Explained: Unfortunate Take-off of Smart Contracts."

to a number of principles in the governance of Ethereum Classic, the most overarching of which is perhaps that "code is law".[956]

The Ethereum Classis Declaration of Independence does not purport to introduce any new features to the Ethereum blockchain, and therefore does not appear to give rise to any possible taxable events beyond those occurring within Ethereum, except the hard fork event itself.

B.19 NEO (NEO)

Concept: "On the NEO blockchain, users are able to register, trade, and circulate multiple types of assets. Proving the connection between digital and physical assets is possible through digital identity. Assets registered through a validated digital identity are protected by law".[957]

Much like Ethereum and other blockchains, the NEO network is designed to support decentralised applications and smart contracts, and is even referred to as the "Chinese Ethereum".[958] In addition to its support of a greater number of programming languages, what distinguishes NEO is its implementation of digital identity standards to strengthen legal enforceability and regulatory compliance. In particular, this may support the digitisation of physical assets.[959]

NEO introduces two crypto-asset tokens: NEO and GAS. Both have a maximum supply of 100 million tokens. New GAS tokens are distributed to NEO token holders each time a block is created in proportion to their holdings. Distribution occurs at a reducing rate until all GAS tokens

[956] Ethereum Classic Community, "The Ethereum Classic Declaration of Independence."
[957] Neo, "NEO White Paper." At 1.
[958] Mangal, "What Is NEO Cryptocurrency? A Beginners' Guide."
[959] Mangal; Harsh Agrawal, "NEO Cryptocurrency: Everything You Need to Know about China Ethereum," 2019, https://coinsutra.com/neo-cryptocurrency/; Neo, "NEO White Paper."

are distributed.[960] Although not named as such, this is effectively a variation of the granting of access rights to token holders.

GAS is required to pay transaction and storage fees on the NEO network.[961] While the NEO white paper only mentions transaction fees in passing, the NEO website documentation contains more detail. The network charges both network fees and system fees, although smaller transactions potentially incur neither. Transaction fees may be a combination of mandatory and optional fees (which ensure prioritisation of transaction processing). Network fees are collected by transaction validators and may be shared with others, while system fees are shared among NEO token holders.[962] GAS may be purchased on exchanges – it is listed as the 173rd largest crypto-asset by market capitalisation on the date the sample for this study was determined.[963]

NEO tokens themselves are not mineable. Of the 100 million NEO tokens, 50% were sold in an ICO, while the remaining 50% were held back in order to 'motivate' NEO and third-party developers and members of the NEO Council, to cross-invest in other blockchain projects and for contingencies.[964] The description and possible oversight of this remaining 50% has been criticised as somewhat vague.[965] Rather than PoW or PoS, NEO uses dBFT, whereby NEO token holders vote for their preferred consensus nodes, from which block creators are selected according to an algorithm.[966] At present, there are seven consensus nodes available for selection, of which five are operated by the NEO Foundation.[967] Although NEO attempts to distinguish dBFT from DPoS,

[960] Neo, "NEO White Paper."
[961] Neo.
[962] Neo, "Transaction Fees."
[963] CoinMarketCap, "CoinMarketCap," 2019.
[964] Neo, "NEO White Paper."
[965] Mangal, "What Is NEO Cryptocurrency? A Beginners' Guide."
[966] Neo, "NEO White Paper."
[967] Neo, "Consensus Nodes - Neo Smart Economy," 2020, https://neo.org/consensus.

these distinctions appear to be marginal, and the two have been categorised together for the purposes of this study.

There is no evidence of any NEO token planned reduction actions.

B.20 IOTA (MIOTA)

Concept: "… an innovative approach that does not incorporate blockchain technology. This approach is currently being implemented as a cryptocurrency called iota, which was designed specifically for the IoT industry".[968]

The objective of the IOTA network is to facilitate transactions within the Internet of Things (IoT) through machine-to-machine micropayments recorded in a distributed ledger that overcomes the problem of the capacity limitations of centralised transaction processing.[969] The IOTA website currently discusses five use cases (which it refers to as 'verticals') for the IoT – mobility and automotive, global trade and supply chains, industrial IoT, eHealth and smart energy. These use cases make arguments for benefits such as vehicle parking and charging paid for without human intervention, for supply chain information sharing, and for remote healthcare monitoring.[970]

The IOTA white paper posits that the weakness of existing blockchains is the necessity of charging transaction fees to incentivise the validation of transactions, and the resultant distinction between users and validators. Rather than employing blockchain technology, IOTA introduces what it refers to as 'the Tangle'. Within the Tangle, a node must, in order to initiate its own transaction, approve two previous transactions selected algorithmically. In this way, the ability to initiate a transaction becomes the incentive for approving other transactions, and the need for transaction

[968] Popov, "The Tangle." At 2.
[969] Popov.
[970] IOTA Foundation, "IOTA."

fees is eliminated. The elimination of transaction fees in turn makes micropayment facilitation possible (since fees cannot exceed even the smallest payments). The majority of the IOTA white paper focuses on proving the functionality and resistance to double-spending of the Tangle.[971] It is perhaps worth noting that until sufficient adoption and transaction throughputs are reached, a centralised function referred to as 'the coordinator' is in place to provide additional security measures.[972]

The only reference to IOTA crypto-asset tokens in the white paper is the statement that all IOTA tokens were created at the inception of the Tangle, and that no mining of tokens occurs.[973] The IOTA website provides more detail in respect of IOTA tokens. These tokens serve as the payment solution for the network's micropayments. The entire supply of IOTA tokens was distributed in an ICO (although IOTA uses the term 'crowdsale' there does not appear to be any distinction from an ICO) in 2015, which was organised by the 'IOTA Founders' and raised approximately USD 500,000. Participants were then asked to donate a portion of these tokens back in order to fund the IOTA Foundation, which is a non-profit foundation registered in Germany. It is unclear whether the donation passed first to the IOTA Founders or directly to the Foundation. While the website is at pains to emphasise that neither the founders nor developers received any preferential access or distribution in the initial sale of these tokens, it does not discuss what the tokens donated to the Foundation, as well as the government grants and other donations that fund it, have been or will be used for.[974]

[971] Popov, "The Tangle."
[972] IOTA Foundation, "IOTA."
[973] Popov, "The Tangle."
[974] IOTA Foundation, "IOTA."

B.21 Cosmos (ATOM)

Concept: "… blockchains have suffered from a number of drawbacks, including their gross energy inefficiency, poor or limited performance, and immature governance mechanisms. … An ideal solution is one that allows multiple parallel blockchains to interoperate while retaining their security properties".[975]

The Cosmos network purports to improve the speed and efficiency of blockchain processing by facilitating multiple blockchains referred to as 'zones'[976] that process transactions independently of one another, but which are interconnected via a 'hub', through which transactions may pass between zones. Each zone may have its own crypto-asset tokens and function according to its own governance rules. While these zones are initially conceived of as being part of a single network, the concept of connecting different networks (such as Bitcoin and Ethereum) through the Cosmos Hub is also considered in the white paper. Cosmos employs the Tendermint consensus protocol and an Application Blockchain Interface to facilitate interconnectedness between zones and the Hub. Based on the speed, efficiency and interconnecting potential of its network design, the Cosmos white paper proposes a number of particular use cases, such as distributed exchanges and mobile applications.[977]

Rather than PoW mining, Cosmos uses DPoS validation, which depends on its Atom crypto-asset token. A limited number of transaction validator nodes, beginning at 100 and increasing to 300 over ten years, are employed to validate transactions in return for block rewards and transaction fees. Validator positions are awarded to the nodes that stake or 'bond' the highest number of Atoms. A withdrawing validator's bonded tokens are returned to it after an 'unbonding' period.

[975] Kwon and Buchman, "Cosmos." At 1-2.
[976] In other generic contexts within the blockchain community these are referred to as 'shards'
[977] Kwon and Buchman, "Cosmos."

Atom-holders may delegate their Atoms to one another in order to increase their chances of qualifying as a validator, in return for a share of the validator's rewards. Validators are also entitled to vote on all proposals in proportion to the number of staked tokens that they hold, including delegated tokens. Transaction fees may be paid for in Atoms or other crypto-assets at a price determined by each validator, and are reduced by a percentage that is transferred to a central reserve pool.[978]

In addition to rewards, validators can also be penalised for taking incorrect actions or for being hacked. These penalties are referred to as 'slashing' a percentage of their staked tokens, as well as of any tokens that have been delegated to them. While it is not absolutely clear what happens to slashed tokens, it appears that they are destroyed. In order to promote the integrity of the network, Cosmos actually incentivises hacking, and anyone successful in hacking a validator is rewarded with a percentage of the validator's staked tokens. Proposers of protocol amendments must also put forward a deposit which may potentially be forfeited to the reserve pool, while block rewards may also be forfeited and penalties levied on voters who choose to veto proposals that were approved by a majority in accordance with Cosmos' voting system.[979]

While new Atom tokens continue to be issued, tokens were also issued at inception to donors and 'lead donors', the Cosmos Network Foundation (referred to in a later document from Cosmos outlining the token issuance as the Interchain Foundation (ICF)) and a company called All In Bits, Inc. trading as 'Tendermint', which was responsible for the initial development of the Cosmos network. The Tendermint development allocation is then further allocated to founders, developers, contractors, and employees, and includes vesting periods for those allocations. While terms like

[978] Kwon and Buchman.
[979] Kwon and Buchman.

'fundraiser', 'donor', and a 'recommendation … for the initial allocation' by the ICF are used, some of these recommended allocations are directly linked to amounts contributed by the recommended recipients, some of whom are privy to preferential discounts in the determination of the allocation ratios.[980]

B.22 Maker (MKR)

Concept: "The Maker Protocol, built on the Ethereum blockchain, enables users to create currency".[981]

The MakerDAO network exists on the Ethereum platform, and its tokens are ERC-20 smart contracts. The MakerDAO network exists to facilitate the creation and use of its primary crypto-asset token, the DAI, and also incorporates a second crypto-asset token, the MKR.[982] The DAI token was the seventieth-largest token by market capitalisation at the date the sample was selected for this study (and therefore falls outside the sample selection).[983] The objective of the network design is to maintain a stable value of USD 1 per DAI token. Unlike Tether tokens, which are (at least in theory) collateralised by fiat currency reserves, DAI tokens are created when a user deposits crypto-assets with the network as collateral. This collateral is held in a smart contract referred to as a Collateralised Debt Position (CDP). At the inception of the network collateral had to be in the form of Ether, but subsequently this has been extended to other Ethereum-based crypto-assets. Because the value of the crypto-asset collateral will fluctuate over time against the US Dollar, the user is required to deposit collateral in excess of the US Dollar-equivalent of DAI tokens that they wish to create, according to the risk level of the collateral token as set by the

[980] Buchman and Goes, "Cosmos Genesis."
[981] MakerDAO, "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System." At 2.
[982] MakerDAO.
[983] CoinMarketCap, "CoinMarketCap," 2019.

network. The DAI is considered a debt of the creating user, which must be settled by repaying the amount of DAI created plus a stability fee, calculated as a percentage of the DAI created. Once settled, the creating user can redeem their collateral. In addition to the holding of collateral to support the DAI's price, the network also attempts to manipulate supply by paying more or less interest to DAI holders who are willing to commit their tokens to a DAI Savings Rate (DSR) contract.[984]

The MakerDAO's second crypto-asset token, MKR, performs two functions – facilitating governance and capitalising the network. It is the governance function that the white paper emphasises. MKR holders are entitled to vote on governance decisions in proportion to the number of tokens that they stake to the voting contract. Governance decisions include the approval of further crypto-assets accepted as collateral, risk assessment of collateral tokens and required levels of collateral, interest rates on DSR contracts, and network protocol amendments.[985]

It would appear however that it is not governance rights that given MKR tokens their value, but rather their function in capitalising the network. Only 1,000,000 MKR tokens were created at inception, and it is unclear from both formal documentation and informal commentary how these were distributed, other than it was not through an open sale in the form of an ICO. MKR tokens cannot be mined. Rather, additional tokens are issued, or existing tokens repurchased and destroyed, in order to maintain the network's balance of reserves to debt. The MakerDAO network maintains a surplus pool of DAI which it accumulates through fees. When this pool exceeds an agreed limit, a surplus auction is held, with the excess awarded to the bidder who is willing to pay the highest price in MKR tokens (and therefore places the lowest value on their MKR tokens). The

[984] MakerDAO, "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System."
[985] MakerDAO.

MKR tokens of any successful bidder are collected by the network and destroyed. This effect on supply and demand presumably increases the market price of MKR tokens. Conversely, when a collateral auction must be held to settle an existing DAI obligation and the outcome is insufficient to fully settle that obligation as well as the penalty fee imposed, the shortfall is funded first by a buffer held by the network, and thereafter new MKR tokens are created and sold on auction for DAI in order to fund the balance. This increase in supply presumably has a negative effect on the market price of MKR tokens. The white paper notes that this acts as an incentive to good governance for MKR holders.[986]

Like many other networks, the MakerDAO network development emanated from within a foundation (the Maker Foundation). A separate DAI Foundation has also been established.[987]

B.23 NEM (XEM)

Concept: "NEM's primary contribution to the crypto currency landscape is a new consensus mechanism called Proof of Importance (PoI). … PoI is similar to Proof of Stake (PoS) except that it is not solely derived from the size of an account's balance. It incorporates other behaviors that are believed to be positive for the holistic economy".[988]

The NEM blockchain's native token is the XEM. A number of networks have proposed alternatives to PoW validation that are less energy intensive and therefore better positioned for efficiency, scalability, and sustainability. The proposition outlined in NEM's Technical Reference document is for a PoS-type protocol that determines the probability of selection for validation based not only on the balance of XEM held, but also the length of time held and the holder's net XEM usage

[986] MakerDAO.
[987] MakerDAO.
[988] NEM.io Foundation Ltd, "NEM Technical Reference." At 1.

volumes. NEM refers to its protocol as 'proof of importance' (PoI) and its validation process as 'harvesting'.[989, 990]

The account that harvests a block on the NEM network receives the transaction fees from those transactions. There are a number of possible transactions that incur fees, including account creation, XEM transfers between accounts, and harvesting delegation, all of which are payable in XEM. The probability of selection as a harvesting account depends on a number of variables that are combined to determine an 'importance score'. In order to participate in the harvesting process, an account must have a vested balance of at least 10,000 XEM. XEM tokens vest over time held in an account at a rate of 1/10 of the total balance every 1,440 blocks. Unvested tokens may be spent, but are not included in the importance score calculation, which increases in line with the size of an account's vested balance. It is this vesting period that adds the element of time held to the standard DPoS determination. In addition, the importance score incorporates the net XEM transaction totals of the account over a period of time. This is intended to incentivise XEM usage rather than merely hoarding for the purpose of earning additional tokens. Accounts that do not participate in harvesting can delegate their importance score to an eligible account to increase that account's score, and share in any resultant fees earned. The act of delegation incurs a transaction fee.[991]

The total supply of XEM tokens is fixed at 8,999,999.[992] It is not clear from the Technical Reference paper itself whether these are created over time or at the genesis of the NEM blockchain. However, a variety of blog posts and documents obtainable indirectly via the NEM.io website

[989] NEM.io Foundation Ltd.
[990] No document named a 'white paper' is provided on the NEM website. However, several online white paper repositories provide links to this Technical Reference document.
[991] NEM.io Foundation Ltd, "NEM Technical Reference."
[992] NEM.io Foundation Ltd.

indicate that these were created at genesis. Some were distributed to the 'stakeholder community', others were sold in an auction, others held for distribution to developers upon completion of milestones, and still others retained in various reserve funds.[993]

The NEM website uses the term 'supernode' to refer to those accounts that participate directly in block validation, while those that delegate their POI scores are referred to as 'harvesting accounts'. The site also outlines the qualifying criteria for a supernode, including the holding of a balance of 3 million XEM, rather than the 10,000 XEM of the white paper.[994] A NEM forum discussion (a link to which is provided on the NEM website) explaining that qualifying supernodes each receive an equal share of 70,000 XEM per day from tokens held in reserve is the only mention of a reward other than transaction fees for participating in the validation process.[995] These rewards appear to be a transfer of existing tokens held by the NEM Foundation, rather than the creation of new tokens that is the norm in block rewards.

NEM achieved notoriety in 2018 when XEM tokens to the value of USD 530 million were stolen from the Coincheck website. This was the largest crypto-asset theft to date.[996]

B.24 USD Coin (USDC)

Concept: "CENTRE is designed to provide a solution and new incentives for connecting the world's disparate digital wallets: a network scheme for fiat token stablecoins that will allow money to flow between wallets the same way information moves

[993] NEM, "Update: Sustainability Fund, Final Redemption Numbers," 2015, https://blog.nem.io/update-sustainability-fund-final-redemption-numbers/; NEM, "Final Development Contract Notice (Public)," 2015, https://docs.google.com/document/d/1TKTIakxUEotmTN4Et80EI7d-8XifgFZ4aBUGAukgLfY/edit#heading=h.xchkdqowarsb.
[994] NEM.io Foundation Ltd, "NEM Supernode Program," 2020, https://nem.io/xem/supernode-program/.
[995] Gray, "NEM Supernode Rewards Program."
[996] Crypto Briefing Analyst Team, "What Is NEM? Introduction To XEM."

between web browsers and servers, email between mail services, text messages between SMS providers".[997]

The USD Coin is another fiat-currency backed stablecoin intended to trade at a constant value of USD 1 per token. While various use cases are presented, these are essentially all variations of the merits of a crypto-asset token with a stable value that can function as a payment solution. Two organisations are connected to the USD Coin – Circle and Centre.[998]

Centre provides the network infrastructure for creation of stablecoins such as the USD Coin, which is issued by Circle. The Centre blockchain is built on the Ethereum network, and supports the creation of stablecoins as ERC-20 contracts by other approved entities that accept fiat currency deposits, the governance and reserves of which Centre oversees. This is intended to create a layer of independent oversight over the stablecoin issuer. Centre is an entity that was carved out of Circle, where the technology was originally developed, taking with it the infrastructure and technology underpinning the network.[999]

Circle is the issuer of the USD Coin and the accepter of fiat currency deposits. To this end, it holds a number of licences from the US Treasury Department and the UK's Financial Conduct Authority, among others. As an ERC-20 contract on the Ethereum network, USD Coins cannot be mined. When a deposit is received, Circle either creates new ERC-20 tokens, or issues tokens from those it holds in reserve. Those tokens can then be transferred freely between the depositor and anyone with a compatible wallet. A USD Coin holder can then redeem tokens for fiat currency from Circle, which will either burn the equivalent tokens or hold them in reserve for reissue. The Centre white paper suggests that no fees are incurred in such transactions. However, the Frequently Asked

[997] Centre, "Centre Whitepaper." At 5.
[998] Centre.
[999] Centre.

Questions on the Circle website indicate that the sender is required to pay the GAS fees associated with a transaction on the Ethereum network.[1000]

As part of its governance, Centre envisages the third-party provision of functions such as know-your-customer identity verification services in return for fees payable in tokens.[1001] As the Centre network is intended to support the creation of various stablecoins, it would seem unlikely that the payment of these fees would be restricted to settlement in USD Coin tokens.

The Circle white paper does not discuss the detail of the USD Coin, which is covered by the Centre white paper (notwithstanding that it is the creation of Circle). Instead, it presents a thought piece on the merits of stablecoins in general. It includes a number of comparisons to and contrasts between Circle and the Libra Association, pioneered by Facebook, which has also proposed the creation of a stablecoin. It also discusses the advantages of public-private partnerships in the creation of stablecoins.[1002] This may be due either to the crypto community's inherent distrust of governments and central banks, or to pre-empt concerns as to the future role of private stablecoin creators, as rumours of the creation of various government-issued crypto-assets in the future continue to circulate.

B.25 Crypto.com Chain (CRO)

Concept: "The Crypto.com Chain is essentially a decentralized mobile cryptocurrency payment solution built on blockchain".[1003]

[1000] Centre; USDC Support Center, "Circle USDC Fee Schedule," 2020, https://support.usdc.circle.com/hc/en-us/articles/360015471331-Circle-USDC-Fee-Schedule.
[1001] Centre, "Centre Whitepaper."
[1002] Jeremy Allaire, "Stablecoins, Global Digital Currency and the Future of the International Monetary System," 2020, https://f.hubspotusercontent00.net/hubfs/6778953/marketing/pdfs/CIRCLE-stablecoins-wp-Jan2020.pdf.
[1003] Crypto.com, "Crypto.Com Chain."

CRO crypto-asset tokens are the creation of CRO Protocol Labs ("Crypto.com"), which previously released the Monaco (MCO) token on the Ethereum network. Crypto.com is focused on facilitating crypto-asset payment solutions between customers and merchants, and offers a Visa card that facilitates payment in various crypto-assets.[1004]

CRO is intended to be the native token of the Crypto.com Chain network, an independent blockchain currently still in development which, like the Cosmos blockchain, will use the Tendermint consensus protocol.[1005]

The Crypto.com Chain white paper and technical white paper together propose a payment solution between customers and merchants through the introduction firstly of an online '"Crypto.com Pay" button', and ultimately debit and credit card support. Interaction between customer and merchant is facilitated through a series of intermediaries within the Crypto.com Chain network – customer acquirers, merchant acquirers, settlement agents and community nodes. The network is overseen by council nodes, initially operated by Crypto.com but subsequently to be extended to third parties in a process of 'phased decentralization'.[1006] These intermediaries as well as council nodes are required to stake CRO tokens, and earn CRO transaction fees for services such as transaction validation and transaction settlement, which includes the acceptance of crypto-assets from customers and settlement in fiat currency or stablecoins to merchants. The adoption of CRO and the Crypto.com Chain is incentivised through various discounts available to customers, while merchants do not incur transaction fees.[1007]

[1004] Crypto.com, "MCO Token"; Crypto.com, "Crypto.Com."
[1005] Crypto.com, "Crypto.Com Chain"; Crypto.com, "Crypto.Com Chain: The next Generation Decentralized Mobile Payment Protocol."
[1006] Crypto.com, "Crypto.Com Chain: The next Generation Decentralized Mobile Payment Protocol."
[1007] Crypto.com, "Crypto.Com Chain"; Crypto.com, "Crypto.Com Chain: The next Generation Decentralized Mobile Payment Protocol."

The Crypto.com Chain will be created with 100 billion CRO tokens. While the majority of these are to be transferred to a number of different reserves, 10 billion tokens are set aside for 'community development', including distribution to MCO token-holders in an airdrop conducted each month from 7 December 2018 to 25 June 2019. (Since the airdrop precedes the public launch of the Chain network, the tokens are presumably in the form of Ethereum ERC-20 contracts that can later be redeemed for CRO tokens.) CRO tokens allocated in the airdrop are 'locked' for a period of 12 months from grant date, and only a percentage are awarded based on the lowest balance of MCO held during the 12-month period in comparison to the balance held at grant date.[1008]

CRO tokens cannot be mined. However, rewards will be paid directly from CRO reserves to council nodes. This seems to be the only case in which earnings are in the form of the introduction of CRO tokens held in reserve. Incentives received by other nodes appear to be funded only by transaction fees from customers, which are distributed by Crypto.com. The basis of how these are determined is not included in the white papers.[1009]

[1008] Crypto.com, "Crypto.Com Chain."
[1009] Crypto.com; Crypto.com, "Crypto.Com Chain: The next Generation Decentralized Mobile Payment Protocol."

B.26 Polkadot (DOT)

Concept: "Present-day blockchain architectures all suffer from a number of issues not least practical means of extensibility and scalability. … this stems from tying two very important parts of the consensus architecture, namely canonicality and validity, too closely together. This paper introduces an architecture, the *heterogeneous multi-chain*, which fundamentally sets the two apart".[1010]

Polkadot proposes to address both the scaling issues of traditional blockchains and the validation concerns of alternatives, by creating a 'heterogeneous multi-chain' – a network consisting of a central 'relay chain' and multiple 'parachains'. Polkadot does not propose any particular use cases for these parachains, leaving it up to the creators of these parachains to determine individual use cases and tailor features accordingly, as well as set transaction fees and create parachain tokens if desired. Polkadot also envisages the creation of parachain bridges that allow the Polkadot network to interact with other networks. The creation of a new parachain requires the 'bonding' of DOT tokens, which are returned if the chain is removed.[1011]

Rather than validating transactions of the entire network, validators are randomly rotationally assigned to validate within parachains in parallel. 'Collators' and 'validators' work together to create and validate blocks, for which they are rewarded both through new tokens and transaction fees. Polkadot employs a DPoS protocol, requiring validators to stake tokens to participate in validation. Other token holders may act as 'nominators' of validators by delegating their token participation rights to validators and sharing in any resultant rewards. Collators are not required to stake tokens.[1012]

[1010] Wood, "Polkadot: Vision for a Heterogeneous Multi-Chain Framework." At 1.
[1011] Wood; Polkadot, "DOT Token," 2021, https://polkadot.network/dot-token/.
[1012] Wood, "Polkadot: Vision for a Heterogeneous Multi-Chain Framework."

Finally, ‘fishermen’ seek out malicious or negligent actors, which results in a penalty charged against the balance of that actor’s staked tokens. A portion of the penalty is burned, while the remainder is the fisherman’s reward. The staking of tokens is also required to act as a fisherman.

Polkadot makes reference to hard forks as a means of creating a ‘checkpoint’ that protects against chain reorganisations, although it indicates that in time it would wish to do away with these. These hard forks appear to be a security measure and there is no indication that they result in the creation of new tokens.[1013]

Although not mentioned in its white paper, Polkadot’s DOT tokens were also originated by means of an ICO in 2017.[1014]

[1013] Wood.
[1014] Yogita Khatri, “Blockchain Project Polkadot Plans Second Token Sale to Raise $60 Million - CoinDesk,” 2019, https://www.coindesk.com/blockchain-project-polkadot-plans-ico-to-raise-another-60-million-report.

APPENDIX C: Crypto-asset selection and market capitalisation[1015]

Date selected 21 August 2019

Total market capitalisation 267.39 billion

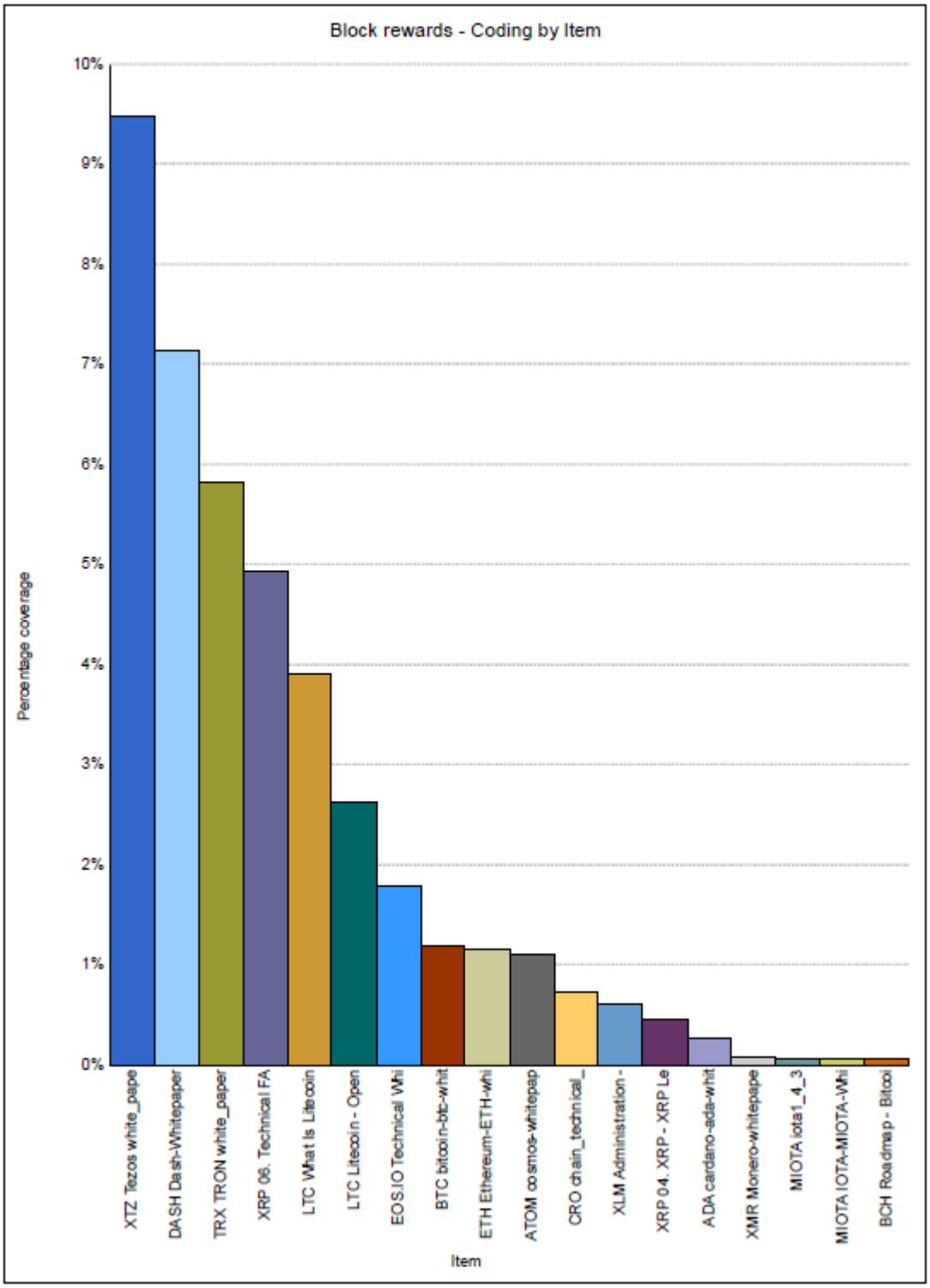
	Name	Symbol	Market capitalisation (USD)	Price (USD)	% of total market capitalisation	Cumulative market capitalisation
1	Bitcoin	BTC	181,949,863,822	10,171.25	68.0%	68.0%
2	Ethereum	ETH	20,175,741,536	187.84	7.5%	75.6%
3	XRP	XRP	11,353,587,254	0.26	4.2%	79.8%
4	Bitcoin Cash	BCH	5,410,087,364	301.24	2.0%	81.9%
5	Litecoin	LTC	4,545,150,198	72.05	1.7%	83.6%
6	Binance Coin	BNB	4,235,417,259	27.23	1.6%	85.1%
7	Tether	USDT	4,026,103,219	1.00	1.5%	86.7%
8	EOS	EOS	3,314,003,152	3.57	1.2%	87.9%
9	Bitcoin SV	BSV	2,380,057,940	133.30	0.9%	88.8%
10	Monero	XMR	1,391,343,884	81.05	0.5%	89.3%
11	Stellar	XLM	1,336,350,232	0.07	0.5%	89.8%
12	UNUS SED LEO	LEO	1,244,025,409	1.24	0.5%	90.3%
13	Cardano	ADA	1,214,772,298	0.05	0.5%	90.7%
14	TRON	TRX	1,131,981,664	0.02	0.4%	91.1%
15	Dash	DASH	802,759,966	89.28	0.3%	91.4%
16	Chainlink	LINK	785,013,804	2.24	0.3%	91.7%
17	Tezos	XTZ	750,611,150	1.14	0.3%	92.0%
18	Ethereum Classic	ETC	680,648,167	6.03	0.3%	92.3%
19	NEO	NEO	667,251,817	9.46	0.2%	92.5%
20	IOTA	MIOTA	664,924,820	0.24	0.2%	92.8%
21	Cosmos	ATOM	518,991,301	2.72	0.2%	93.0%
22	Maker	MKR	493,594,916	493.59	0.2%	93.1%
23	NEM	XEM	491,003,072	0.05	0.2%	93.3%
24	USD Coin	USDC	415,518,196	1.00	0.2%	93.5%
25	Crypto.com Chain	CRO	401,634,202	0.04	0.2%	93.6%

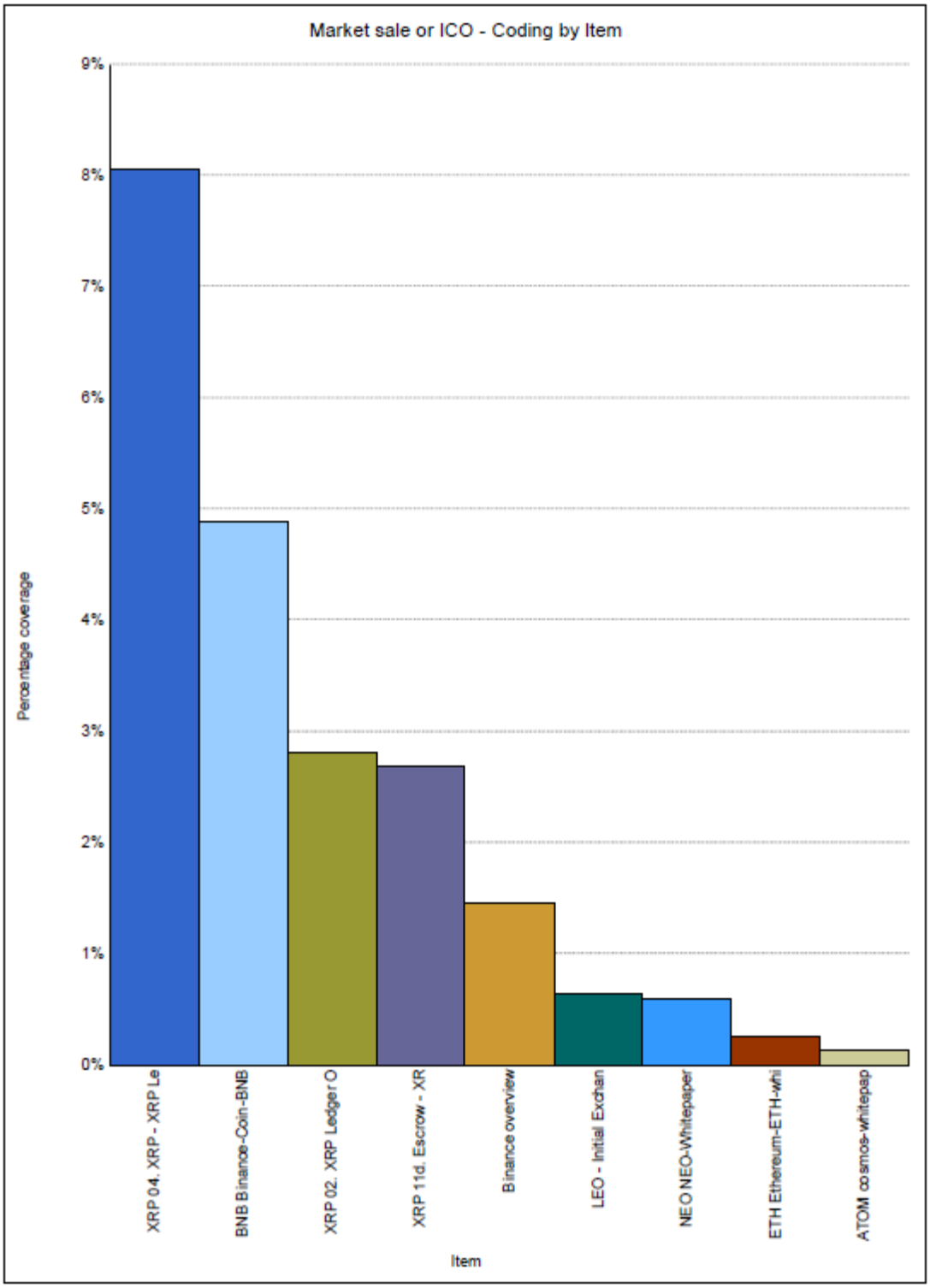
[1015] CoinMarketCap, "CoinMarketCap," 2021; CoinMarketCap, "CoinMarketCap," 2019.

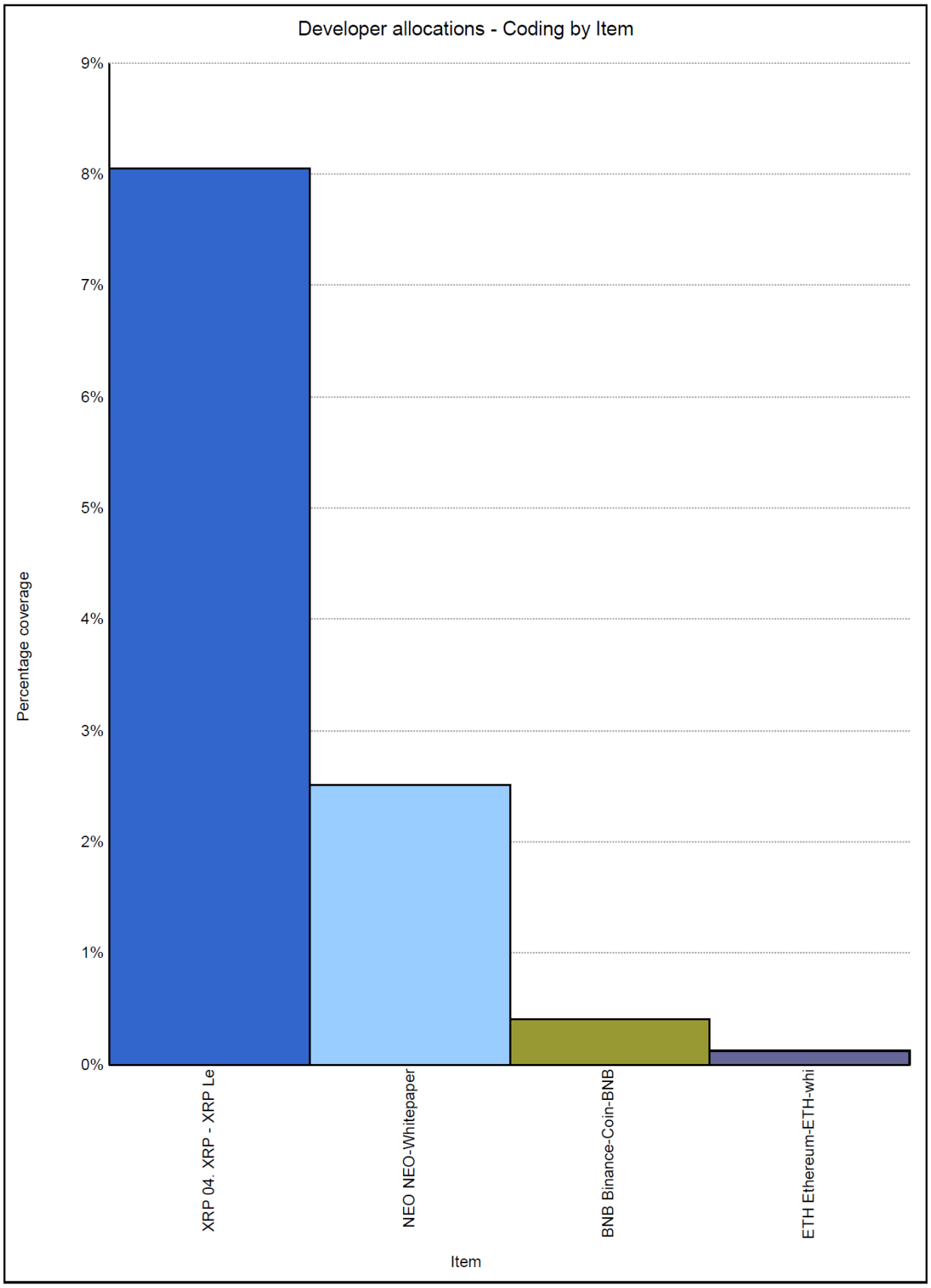
Date selected 30 June 2021
Total market capitalisation 1,422.75 billion

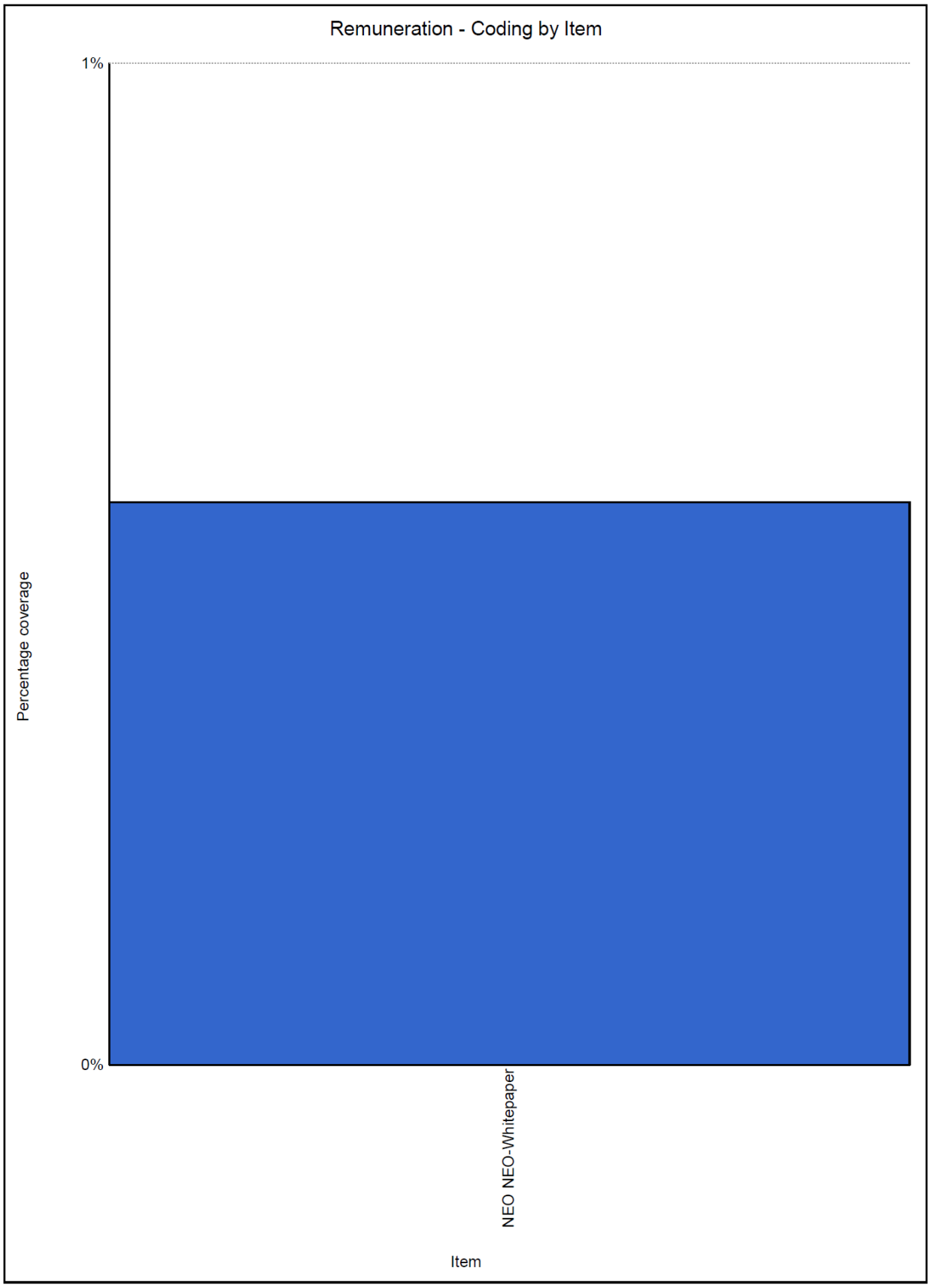
	Name	Symbol	Market capitalisation (USD)	Price (USD)	% of total market capitalisation	Cumulative market capitalisation
1	Bitcoin	BTC	56,852,513,238	35,040.84	46.2%	46.2%
2	Ethereum	ETH	265,001,225,921	2,274.55	18.6%	64.8%
3	XRP	XRP	32,597,010,801	0.71	2.3%	67.1%
4	Bitcoin Cash	BCH	9,882,664,769	526.30	0.7%	67.8%
5	Litecoin	LTC	9,621,414,741	144.14	0.7%	68.5%
6	Binance Coin	BNB	46,535,565,043	303.30	3.3%	71.7%
7	Tether	USDT	62,468,888,600	1.00	4.4%	76.1%
8	EOS	EOS	3,948,856,020	4.14	0.3%	76.4%
9	Bitcoin SV	BSV	2,758,157,227	146.91	0.2%	76.6%
10	Monero	XMR	3,988,194,095	222.27	0.3%	76.9%
11	Stellar	XLM	6,567,139,393	0.28	0.5%	77.3%
12	UNUS SED LEO	LEO	2,427,518,961	2.54	0.2%	77.5%
13	Cardano	ADA	44,196,834,747	1.38	3.1%	80.6%
14	TRON	TRX	4,883,353,621	0.07	0.3%	81.0%
15	Dash	DASH	1,483,146,167	145.27	0.1%	81.1%
16	Chainlink	LINK	8,491,232,801	19.50	0.6%	81.7%
17	Tezos	XTZ	2,588,204,722	3.04	0.2%	81.8%
18	Ethereum Classic	ETC	6,702,822,474	57.63	0.5%	82.3%
19	NEO	NEO	2,580,340,677	36.58	0.2%	82.5%
20	IOTA	MIOTA	2,407,161,497	0.87	0.2%	82.7%
21	Cosmos	ATOM	2,609,697,589	12.00	0.2%	82.8%
22	Maker	MKR	2,645,500,850	2,668.58	0.2%	83.0%
23	NEM	XEM	1,209,740,753	0.13	0.1%	83.1%
24	USD Coin	USDC	25,162,837,210	1.00	1.8%	84.9%
25	Crypto.com Chain	CRO	2,914,086,568	0.12	0.2%	85.1%

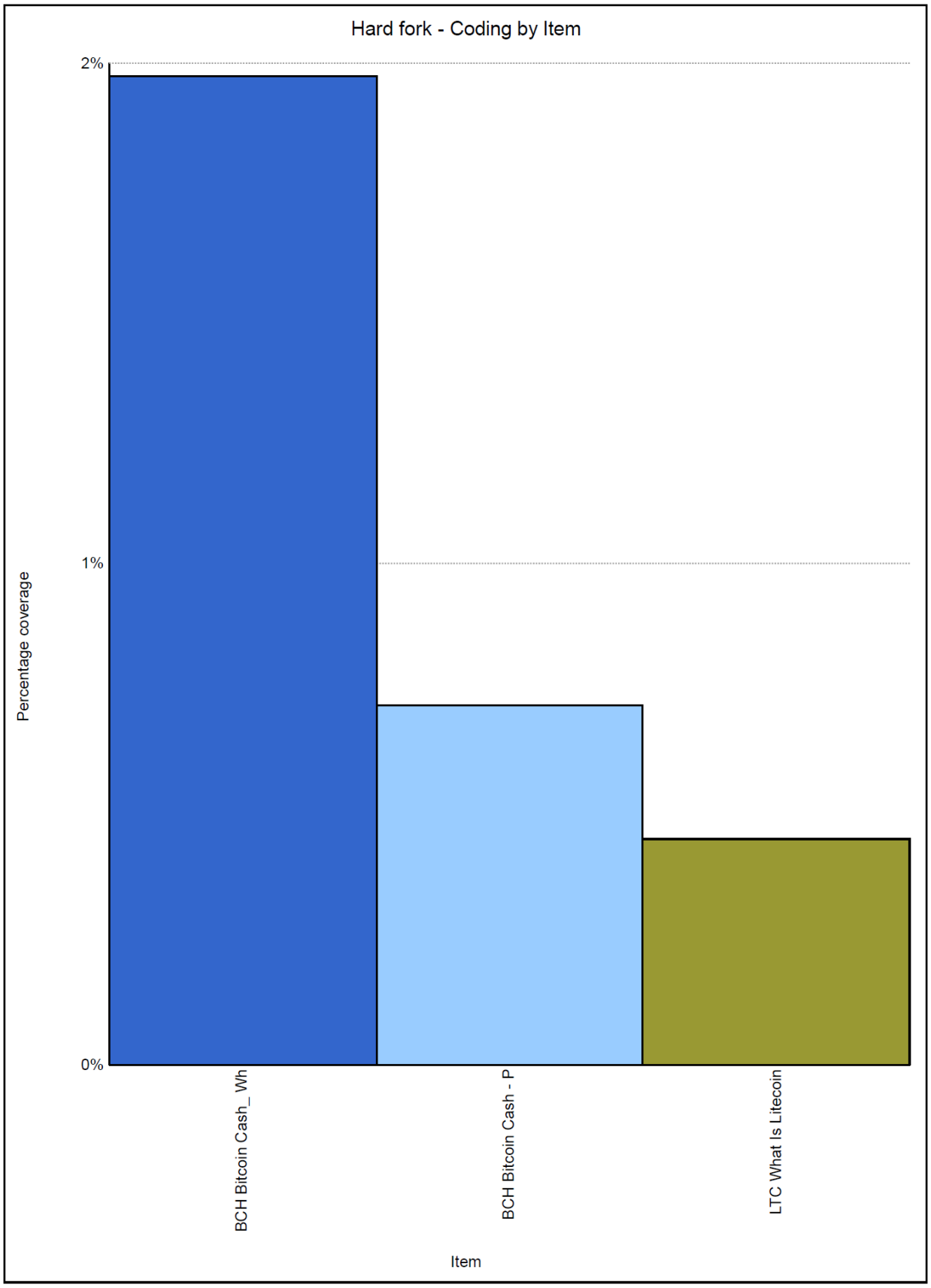
APPENDIX D: NVivo coding outputs

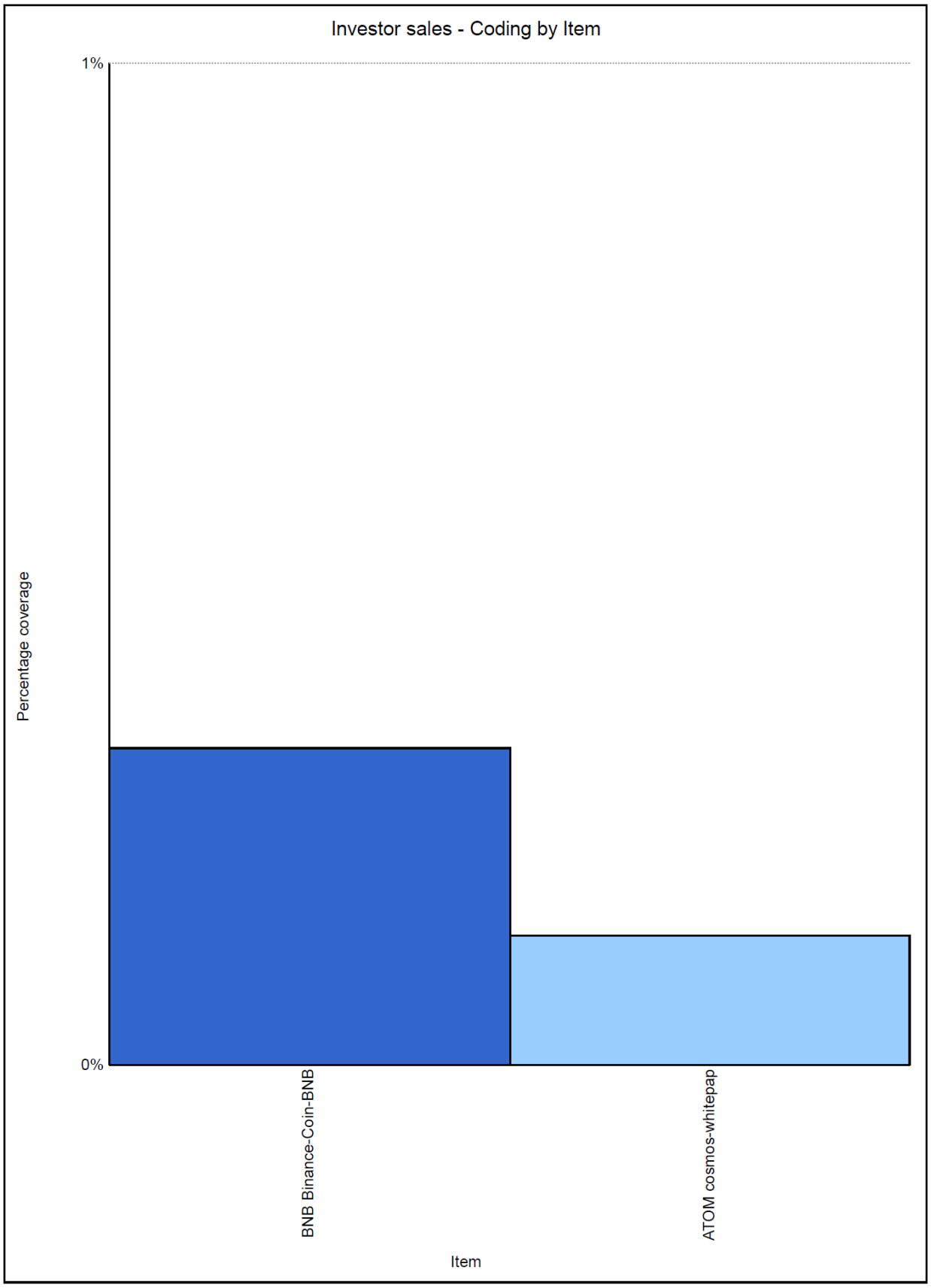


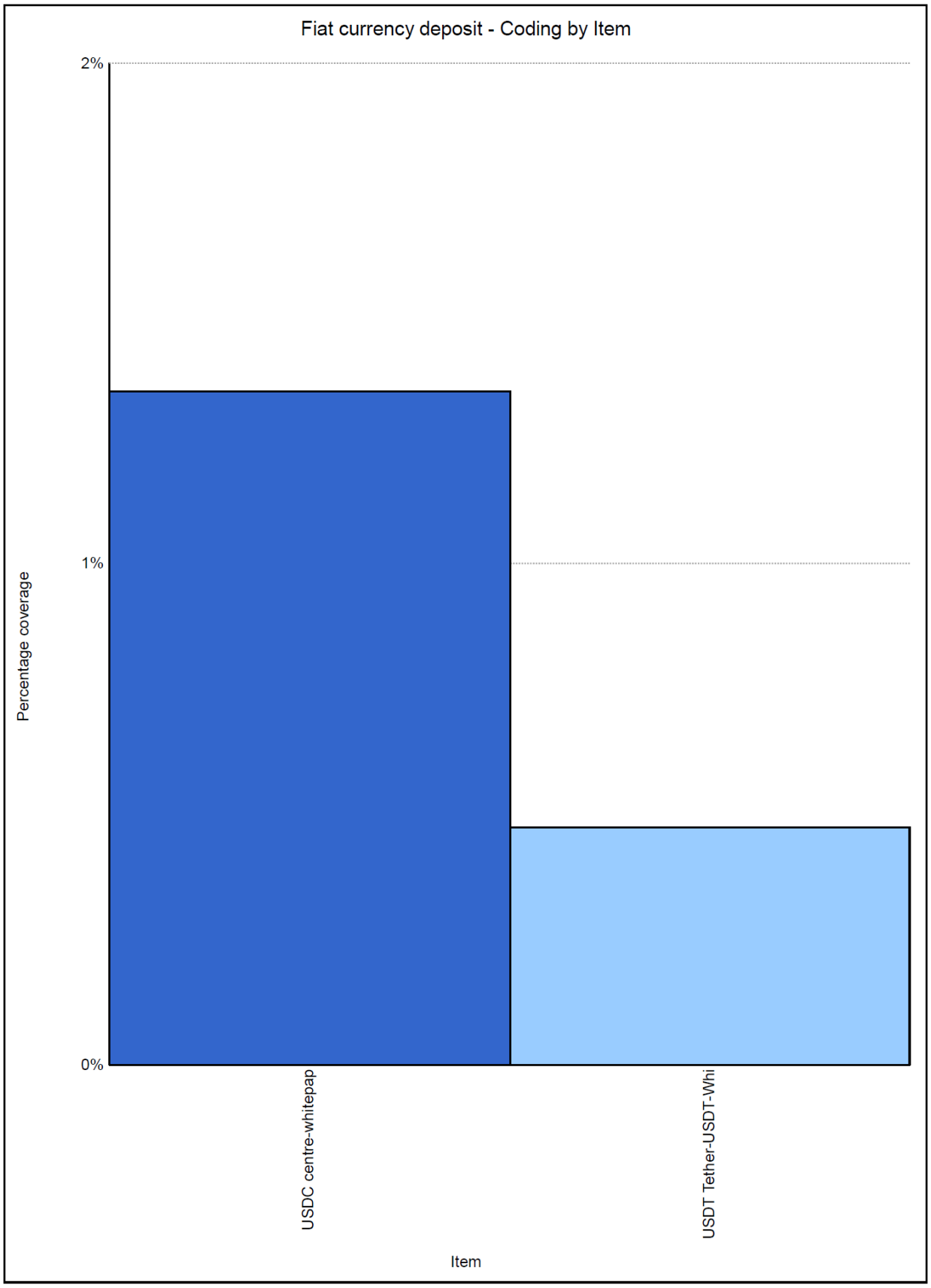

Market sale or ICO - Coding by Item
Percentage coverage
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
XRP 04. XRP - XRP Le
BNB Binance-Coin-BNB
XRP 02. XRP Ledger O
XRP 11d. Escrow - XR
Binance overview
LEO - Initial Exchan
NEO NEO-Whitepaper
ETH Ethereum-ETH-whi
ATOM cosmos-whitepap
Item

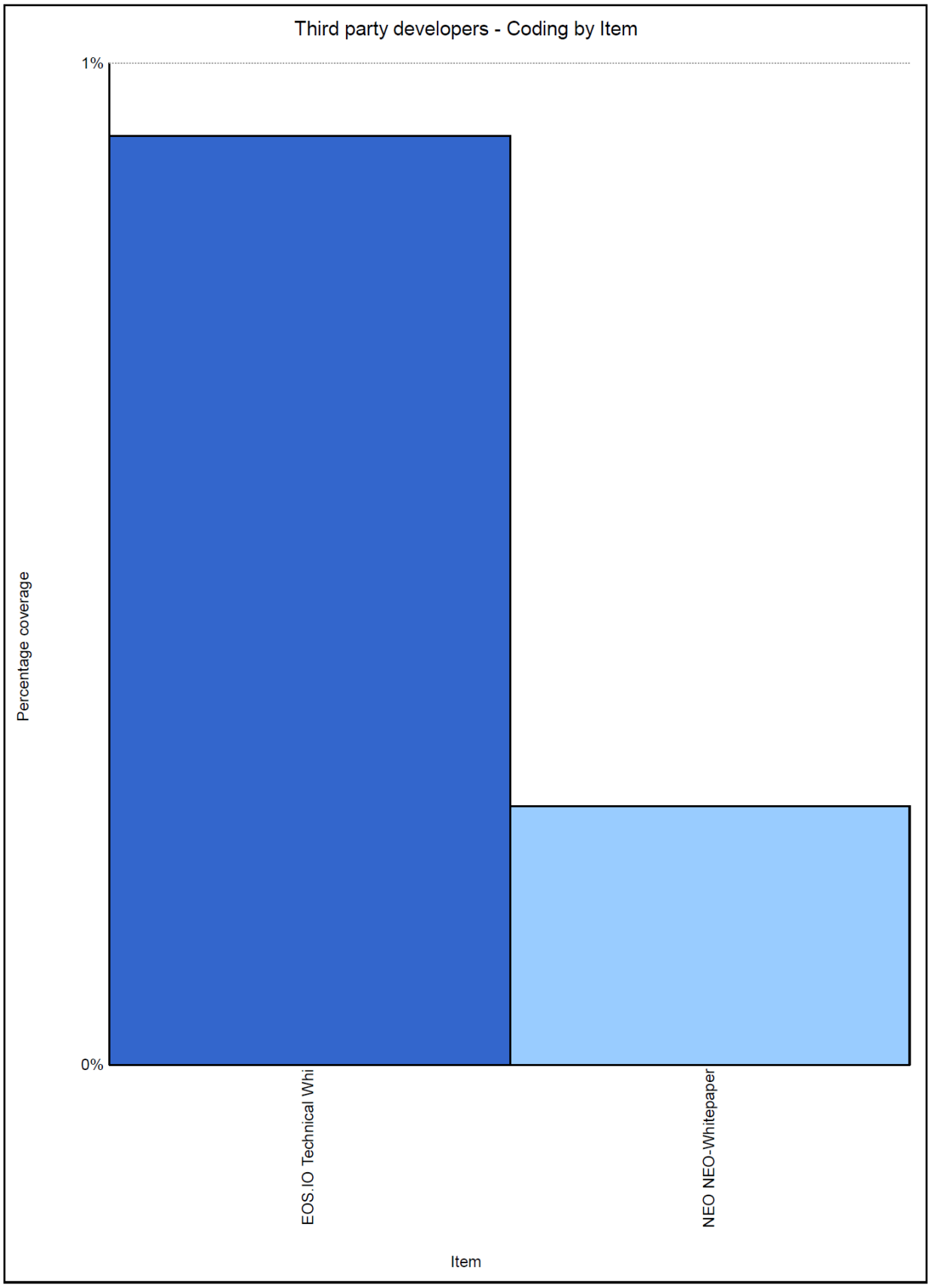

Developer allocations - Coding by Item
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
Percentage coverage
XRP 04. XRP - XRP Le
NEO NEO-Whitepaper
BNB Binance-Coin-BNB
ETH Ethereum-ETH-whi
Item

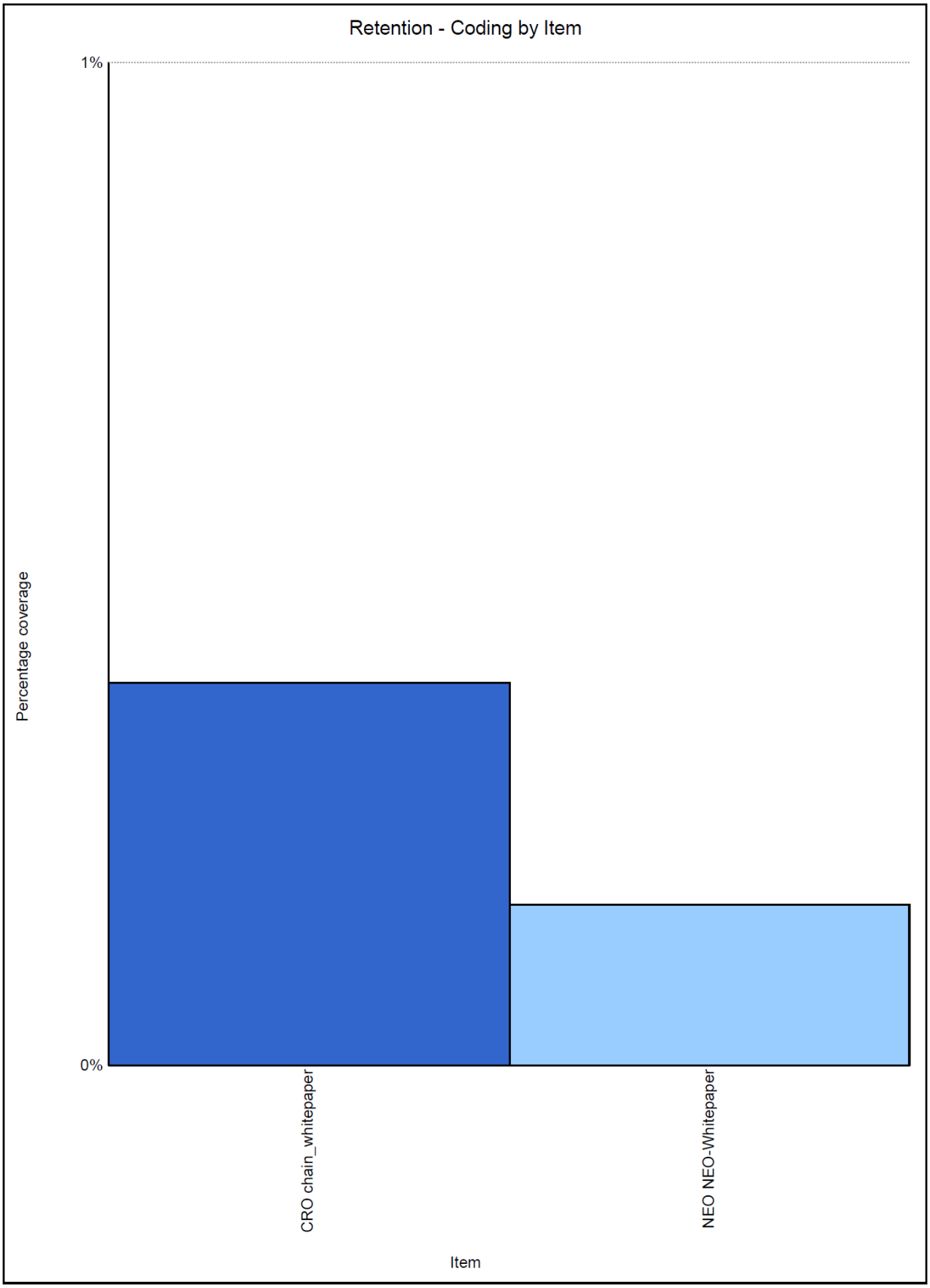

Remuneration - Coding by Item
1%
0%
Percentage coverage
NEO NEO-Whitepaper
Item

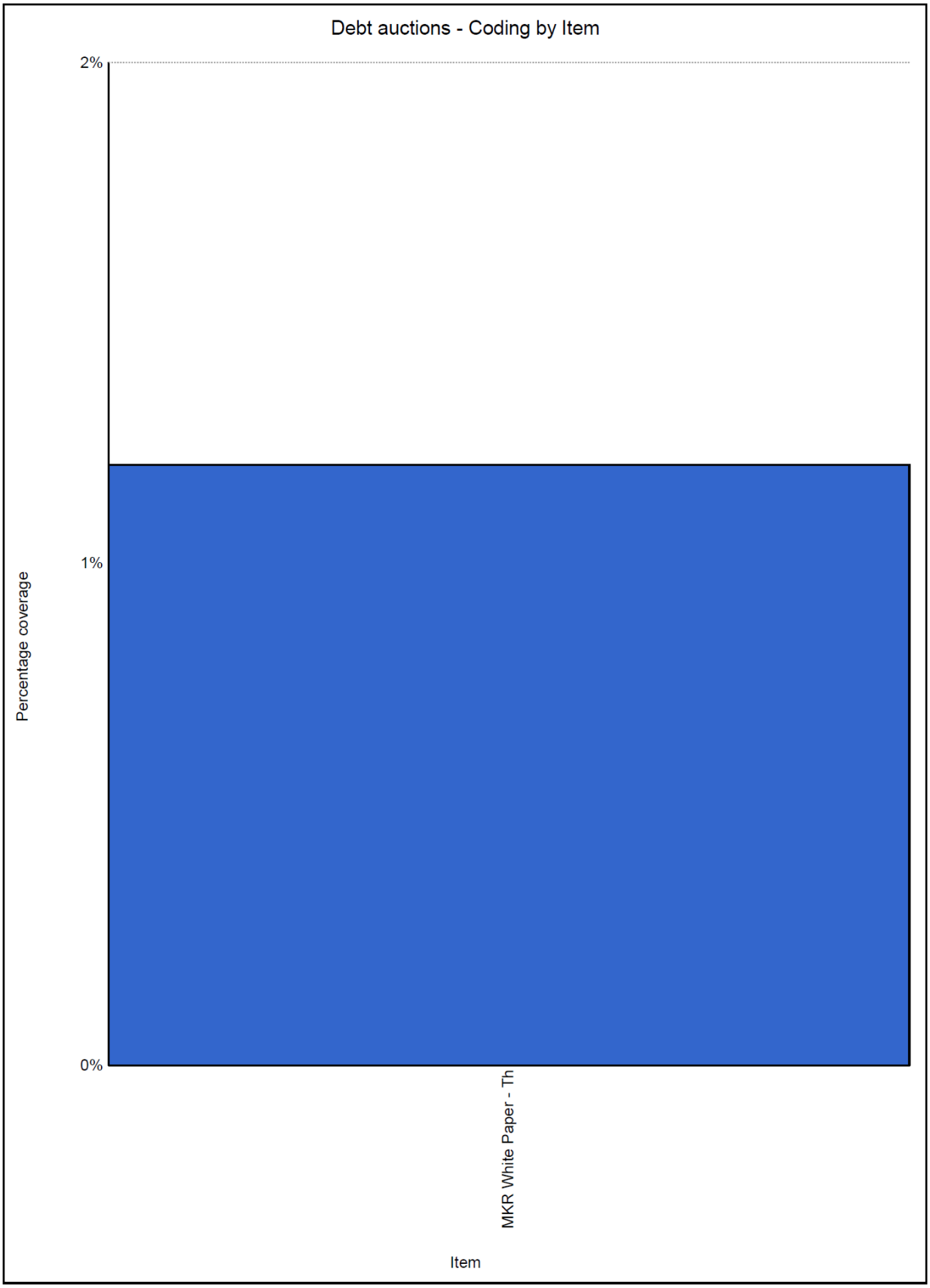

Hard fork - Coding by Item
2%
1%
0%
Percentage coverage
BCH Bitcoin Cash_ Wh
BCH Bitcoin Cash - P
LTC What Is Litecoin
Item

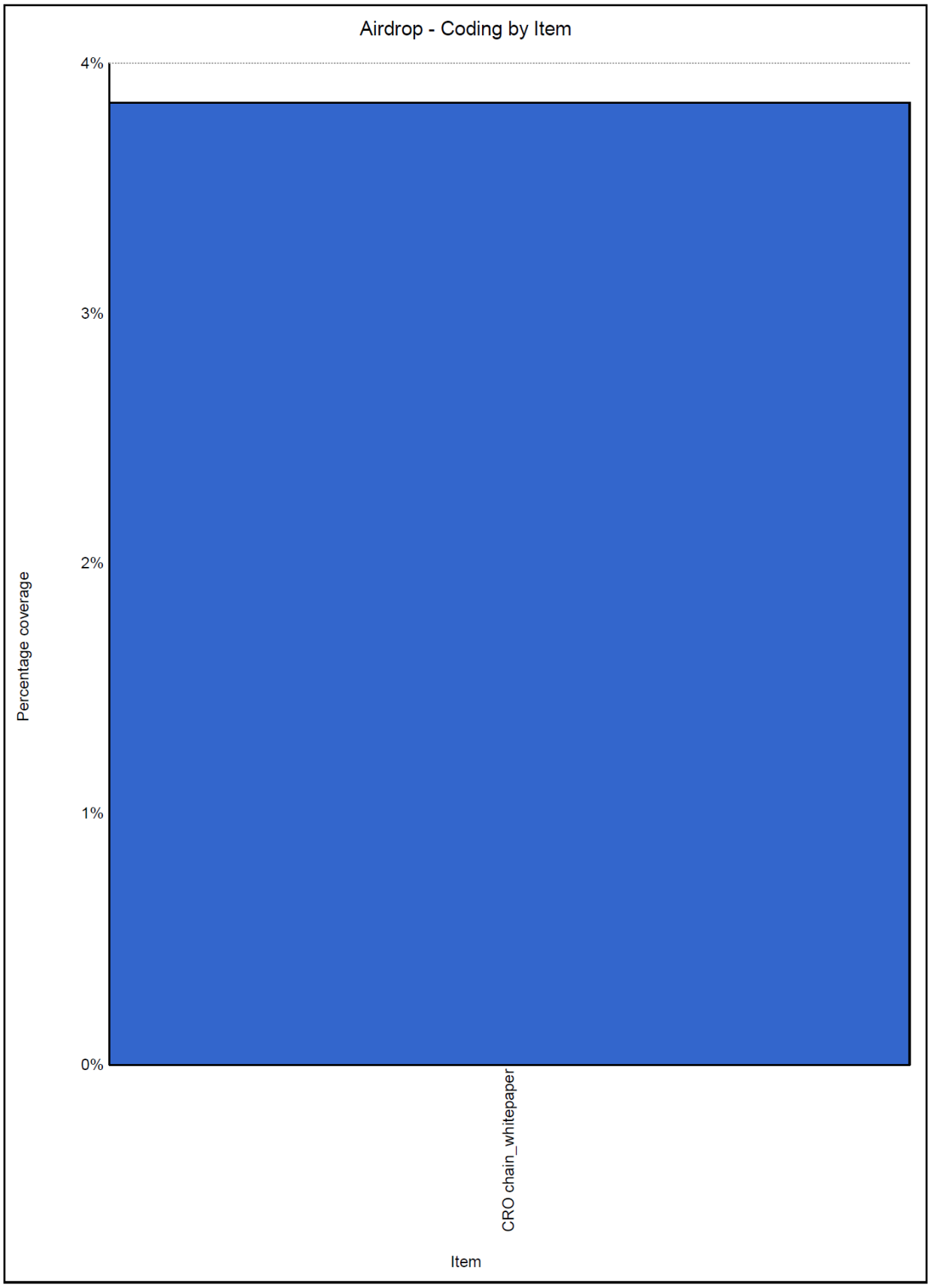

Investor sales - Coding by Item
1%
0%
Percentage coverage
BNB Binance-Coin-BNB
ATOM cosmos-whitepap
Item

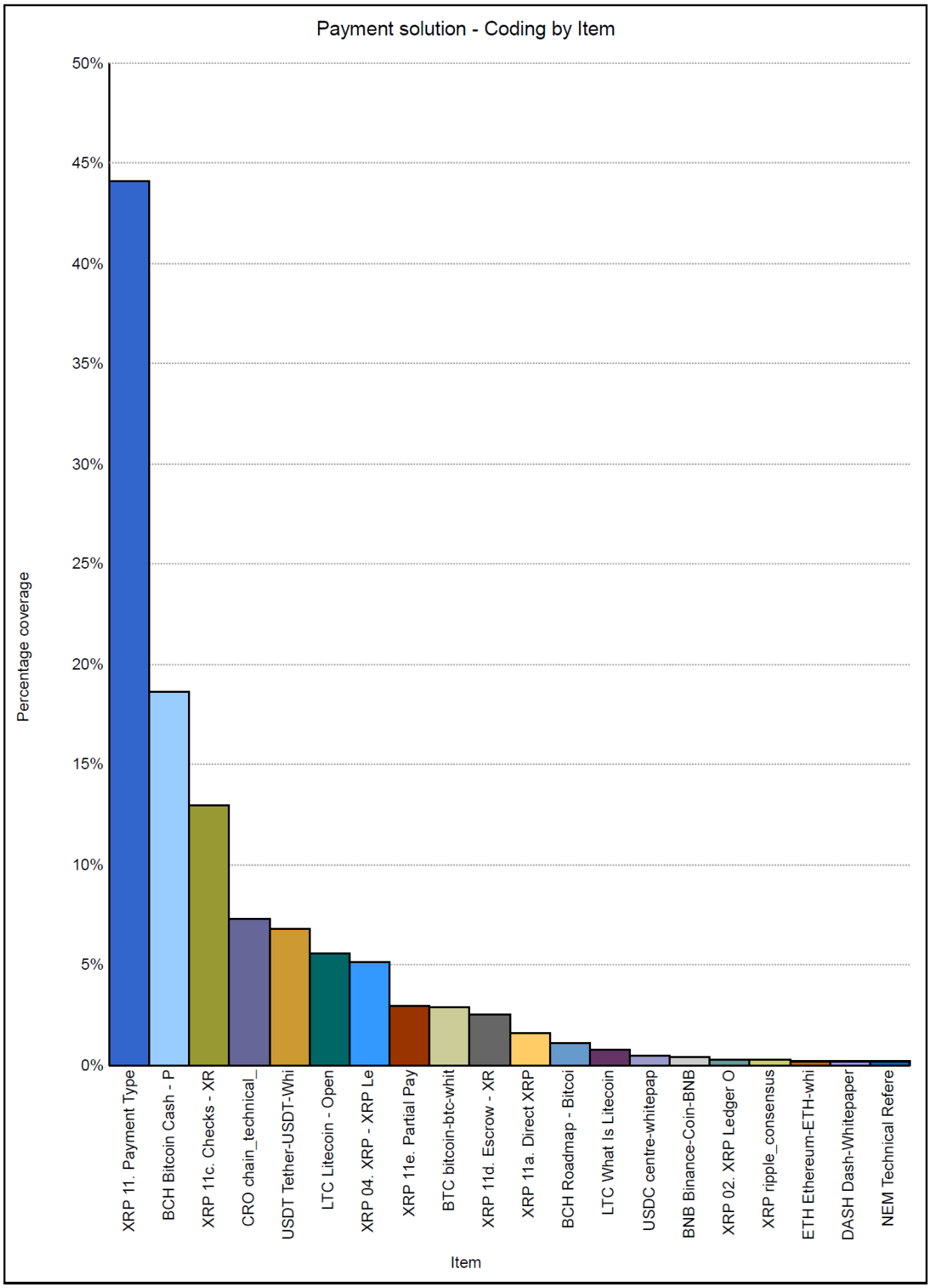

Fiat currency deposit - Coding by Item
2%
1%
0%
Percentage coverage
USDC centre-whitepap
USDT Tether-USDT-Whi
Item

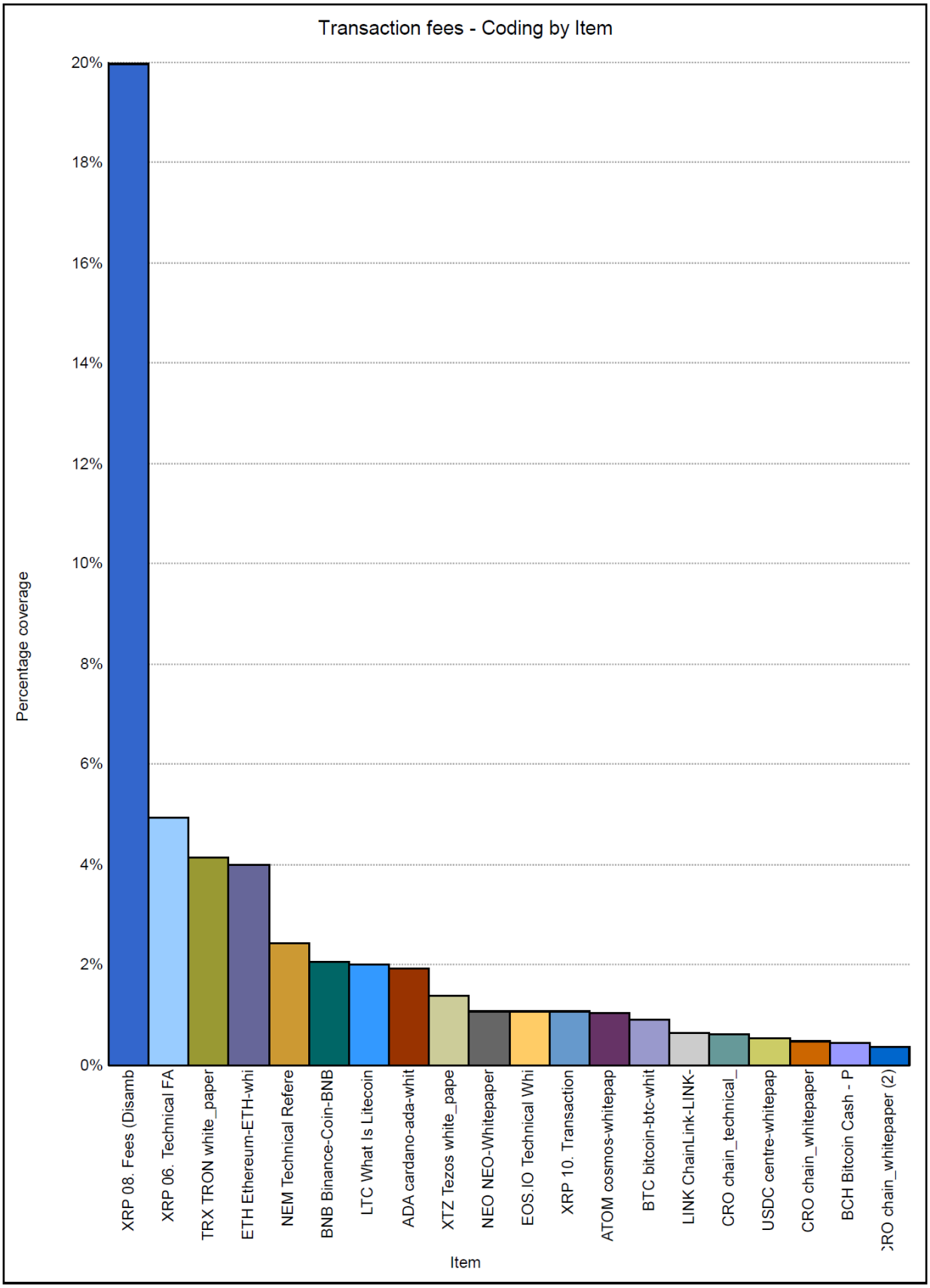

Third party developers - Coding by Item
1%
0%
Percentage coverage
EOS.IO Technical Whi
NEO NEO-Whitepaper
Item

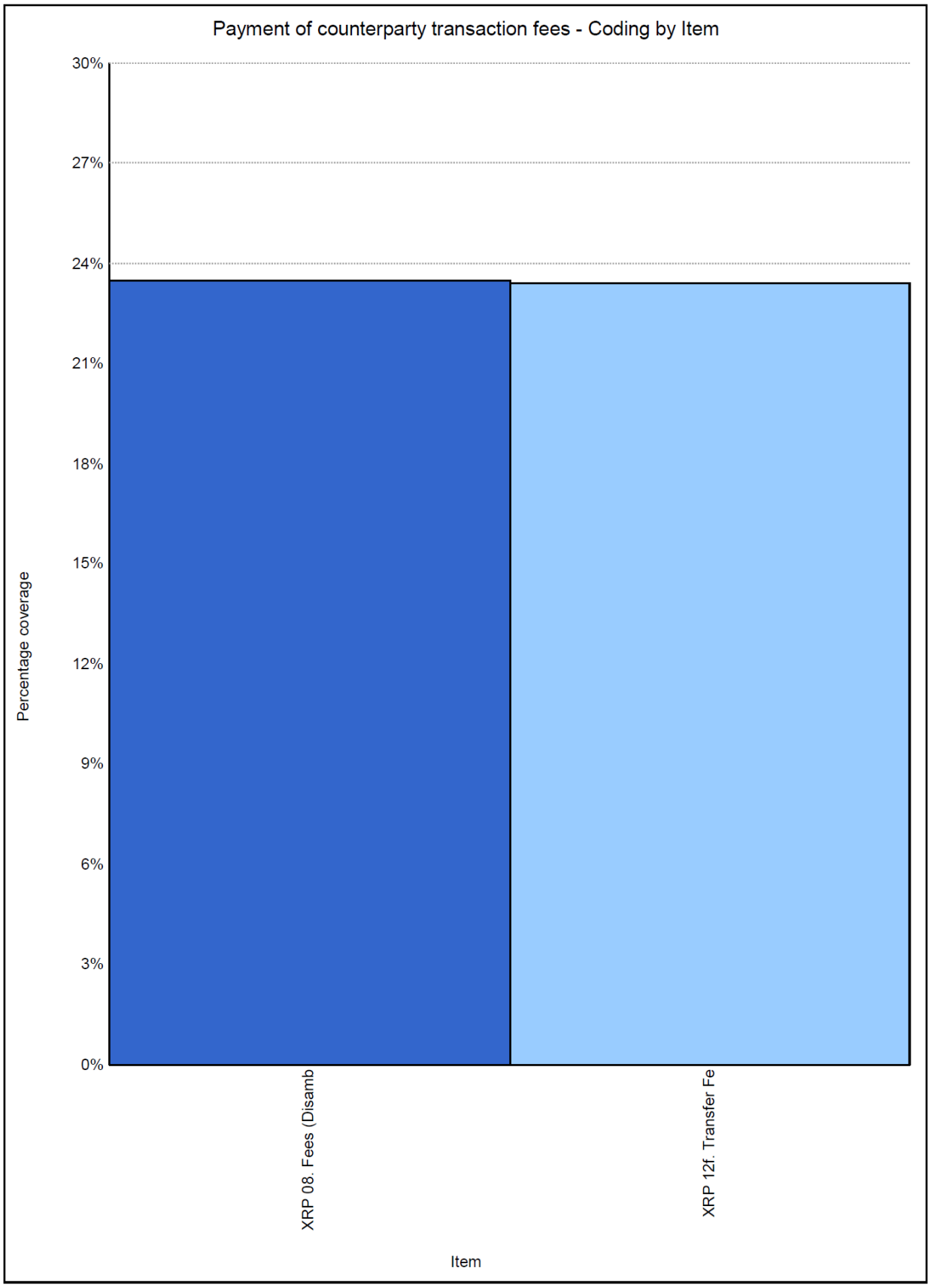

Retention - Coding by Item
1%
0%
Percentage coverage
CRO chain_whitepaper
NEO NEO-Whitepaper
Item

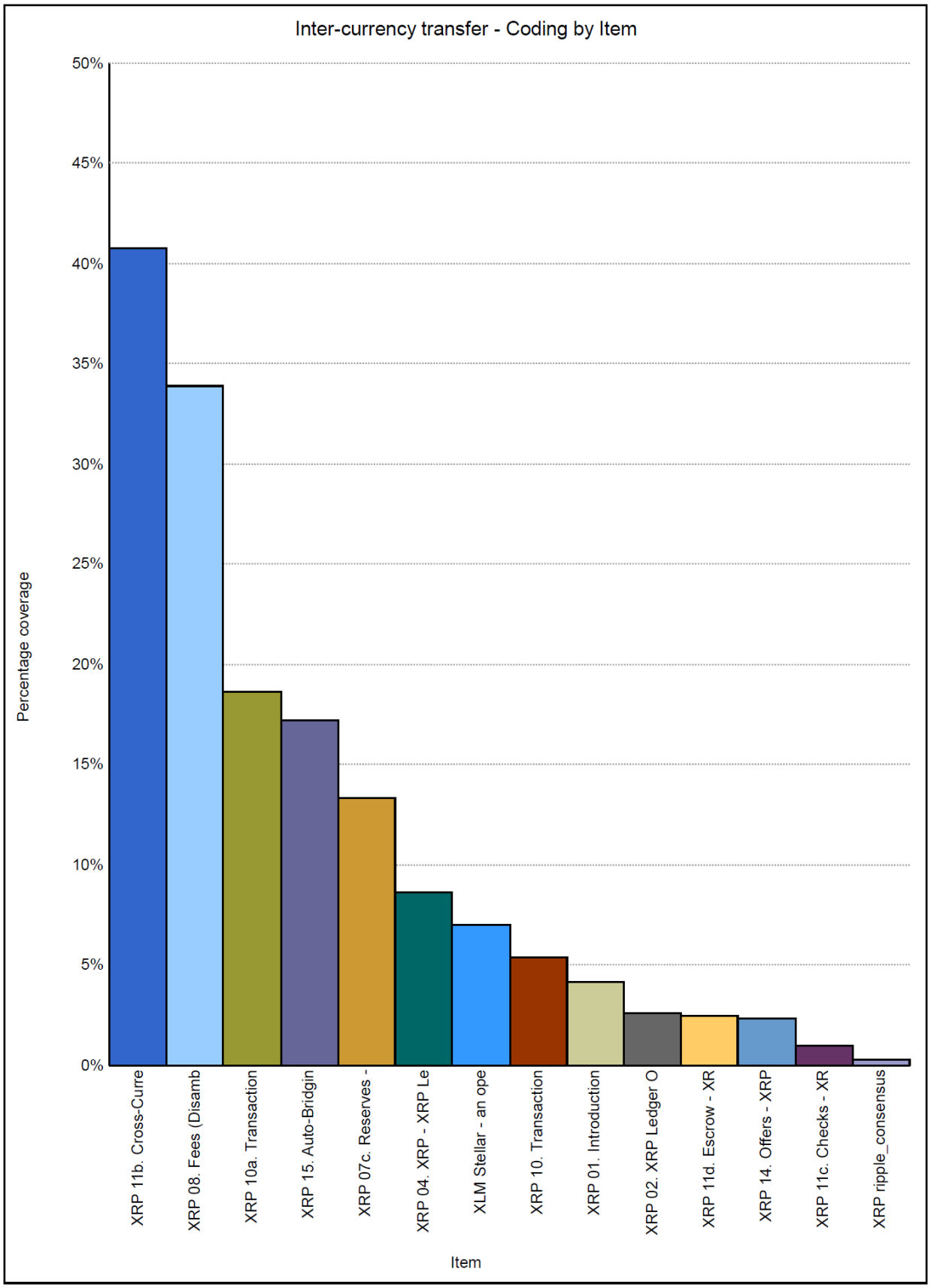

Debt auctions - Coding by Item
2%
1%
0%
Percentage coverage
MKR White Paper - Th
Item

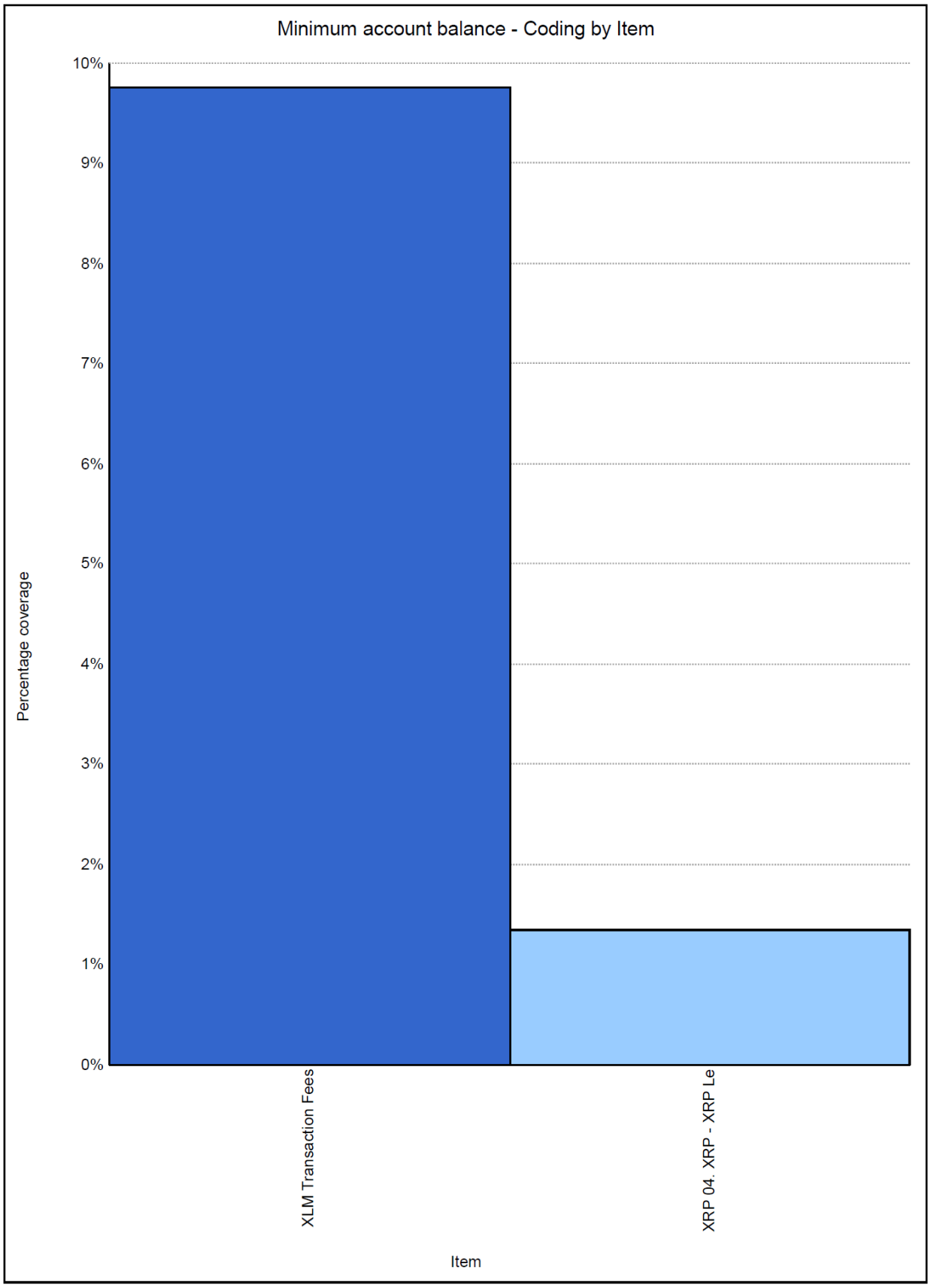

Airdrop - Coding by Item
4%
3%
2%
1%
0%
Percentage coverage
CRO chain_whitepaper
Item

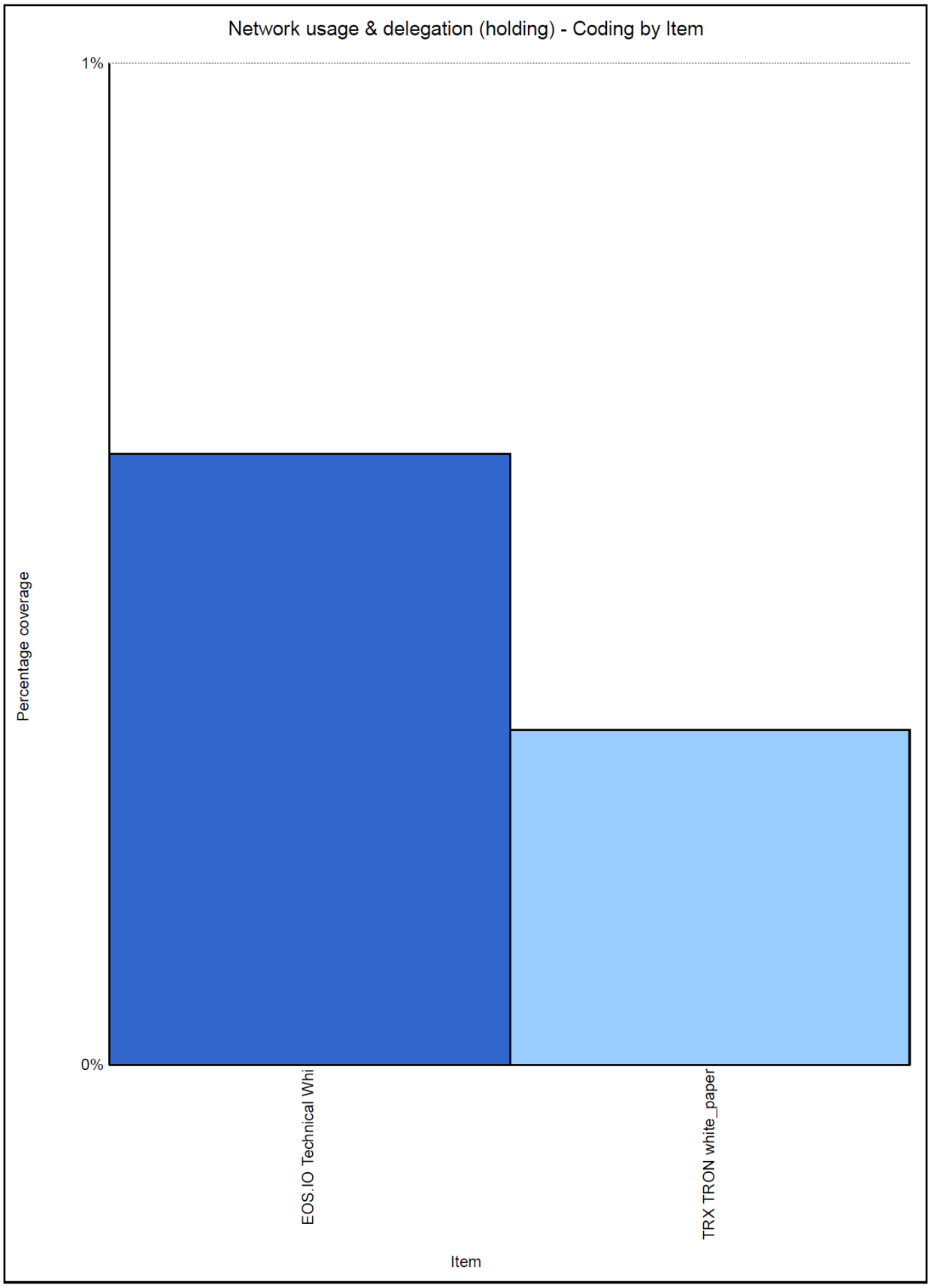

Payment solution - Coding by Item
Percentage coverage
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
XRP 11. Payment Type
BCH Bitcoin Cash - P
XRP 11c. Checks - XR
CRO chain_technical_
USDT Tether-USDT-Whi
LTC Litecoin - Open
XRP 04. XRP - XRP Le
XRP 11e. Partial Pay
BTC bitcoin-btc-whit
XRP 11d. Escrow - XR
XRP 11a. Direct XRP
BCH Roadmap - Bitcoi
LTC What Is Litecoin
USDC centre-whitepap
BNB Binance-Coin-BNB
XRP 02. XRP Ledger O
XRP ripple_consensus
ETH Ethereum-ETH-whi
DASH Dash-Whitepaper
NEM Technical Refere
Item

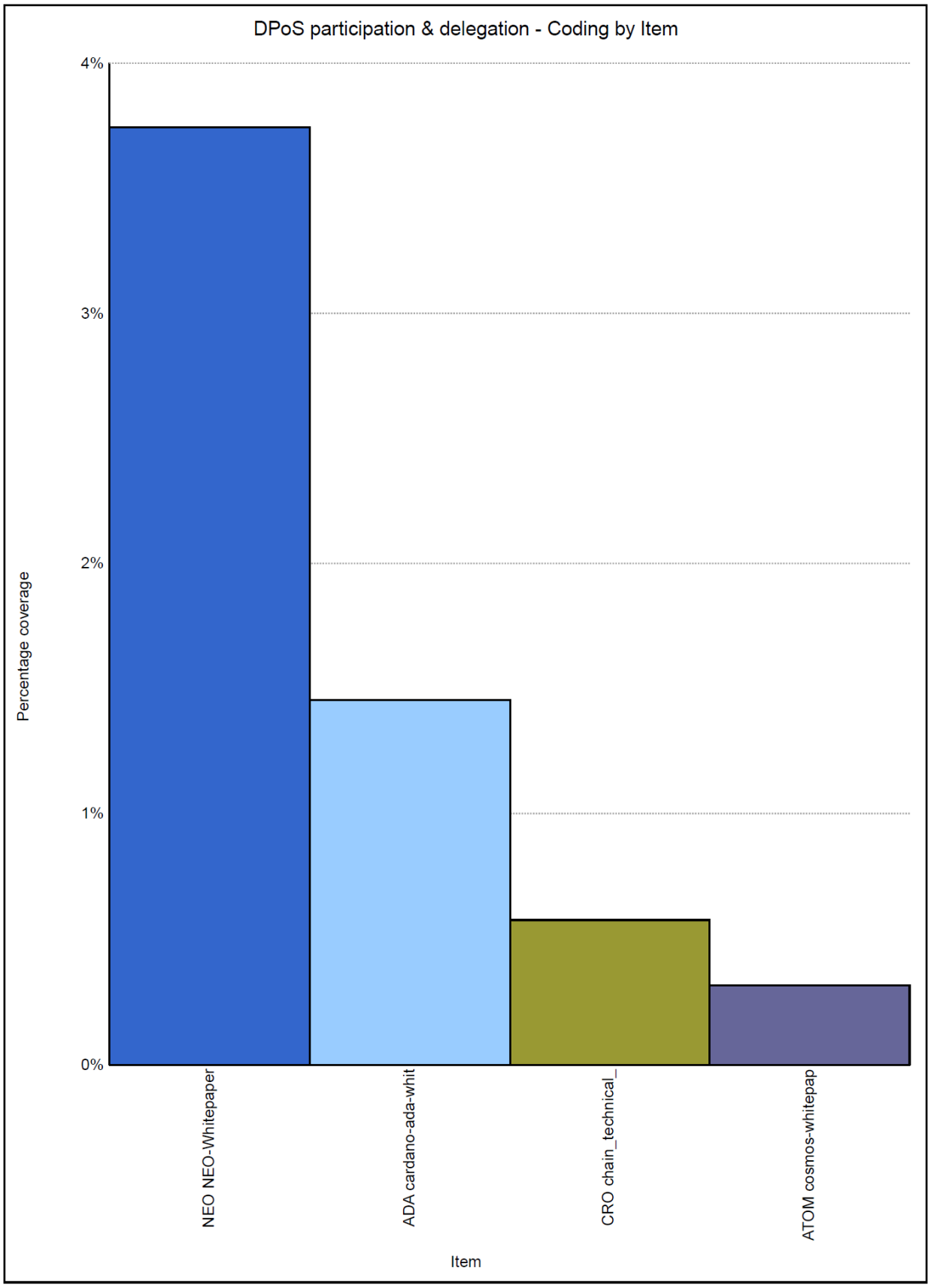

Transaction fees - Coding by Item
Percentage coverage
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
XRP 08. Fees (Disamb
XRP 06. Technical FA
TRX TRON white_paper
ETH Ethereum-ETH-whi
NEM Technical Refere
BNB Binance-Coin-BNB
LTC What Is Litecoin
ADA cardano-ada-whit
XTZ Tezos white_pape
NEO NEO-Whitepaper
EOS.IO Technical Whi
XRP 10. Transaction
ATOM cosmos-whitepap
BTC bitcoin-btc-whit
LINK ChainLink-LINK-
CRO chain_technical_
USDC centre-whitepap
CRO chain_whitepaper
BCH Bitcoin Cash - P
CRO chain_whitepaper (2)
Item

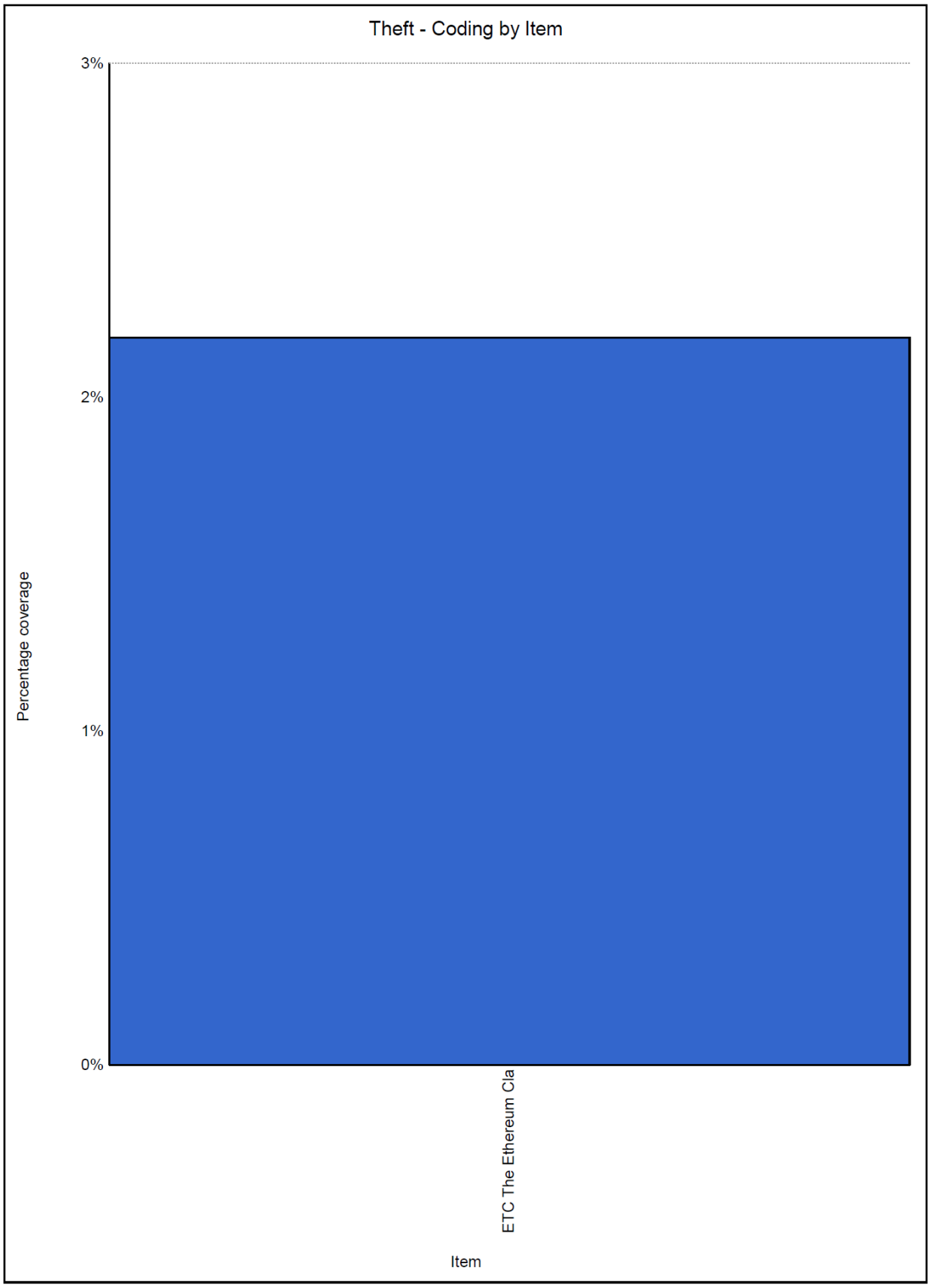

Payment of counterparty transaction fees - Coding by Item
30%
27%
24%
21%
18%
15%
12%
9%
6%
3%
0%
Percentage coverage
XRP 08. Fees (Disamb
XRP 12f. Transfer Fe
Item

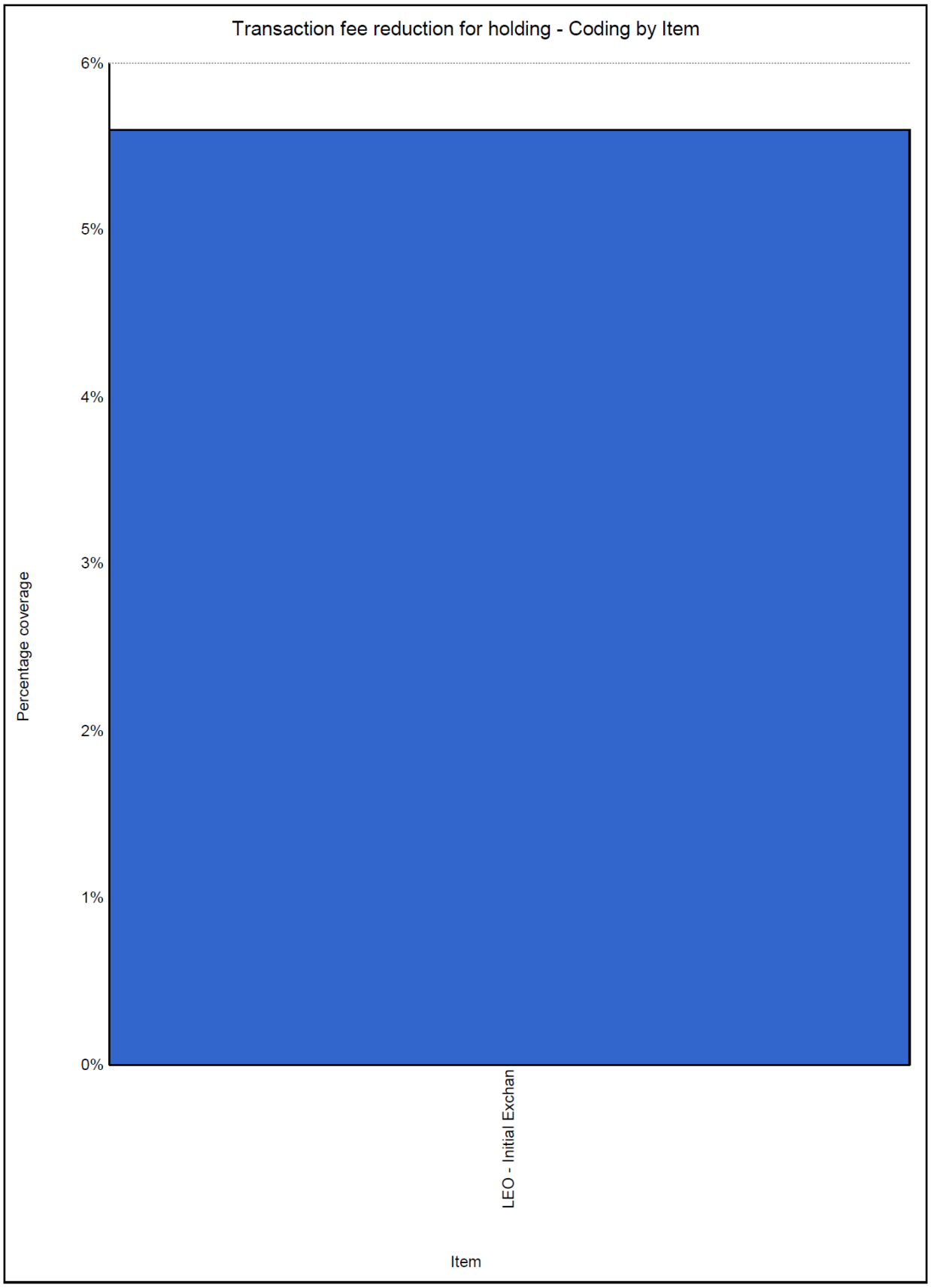

Inter-currency transfer - Coding by Item
Percentage coverage
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
XRP 11b. Cross-Curre
XRP 08. Fees (Disamb
XRP 10a. Transaction
XRP 15. Auto-Bridgin
XRP 07c. Reserves -
XRP 04. XRP - XRP Le
XLM Stellar - an ope
XRP 10. Transaction
XRP 01. Introduction
XRP 02. XRP Ledger O
XRP 11d. Escrow - XR
XRP 14. Offers - XRP
XRP 11c. Checks - XR
XRP ripple_consensus
Item

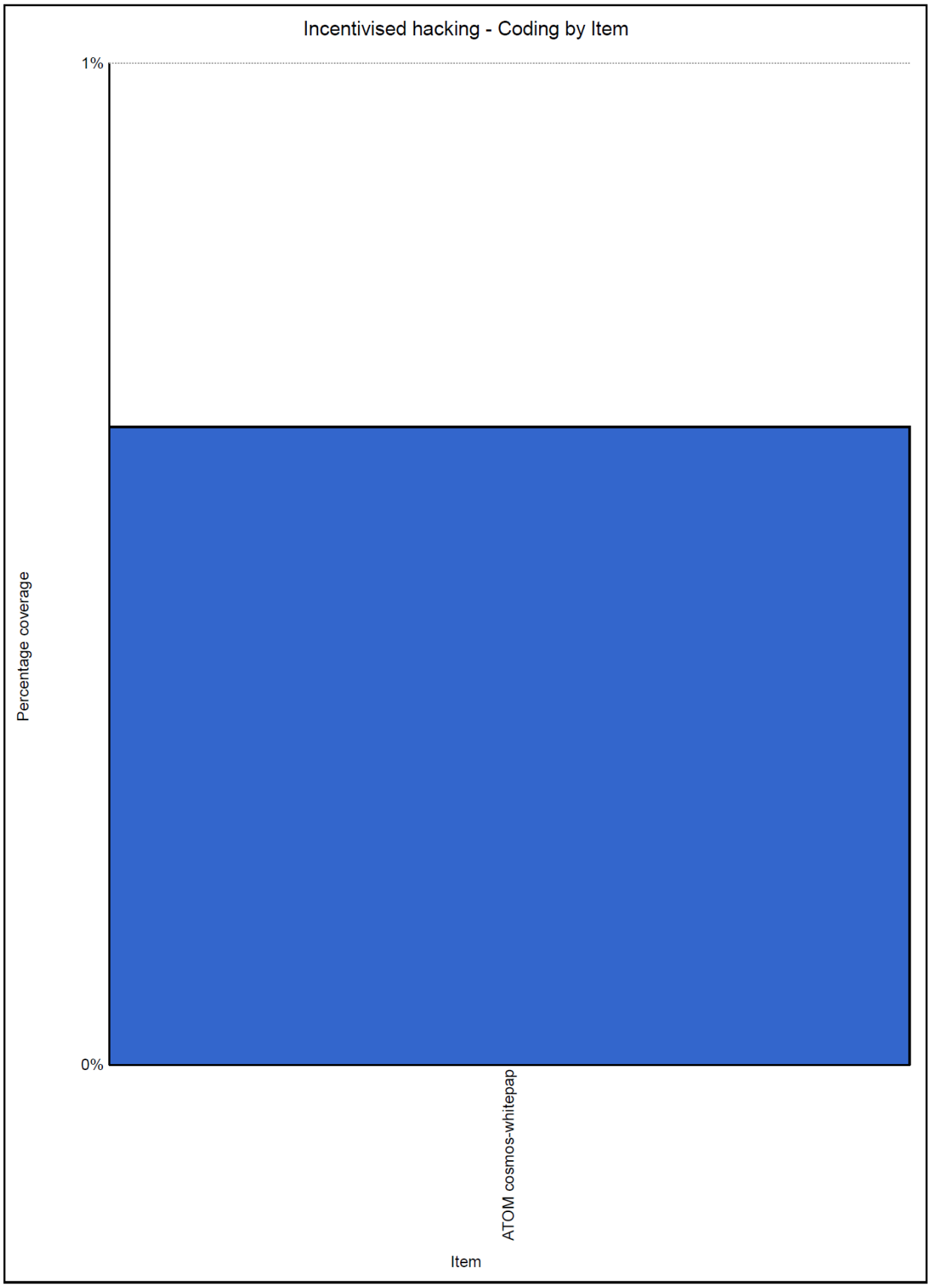

Minimum account balance - Coding by Item
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
Percentage coverage
XLM Transaction Fees
XRP 04. XRP - XRP Le
Item

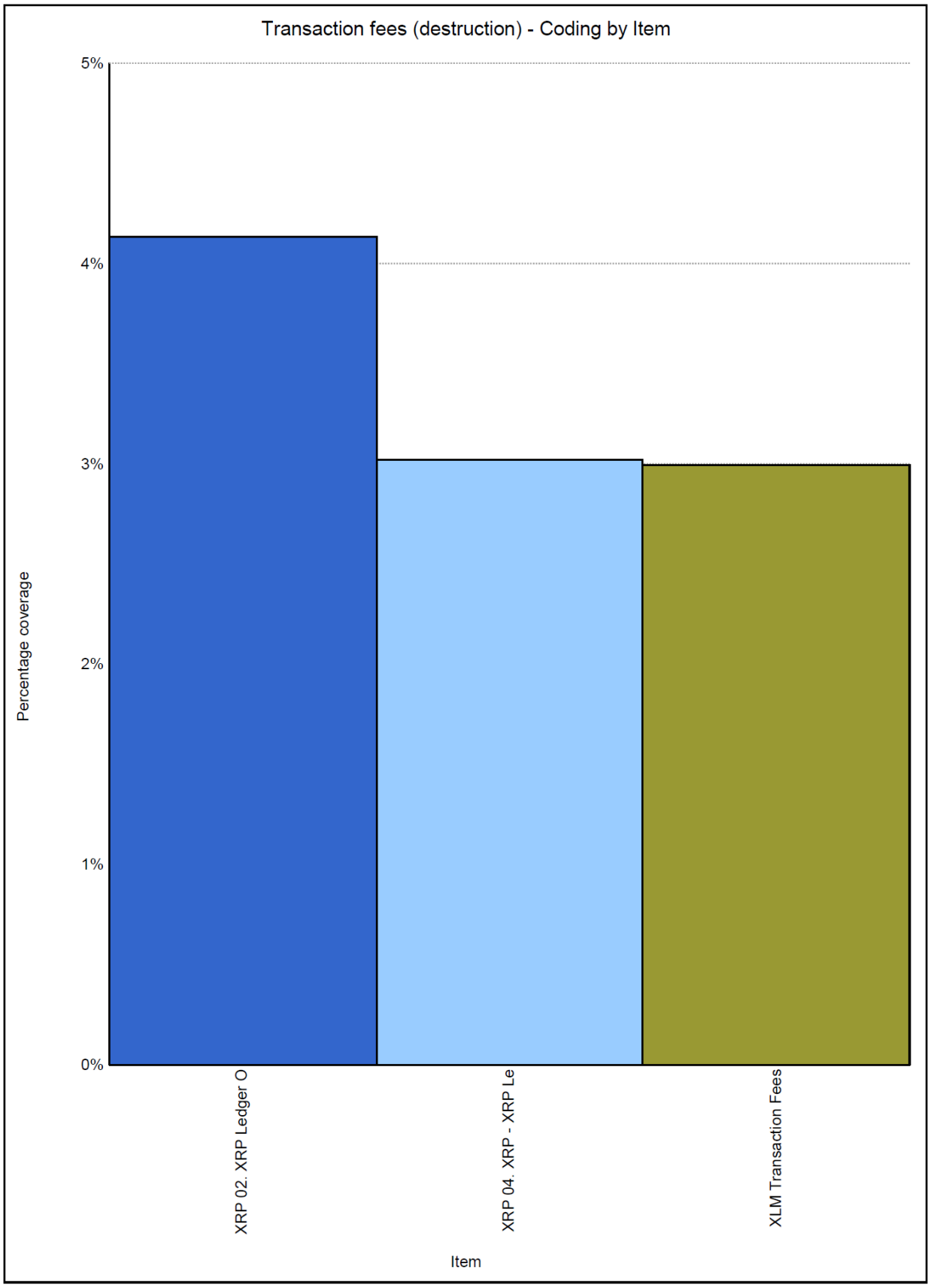

Network usage & delegation (holding) - Coding by Item
1%
0%
Percentage coverage
EOS.IO Technical Whi
TRX TRON white_paper
Item

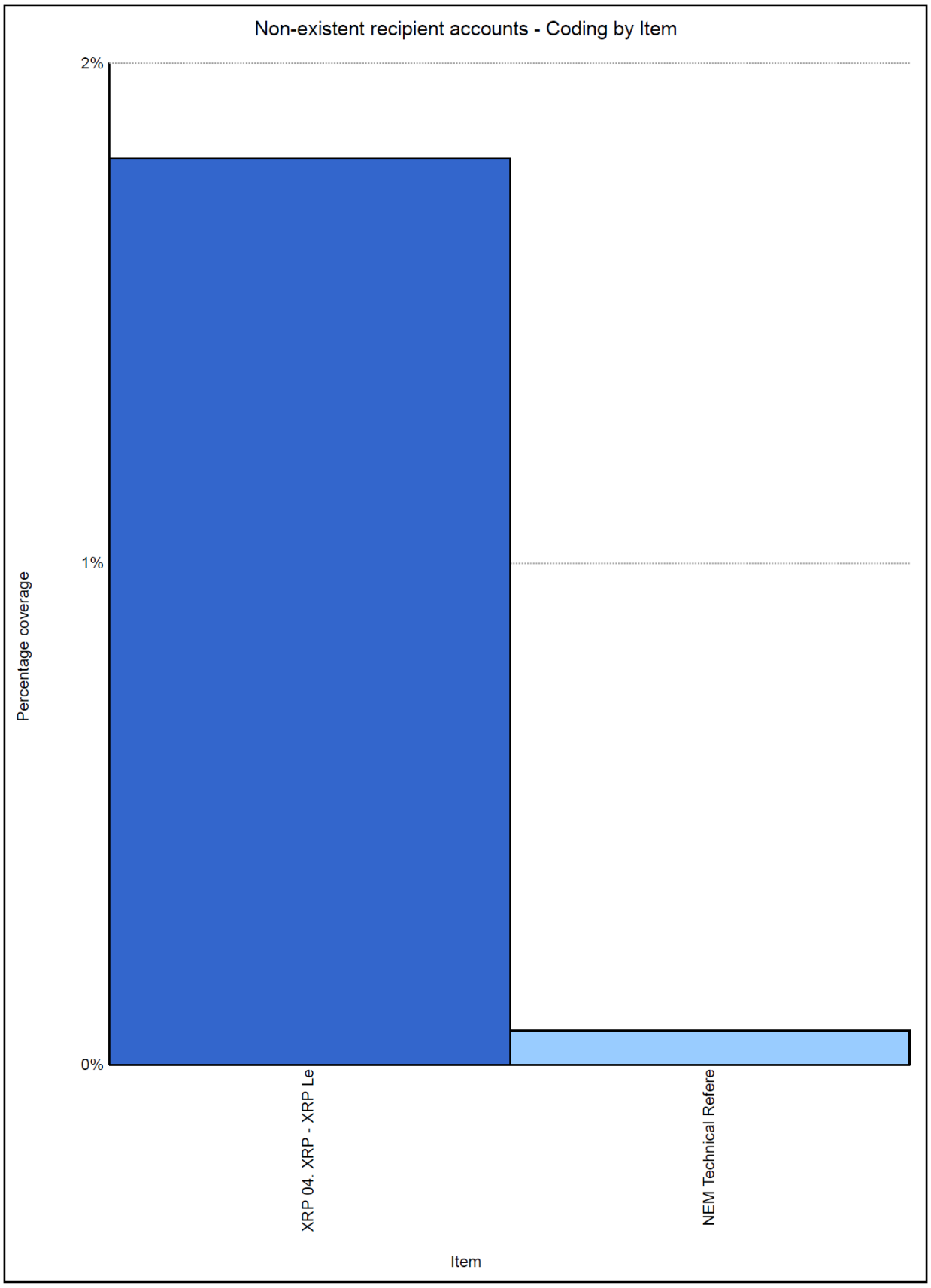

DPoS participation & delegation - Coding by Item
4%
3%
2%
1%
0%
Percentage coverage
NEO NEO-Whitepaper
ADA cardano-ada-whit
CRO chain_technical_
ATOM cosmos-whitepap
Item

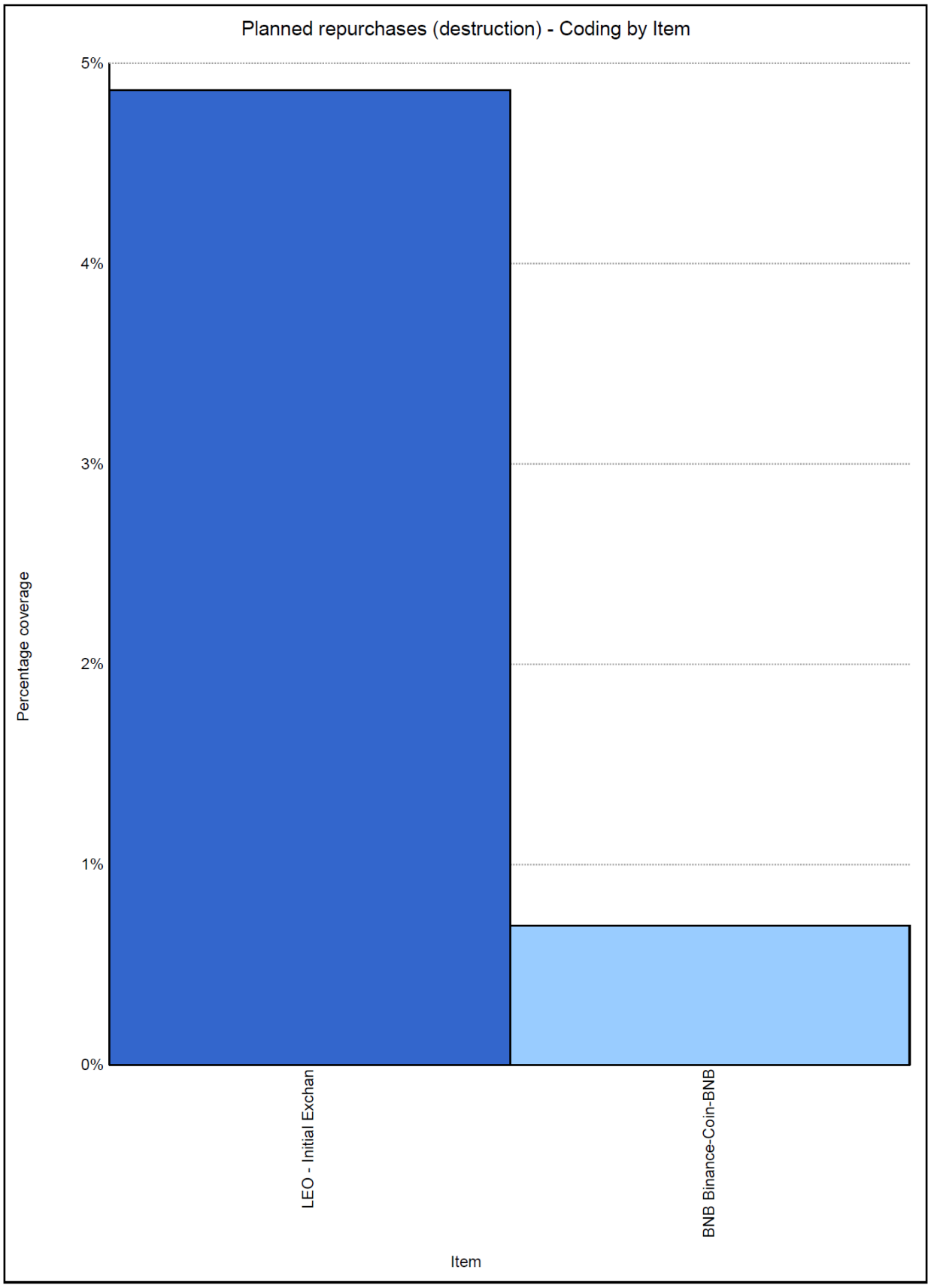

Theft - Coding by Item
3%
2%
1%
0%
Percentage coverage
ETC The Ethereum Cla
Item

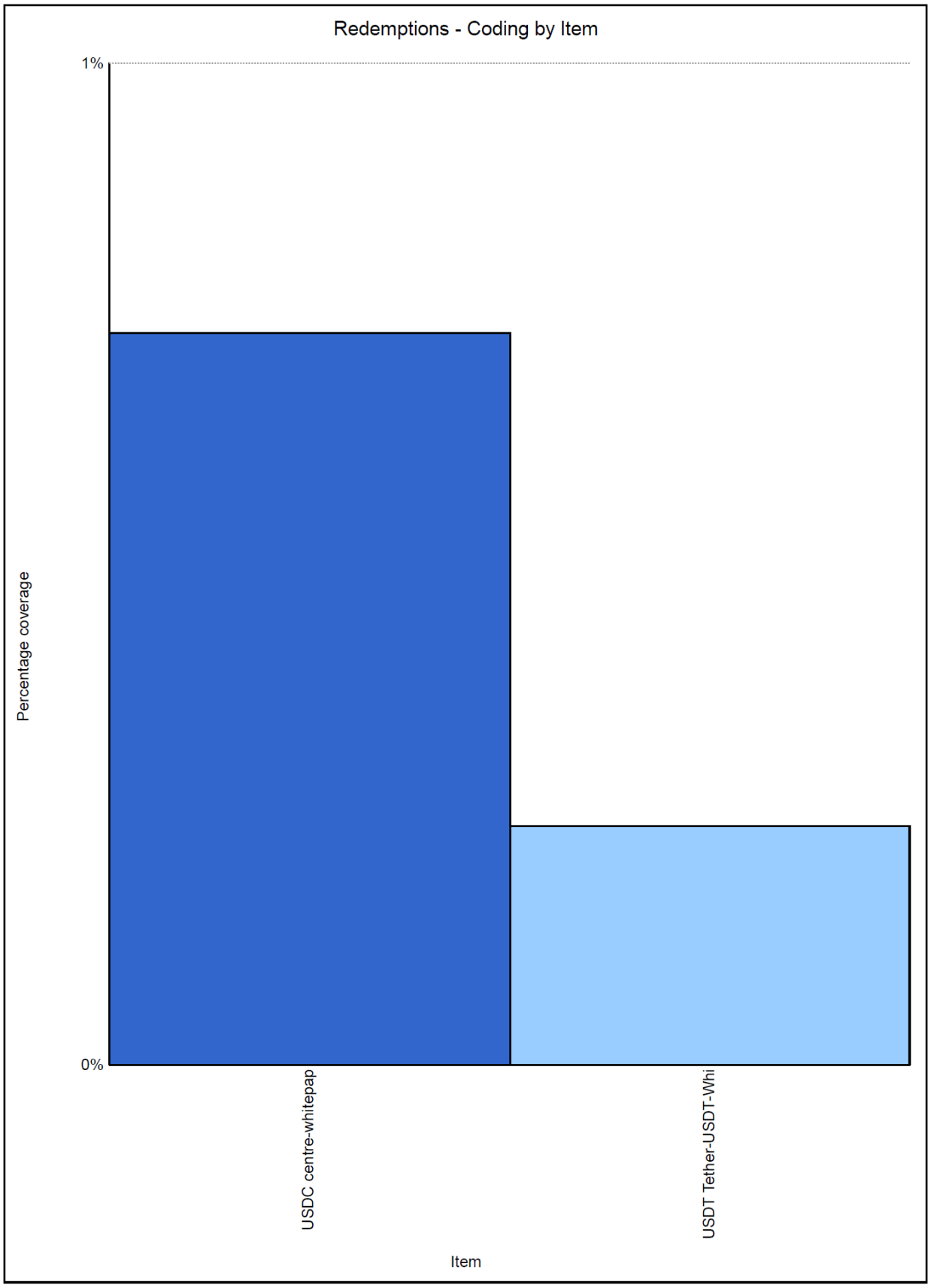

Transaction fee reduction for holding - Coding by Item
6%
5%
4%
3%
2%
1%
0%
Percentage coverage
LEO - Initial Exchan
Item

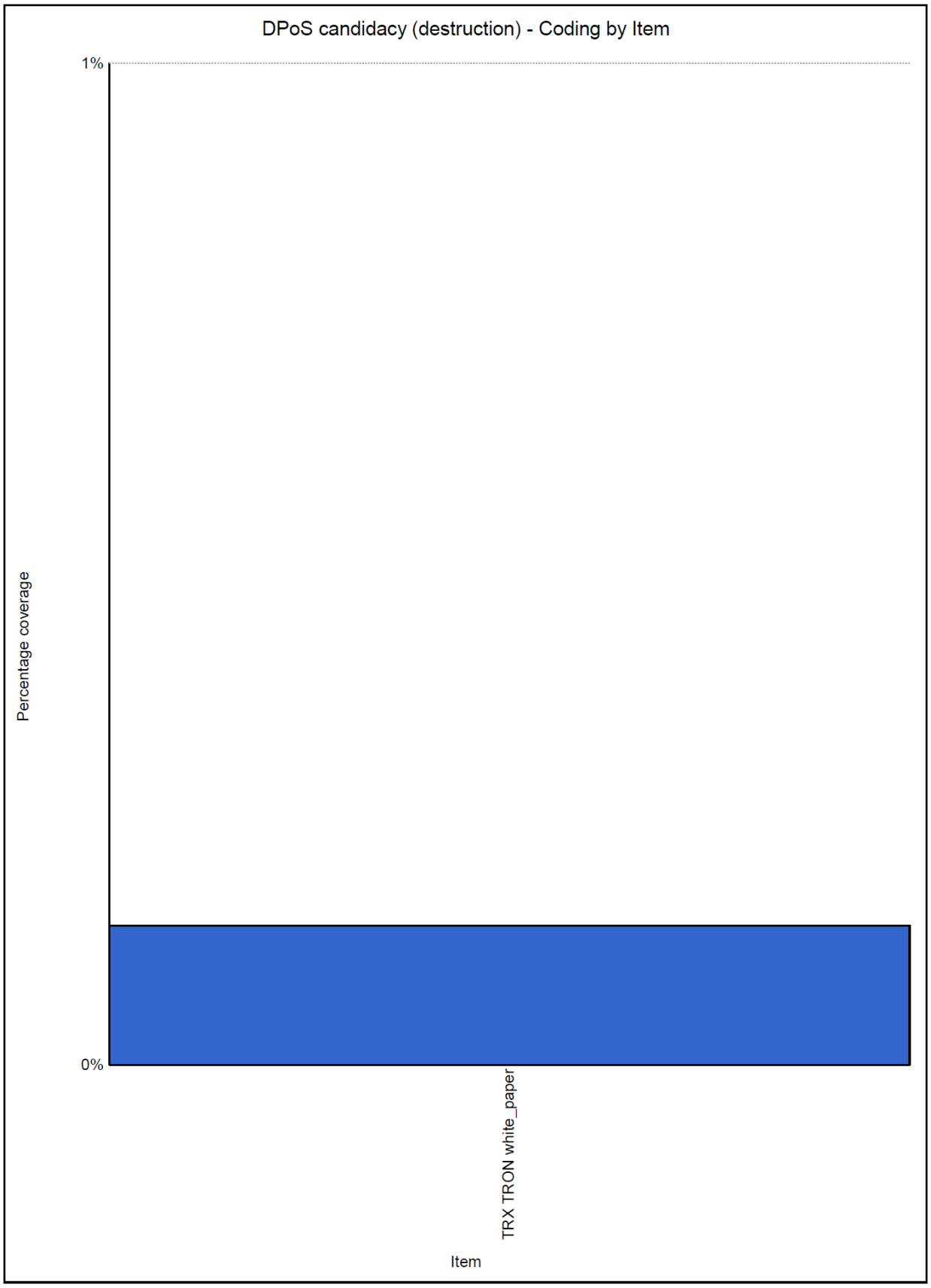

Incentivised hacking - Coding by Item
1%
0%
Percentage coverage
ATOM cosmos-whitepap
Item

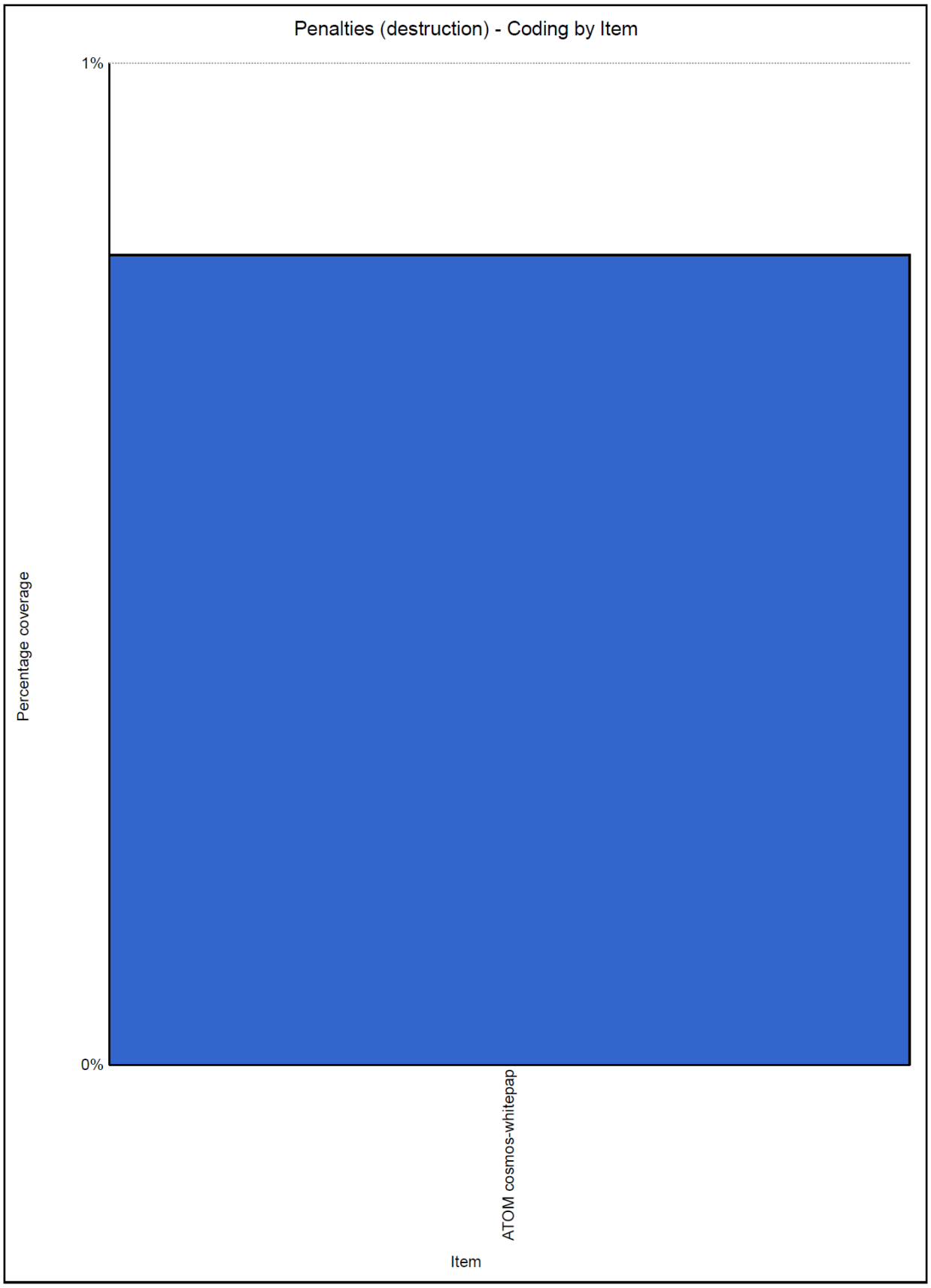

Transaction fees (destruction) - Coding by Item
5%
4%
3%
2%
1%
0%
Percentage coverage
XRP 02. XRP Ledger O
XRP 04. XRP - XRP Le
XLM Transaction Fees
Item

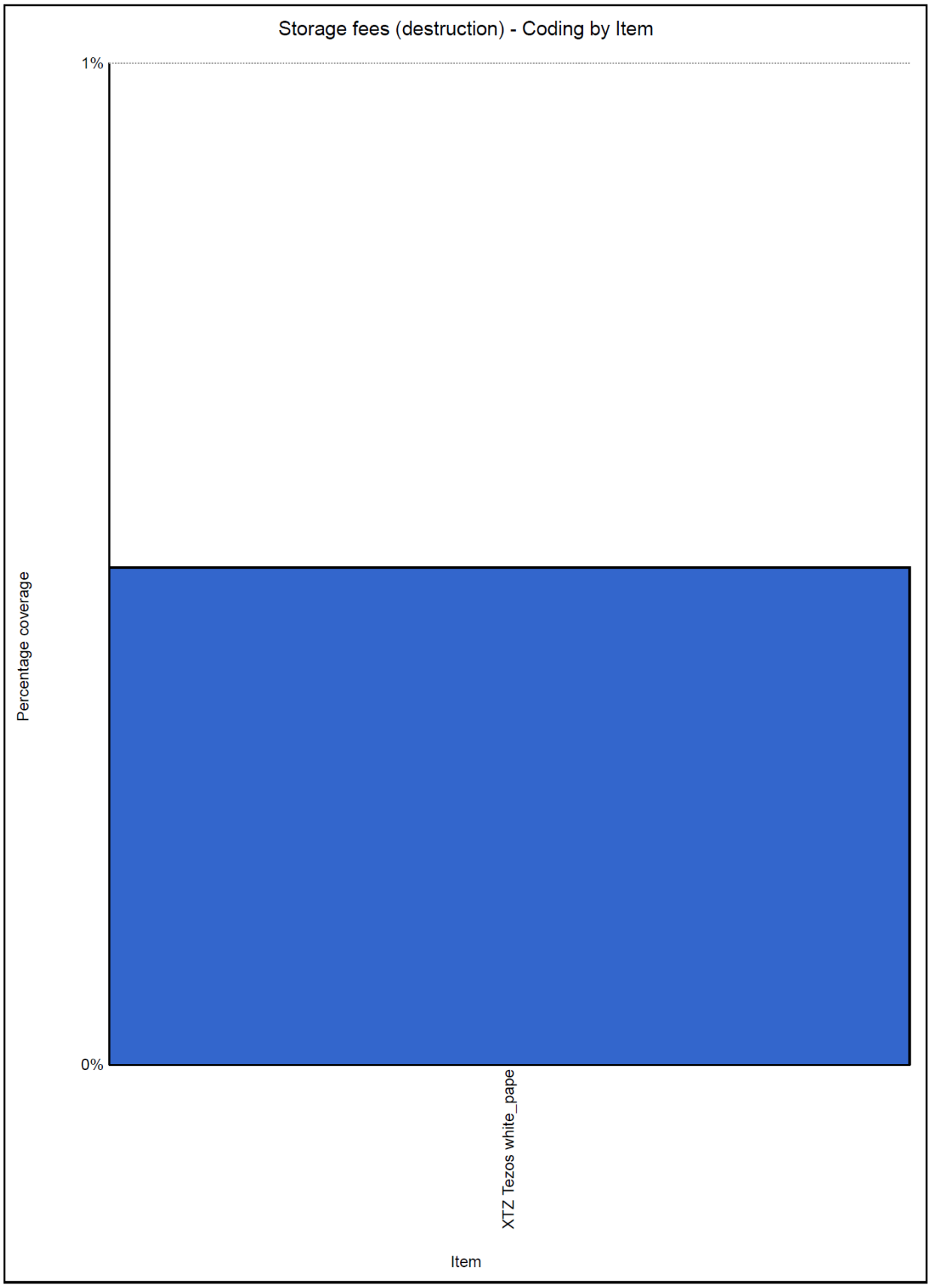

Non-existent recipient accounts - Coding by Item
2%
1%
0%
Percentage coverage
XRP 04. XRP - XRP Le
NEM Technical Refere
Item

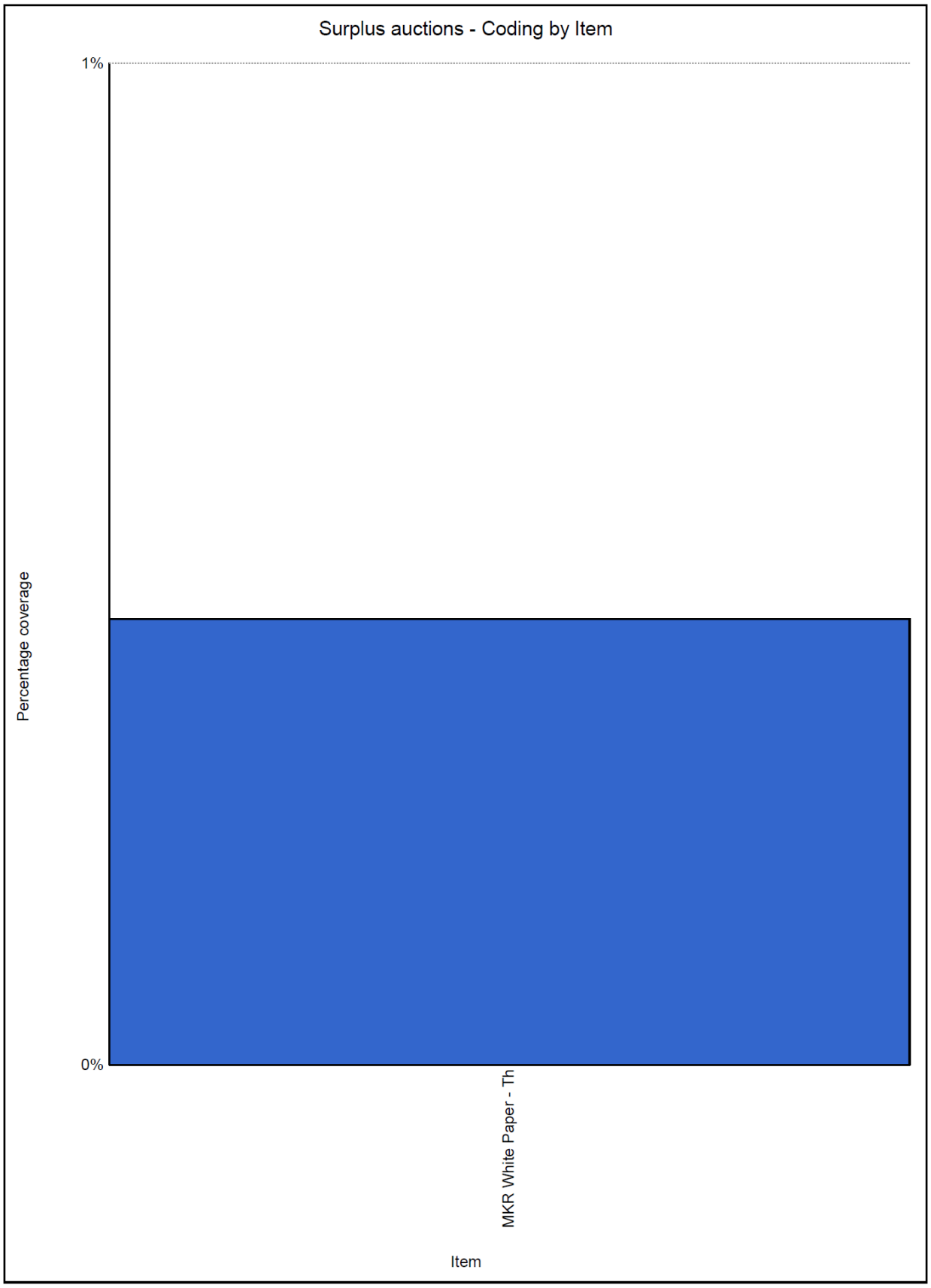

Planned repurchases (destruction) - Coding by Item
5%
4%
3%
2%
1%
0%
Percentage coverage
LEO - Initial Exchan
BNB Binance-Coin-BNB
Item

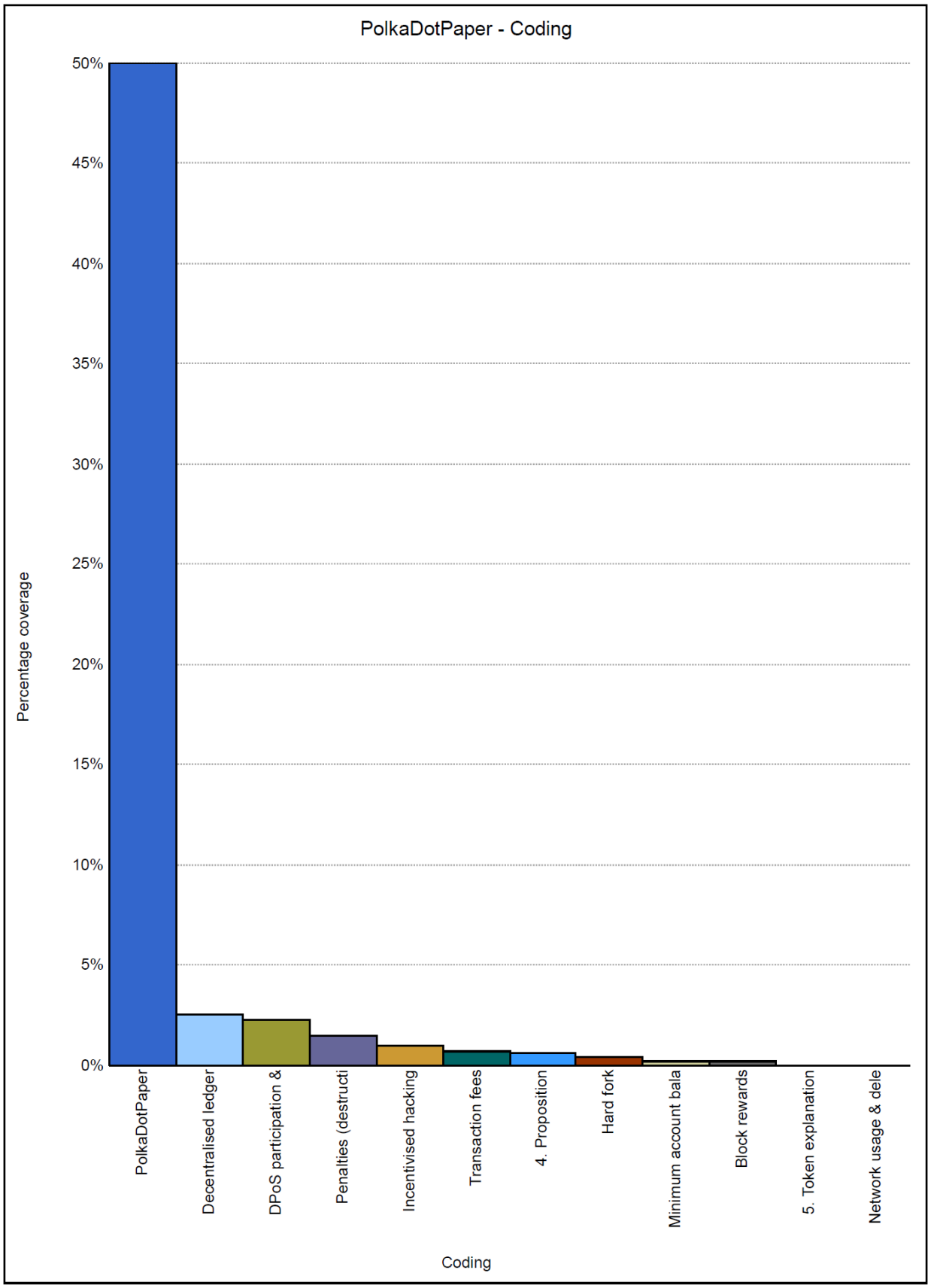

Redemptions - Coding by Item
1%
0%
Percentage coverage
USDC centre-whitepap
USDT Tether-USDT-Whi
Item


DPoS candidacy (destruction) - Coding by Item
1%
0%
Percentage coverage
TRX TRON white_paper
Item


Penalties (destruction) - Coding by Item
1%
0%
Percentage coverage
ATOM cosmos-whitepap
Item


Storage fees (destruction) - Coding by Item
1%
0%
Percentage coverage
XTZ Tezos white_pape
Item


Surplus auctions - Coding by Item
1%
0%
Percentage coverage
MKR White Paper - Th
Item


PolkaDotPaper - Coding
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Percentage coverage
PolkaDotPaper
Decentralised ledger
DPoS participation &
Penalties (destructi
Incentivised hacking
Transaction fees
4. Proposition
Hard fork
Minimum account bala
Block rewards
5. Token explanation
Network usage & dele
Coding

APPENDIX E: Detailed transaction category mapping tables

Table 4a: Transaction categories within origination events

	Crypto-assets		Origination										
			Fiat currency deposits	Sales of crypto-asset tokens by originators			Remuneration or incentive				Fortuitous issuances and receipts		Retained
	Name	Symbol	Fiat currency deposit	ICOs and other market sales	Investor sale	Recapitalisation (debt auction)	Developer allocation	Remuneration and other incentives	Third-party developers	Block rewards	Airdrop participation	Hard fork	Retained
1	Bitcoin	BTC								✓			
2	Ethereum	ETH		✓			✓			✓			
3	XRP	XRP		✓			✓						
4	Bitcoin Cash	BCH								✓		✓	
5	Litecoin	LTC								✓		✓	
6	Binance Coin	BNB		✓	✓		✓	✓					
7	Tether	USDT	✓										
8	EOS	EOS		✓					✓	✓			
9	Bitcoin SV	BSV								✓		✓	
10	Monero	XMR								✓			
11	Stellar	XLM		✓									
12	UNUS SED LEO	LEO		✓									
13	Cardano	ADA		✓									
14	TRON	TRX		✓						✓			
15	Dash	DASH								✓		✓	
16	Chainlink	LINK		✓									
17	Tezos	XTZ		✓			✓		✓	✓			
18	Ethereum Classic	ETC		✓						✓		✓	
19	NEO	NEO		✓			✓	✓	✓				✓
20	IOTA	MIOTA		✓									
21	Cosmos	ATOM		✓	✓		✓	✓		✓			
22	Maker	MKR				✓							
23	NEM	XEM		✓			✓			✓			✓
24	USD Coin	USDC	✓										
25	Crypto.com Chain	CRO								✓	✓		✓
	TOTAL		2	15	2	1	7	3	3	14	1	5	3

Table 5a: Post-origination transaction categorised

Crypto-assets			Post-origination										
			Medium of exchange				Involuntary transfer		Holding					Speculation and investment
	Name	Symbol	Payment solution	Inter-currency transfer	Payment of transaction fees	Payment of counterparty transaction fees	Incentivised hacking	Theft	Minimum account balance	Network usage and delegation	DPoS candidacy and delegation	Future hard fork and airdrop participation	Transaction fee reduction	
1	Bitcoin	BTC	✓		✓			✓				✓		✓
2	Ethereum	ETH	✓		✓			✓				✓		✓
3	XRP	XRP	✓	✓		✓		✓	✓					✓
4	Bitcoin Cash	BCH	✓		✓			✓				✓		✓
5	Litecoin	LTC	✓		✓			✓						✓
6	Binance Coin	BNB	✓		✓			✓						✓
7	Tether	USDT	✓					✓						✓
8	EOS	EOS						✓		✓	✓			✓
9	Bitcoin SV	BSV	✓		✓			✓						✓
10	Monero	XMR	✓		✓			✓				✓		✓
11	Stellar	XLM		✓	✓			✓	✓					✓
12	UNUS SED LEO	LEO						✓					✓	✓
13	Cardano	ADA	✓		✓			✓			✓			✓
14	TRON	TRX	✓		✓			✓		✓	✓	✓		✓
15	Dash	DASH	✓		✓			✓			✓			✓
16	Chainlink	LINK				✓		✓						✓
17	Tezos	XTZ			✓			✓			✓			✓
18	Ethereum Classic	ETC	✓		✓			✓						✓
19	NEO	NEO			✓			✓			✓	✓		✓
20	IOTA	MIOTA	✓					✓						✓
21	Cosmos	ATOM			✓		✓	✓			✓			✓
22	Maker	MKR						✓						✓
23	NEM	XEM	✓		✓			✓			✓			✓
24	USD Coin	USDC	✓					✓						✓
25	Crypto.com Chain	CRO	✓					✓						✓
TOTAL			17	2	16	2	1	25	2	2	8	6	1	25

Table 6a: Post-origination transaction categorised (including extinction transactions)

Crypto-assets			Medium of exchange							Redemptions	Holding					Speculation and investment			Involuntary transfers				
	Name	Symbol	Payment solution	Inter-currency transfer	Payment of transaction fees	Payment of counterparty transaction fees	Transaction fees	Storage	DPOS candidacy		Minimum account balance	Network usage and delegation	DPoS candidacy and delegation	Future hard fork and airdrop participation	Transaction fee reduction	Speculation and investment	Repurchases	Surplus auctions (supply reductions)	Incentivised hacking	Theft	Penalties	Non-existent accounts	Lost access
1	Bitcoin	BTC	✓		✓									✓		✓				✓			✓
2	Ethereum	ETH	✓		✓									✓		✓				✓			✓
3	XRP	XRP	✓	✓		✓	✓				✓					✓				✓		✓	✓
4	Bitcoin Cash	BCH	✓		✓									✓		✓				✓			✓
5	Litecoin	LTC	✓		✓											✓				✓			✓
6	Binance Coin	BNB	✓		✓											✓	✓			✓			✓
7	Tether	USDT	✓							✓						✓				✓			✓
8	EOS	EOS										✓	✓			✓				✓			✓
9	Bitcoin SV	BSV	✓		✓											✓				✓			✓
10	Monero	XMR	✓		✓									✓		✓				✓			✓
11	Stellar	XLM		✓	✓		✓				✓					✓				✓			✓
12	UNUS SED LEO	LEO													✓	✓	✓			✓			✓
13	Cardano	ADA	✓		✓								✓			✓				✓			✓
14	TRON	TRX	✓		✓				✓			✓	✓	✓		✓				✓			✓
15	Dash	DASH	✓		✓								✓			✓				✓			✓
16	Chainlink	LINK				✓										✓				✓	✓		✓
17	Tezos	XTZ			✓			✓					✓			✓				✓			✓
18	Ethereum Classic	ETC	✓		✓											✓				✓			✓
19	NEO	NEO			✓								✓	✓		✓				✓			✓
20	IOTA	MIOTA	✓													✓				✓			✓
21	Cosmos	ATOM			✓								✓			✓			✓	✓	✓		✓
22	Maker	MKR														✓		✓		✓			✓
23	NEM	XEM	✓		✓								✓			✓				✓		✓	✓
24	USD Coin	USDC	✓							✓						✓				✓			✓
25	Crypto.com Chain	CRO	✓													✓				✓			✓
TOTAL			17	2	16	2	2	1	1	2	2	2	8	6	1	25	2	1	1	25	2	2	25

Table 7a: Complete crypto-asset transaction category matrix

		Medium of exchange							**Redemptions**	**Holding**					**Speculation and investment**			**Involuntary transfers**				
		Payment solution	Inter-currency transfer	Payment of transaction fees	Payment of counterparty transaction fees	Transaction fees	Storage	DPOS candidacy		Minimum account balance	Network usage and delegation	DPoS candidacy and delegation	Future hard fork and airdrop participation	Transaction fee reduction	Speculation and investment	Repurchases	Surplus auctions (supply reductions)	Incentivised hacking	Theft	Penalties	Non-existent accounts	Lost access
Fiat currency deposits	Fiat currency deposit	USDT USDC							USDT USDC						USDT USDC				USDT USDC			USDT USDC
Sales of crypto-asset tokens by originators	ICOs and other market sales	ETH XRP BNB ADA TRX ETC MIOTA XEM	 XRP XLM 	ETH BNB XLM ADA TRX XTZ ETC NEO ATOM XEM	 XRP LINK 	 XRP XLM 	 XTZ 	 TRX 		 XRP XLM 	 EOS TRX 	 EOS TRX XTZ NEO ATOM XEM	ETH TRX NEO 	 LEO 	ETH XRP BNB EOS XLM LEO ADA TRX LINK XTZ ETC NEO MIOTA ATOM XEM	 BNB LEO 	 	 ATOM 	ETH XRP BNB EOS XLM LEO ADA TRX LINK XTZ ETC NEO MIOTA ATOM XEM	 LINK ATOM 	 XRP XEM	ETH XRP BNB EOS XLM LEO ADA TRX LINK XTZ ETC NEO MIOTA ATOM XEM
	Investor sale	BNB 	 	BNB ATOM	 	 	 	 	 	 	 	 ATOM	 	 	BNB ATOM	BNB 	 	 ATOM	BNB ATOM	 ATOM	 	BNB ATOM
	Recapitalisation (debt auction)														MKR		MKR		MKR			MKR
Remuneration or incentive	Developer allocation	ETH XRP BNB MIOTA XEM	 XRP 	ETH BNB XTZ NEO ATOM XEM	 XRP 	 XRP 	 XTZ 	 		 XRP 	 	 XTZ NEO ATOM XEM	ETH NEO 	 	ETH XRP BNB XTZ NEO MIOTA ATOM XEM	 BNB 	 	 ATOM 	ETH XRP BNB XTZ NEO MIOTA ATOM XEM	 XEM	ETH XRP BNB XTZ NEO MIOTA ATOM XEM
	Remuneration and other incentives	ETH BNB 	 	ETH BNB NEO ATOM	 	 	 	 		 	 	 NEO ATOM	ETH NEO 	 	ETH BNB NEO ATOM	 BNB 	 	 ATOM	ETH BNB NEO ATOM	 ATOM	 	ETH BNB NEO ATOM

		Medium of exchange							Redemptions	Holding					Speculation and investment			Involuntary transfers				
		Payment solution	Inter-currency transfer	Payment of transaction fees	Payment of counterparty transaction fees	Transaction fees	Storage	DPOS candidacy		Minimum account balance	Network usage and delegation	DPoS candidacy and delegation	Future hard fork and airdrop participation	Transaction fee reduction	Speculation and investment	Repurchases	Surplus auctions (supply reductions)	Incentivised hacking	Theft	Penalties	Non-existent accounts	Lost access
Remuneration or incentive (continued)	Third-party developers			XTZ NEO			XTZ				EOS	EOS XTZ NEO			EOS XTZ NEO				EOS XTZ NEO			EOS XTZ NEO
	Block rewards	BTC ETH BCH LTC BSV XMR TRX DASH ETC XEM CRO		BTC ETH BCH LTC BSV XMR TRX DASH XTZ ETC ATOM XEM			XTZ	TRX			EOS TRX	EOS TRX DASH XTZ ATOM XEM	BTC ETH BCH EOS XMR TRX ATOM		BTC ETH BCH LTC EOS BSV XMR TRX DASH XTZ ETC ATOM XEM CRO			ATOM	BTC ETH BCH LTC EOS BSV XMR TRX DASH XTZ ETC ATOM XEM CRO	ATOM	XEM	BTC ETH BCH LTC EOS BSV XMR TRX DASH XTZ ETC ATOM XEM CRO
Fortuitous issuances and receipts	Airdrop participation	CRO													CRO				CRO			CRO
	Hard fork	BCH LTC BSV DASH ETC		BCH LTC BSV DASH ETC								DASH	BCH		BCH LTC BSV DASH ETC				BCH LTC BSV DASH ETC			BCH LTC BSV DASH ETC
Retained	Retained	XEM CRO		NEO XEM								NEO XEM	NEO		NEO XEM CRO				NEO XEM CRO		XEM	NEO XEM CRO