Take Cover: Incentivising Wider Social Insurance Participation in South Africa

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Abstract

This paper examines the gap in social insurance coverage in semi-formal enterprises, and explores options for incentivising participation by lower income workers in a comprehensive statutory social security scheme. A probit model is used to quantify current patterns of UIF and pension coverage. The analysis confirms that business owners, employees in the informal sector and those without an employment contract are significantly less likely to participate. A transition matrix is used to assess the trends in participation over the 2020 lockdown period - showing a statistically significant increase in pension fund and UIF participation, which suggests that the Covid-19 TERS benefit generated an availability heuristic effect. Two subsidy models are examined, designed to incentivise wider participation: the first being a subsidy for comprehensive social insurance cover (including pension and unemployment insurance) and the second a subsidisation of unemployment insurance only. Both subsidy models are costed. In the event of full participation, the unemployment insurance subsidy would cost the state R16 billion annually, while a comprehensive social insurance subsidy would amount to R48 billion annually. The unemployment insurance subsidy is advised as an immediate avenue for action, while the comprehensive plan remains a goal for higher welfare in the long run.

Contents

1 Introduction

Social insurance, a core component of the social security system, seeks to protect contributors from the risk of falling into poverty in the event of job loss, injury, old age or illness. South Africa faces the following coverage gaps, of particular concern during recessionary periods such as the one faced in light of COVID-19 [17]:

- The Unemployment Insurance Fund (UIF), designed to cover all formal sector workers from the risk of job loss, fails to protect many members of the labour force [18]; workers who do not form part of the formal sector are largely excluded, having no incentive to formalise operations in order to participate.
- The absence of a mandatory contributory pension scheme has caused many elderly individuals to rely on limited support from the state old age pension (SOAP) [17], where the SOAP means-test implies a poverty trap [39].

While South Africa's high unemployment rate does explain the larger reliance on social grants relative to social insurance, this paper aims to explore options for extending participation to workers currently not covered, while considering the need to mitigate the possible effect of higher contribution rates (associated with financing a pension system) on discouraging participation.

Small & Micro Enterprise (SME) owners and their employees are often among those who elect not to participate in social insurance. This lack of participation (found often to be accompanied by non-compliance in terms of income tax [4]) by otherwise formalised SMEs prevents such enterprises from being included in the 'formal sector', contributing to the blurring of formal and informal sectors prevalent in developing countries [28]. Such a 'blurred' sector includes non-compliant yet operationally formal SMEs, deemed *semi*-formal for the purposes of this paper: those considered formal in nature yet remaining informal in some stricter, legal sense[1]. More specifically, this paper considers businesses to be *semi*-formal if they possess a formal workspace while not being tax or UIF compliant.

The COVID-19 pandemic left this *semi*-formal sector exposed. A survey of 233 Small & Micro Enterprises (SMEs) has shown that, while being registered businesses and having a formal workspace, upwards of 80% of those surveyed were ineligible for relief and emergency funding during COVID-19 due to not being fully compliant with the South African Revenue Service (SARS) and the Unemployment Insurance Fund (UIF) [4]. This dilemma indicates that there have been constraints combined with little incentive for SMEs to fully formalise operations and register with both SARS and the UIF.

While the lack of compliance signals a loss in tax revenue, this paper will focus on the underutilised social insurance system. Since SARS facilitates the collection of UIF revenue for businesses [38], it is reasonable to assume that boosting UIF compliance would assist

[1]Combining definitions of formality from Bradford [5] and Ligthelm [22], this paper defines *formal* enterprises as registered businesses that are legally compliant with a formal workspace. Legal compliance requires that businesses are formally registered with the CIPC, are tax compliant with the South African Revenue Service (SARS) and compliant with the Unemployment Insurance Fund (UIF). Consequently, *semi*-formal businesses are considered to be those who fail to be fully legally compliant while having a degree of formalisation - such as those with a fixed workspace or registered business, frequently observed among 233 SMEs surveyed during the lockdown period in South Africa [4].

SARS with broadening the tax base. The social insurance system is of particular concern as 5.2 million lost their jobs or were temporarily unemployed and 3 million people fell into poverty between February and April of 2020 [15]. These individuals need support from unemployment insurance or, if elderly, a pension. Worryingly, a study from the 2008/2009 recession found that less than 5% of those unemployed were UIF beneficiaries [45].

Expanding on previous studies, this paper aims to provide a dynamic view of social insurance participation from 2014 to 2020. Cases for broad pension and unemployment insurance coverage will be considered, as well as the incentivisaiton mechanisms needed to accompany the contribution rates that such schemes would imply.

What follows is a review of the current literature surrounding behavioural solutions for incentivising wider social insurance participation; a description of the social insurance landscape in South Africa; a quantitative analysis of social insurance participation; and a cost projection of two proposed subsidy designs.

2 Local, International and Behavioural Approaches to Incentivisation

2.1 The Case for Incentivisation

In South Africa, employers and employees are required by law to pay contributions towards unemployment insurance, while contributions towards old age insurance are non-statutory and based on company policy. In both cases, the obligation is on employers to make these payments. Among higher earners, high rates of compliance are achieved through the implementation of a tax "withholding" system, whereby the employer withholds the employee's contribution which is then income tax deductible up to a ceiling [31]. This approach, however, has not been enough to elicit widespread coverage. Using data from a nationally representative sample of the working population, Table 1[2] shows that while contributions have increased over time, unemployment and pension contributions were 64.3% and 52.0% in 2020 respectively - with a wide differential between unemployment and pension contribution rates. Internationally, it is known that when the contribution rates are high enough to include pension funding there are often high levels of non-compliance; this is partly because employers and employees can, in effect, collaborate to avoid participation, with short term benefits to both [27]. In South Africa, a similar phenomenon can be seen under the voluntary pension system - with higher contribution rates (in comparison to unemployment insurance) likely leading to the disparity between the proportion of pension and unemployment insurance contributors.

Implementing national coverage for both unemployment and old age insurance will require higher contribution rates, hence innovative means of incentivisation will be needed.

[2]Prior to 2020, the reported standard errors take the full survey design into account (clustering and stratification) - using the cluster variable, the primary sampling unit (PSU), from PALMS (which provides this data until 2019 at the time of writing). In 2020 however, due to constraints from the publicly available QLFS cross sectional data, only sampling weights are used in the estimation - giving accurate point estimates, yet biased standard errors.

Table 1: **Trends in Social Insurance Participation**

	(1) UIF Contributions	(2) Pension Contributions
2014	0.621***	0.498***
	(0.005)	(0.005)
2015	0.611***	0.470***
	(0.004)	(0.005)
2016	0.614***	0.479***
	(0.004)	(0.005)
2017	0.612***	0.489***
	(0.004)	(0.005)
2018	0.611***	0.482***
	(0.005)	(0.005)
2019	0.623***	0.491***
	(0.005)	(0.006)
Observations	*344,112*	*343,991*
2020	0.643***	0.520***
	(0.003)	(0.003)
Observations	*30,830*	*30,823*

Standard errors in parentheses
$***p < 0.01, **p < 0.05, *p < 0.1$
Sample: employed population in South Africa.
Data Source: QLFS (author's calculations).
Sampling weights applied.

2.2 Behavioural Approaches

Thaler & Sunstein have found solutions to optimise policy effectiveness using their concept of *libertarian paternalism*, which nudges individuals towards optimal choices without impeding on their freedom to choose [44]. Loss aversion, the availability heuristic, lack of self control and unrealistic optimism are highlighted as obstacles preventing individuals from making good choices. Kahneman & Tversky have further shown that loss aversion causes individuals to be biased towards the status quo, as "the advantages of alternative options will then be evaluated as gains and their disadvantages as losses" [16] - especially relevant when it comes to saving for retirement, contributing to pension schemes or taking out insurance, preventing people from initiating these plans [44].

In the insurance market, individuals have been shown to adopt risk seeking behaviour, taking their chances on the risk of a greater loss rather than the sure loss of purchasing insurance [16]. Thaler & Sunstein refer to this as unrealistic optimism, where individuals underweight the probability that events needing insurance will arise. Moreover, a lack of self control means that people do not save sufficiently [44]. Simply put, individuals desire

having benefits now and costs later, making it difficult to incentivise people to put money towards endeavours that do not give rise to immediate benefits. The availability heuristic (where individuals assess the likelihood of risks by how readily examples come to mind) has been found in the increased uptake of insurance following a natural disaster [44]. In this way, recessionary periods could give rise to the availability heuristic as the risk of unemployment becomes more apparent.

Policymakers are becoming aware of these behavioural phenomena - giving rise to a multitude of solutions, outlined below.

Existing Solutions

- **Automatic enrolment & default options** in pension or savings schemes have been found to assist individuals to overcome the inertia involved with signing up [44]. Options designated as the default attract a larger market share by decreasing administration costs and confusion [44]. These were legitimate problems in Nicaragua, where reducing the time taken to enrol in social insurance significantly expanded coverage [47].

- **Mandatory pension coverage** was found to cover 23-30% of informal workers in Argentina, Brazil & Uruguay, including self-employed, domestic and agricultural workers, while countries with voluntary coverage were able to cover only 0-10% [24].

- **Contribution matching** has been used to incentivise participation in India and China, where the government matches workers' contributions up to a threshold [12].

- **A Systems approach** to counter loss aversion, bundling policies with net gains that also involve costs, was found to be effective, with costs and benefits presented as one combined outcome [26]. Similar to bundling, Singapore and Malaysia use highly coordinated pension and health insurance systems to expand coverage and reduce administration costs, ranging from coordinated collections to coordinated investment [2]. It has been argued that social programs perform better under an integrated system:

  > *"Combining long term savings for pensions with savings for unemployment benefits can better protect young workers with short vesting periods and, during a recession, it can allow the unemployed to receive benefits for a longer period of time [32]."*

  In adopting the above *systems view* of social insurance, management of a given risk is more efficient and the potential gains of coordination are higher. Here, savings accounts and transfers can be used to combat a multitude of shocks, including the risks imposed by unemployment and old age that are the focus of this paper. This approach has been highlighted as an area for further analysis "to explore and exploit opportunities to enhance the impact of individual programs by linking them to others [32]".

- **Wage & contribution subsidisation** under an integrated system is an effective tool to expand coverage [47], which should also serve to counter the severity of loss aversion when contributing to social insurance. In using state subsidies for the low-income self-employed by matching their contribution with that of the employer they lacked, Costa Rica was able to attain 24% informal sector coverage using a voluntary mechanism [24].

Given the existing solutions presented in the literature, the wage and contribution subsidy appears especially compelling. This is because subsidisation can serve as a redistributive measure as well as a mechanism to change behaviour - both having desirable effects. Research on universal pension coverage in Latin America and the Caribbean highlights subsidisation as a way to promote formal employment, where subsidies can be offered to reduce the contribution burden for low- and middle-income workers, thereby integrating these groups into the formal system while subsequently improving societal equity [23]. Further research in Chile shows how various forms of subsidisation - including a state subsidy granted to employers of low income workers - supported an increase in pension coverage across the labour force to the highest level observed since 1980 (64.8%) [25].

Consequently, consideration could be given to implementation in South Africa of a subsidy to support mandatory social insurance coverage throughout the working population, using a systems approach of combining pension and unemployment insurance. In doing so, the pension system will experience a shift from a non-statutory to a statutory model - whereby subsidisation will serve as a necessary incentivisation tool in order to prevent low-income workers from retreating to or remaining in the informal sector. A National Social Security Fund (NSSF) of this nature has been proposed previously [13] and will be discussed in section 3.

It is important to note that subsidisation is one incentivisation method and certainly not the only way to affect behaviour. For the purpose of this analysis, subsidisation appears viable to explore given its links to increasing formalisation in developing countries [23] and promoting greater social insurance coverage [47][25] - both aspects relevant to the South African labour force and the focus of this paper.

As such, subsidisation can be implemented through various channels, where the discussion to follow will outline options relevant to South Africa.

Subsidisation Methods

- **Cross Subsidisation**, "the practice of using profits generated from one product or service to support another provided by the same operating entity [49]", is already prevalent in South Africa. This occurs when one population group essentially covers the contributions of another group, often happening when individuals on the higher end of the income distribution pay greater contributions than their lower income counterparts. This setup is characteristic of the unemployment insurance (UIF) system in South Africa, where employees are required to contribute 1% of their income each month (up to a ceiling of R14872 per month [35]), naturally resulting in higher contributions from higher earners. The benefits, however, are capped at R6,638.40 per month [20].

  The cross-subsidisation existing in the UIF system can be expected to continue under a broad social insurance scheme, whereby higher earners pay higher contributions yet unemployment benefits remain capped at some level. However, further subsidisation will be required, as the inclusion of a pension system requires higher contributions from all parties and those benefits need to accrue directly to contributors. Hence, the scope for cross-subsidisation is limited to unemployment insurance.

- **Wage Subsidisation**, used to reduce poverty and increase employment, arrives in various forms (employer-side, employee-side, targeted and general) and is usually paid

in one of the following ways: through the tax system, through the social security system, or as direct programmatic payments to the employer or worker [33]. Within the context of developing countries, characterised by high unemployment rather than high reservation wages, employer-side subsidisation promoting labour demand is the most appropriate means of generating higher employment [6].

Though primarily seen as a redistributive measure, when considering a wage subsidy mechanism as a tool for *incentivisation*, the Employment Tax Incentive (ETI) in South Africa is a useful starting point for policymakers to draw from since the administrative capacity is already in place and the design may be usefully adapted for a contribution subsidy. The ETI was implemented to incentivise youth employment through the state assisting employers with the first two years of wages upon employing someone within this category [9]. Table 2 shows that the ETI functions as a progressive system, offering a higher rate of subsidisation for low income employees relative to higher earners.

Table 2: **ETI Design**

Monthly Wage	**ETI per month for the first 12 months of employment**	**ETI per month for the second 12 months of employment**
R0-R1,999	50% of monthly remuneration	25% of monthly remuneration
R2,000-R4,499	R1,000	R500
R4,500-R6,499	Formula: X = A-(B x (C – D)) A = R1 000 B = represents 0.50 C = monthly remuneration D = R4 500	Formula: X = A-(B x (C – D)) A = R 500 B = represents 0.25 C = monthly remuneration D = R4 500

Source: SARS [36]

While Ebrahim et al (2017) did not find that the ETI significantly increased overall employment, a significant increase in employment among firms with less than 200 employees was found (yet whether this was due to growth in the sector or the ETI remains uncertain) [9]. Having said that, there is good reason to believe that the subsidy would increase youth employment in smaller firms, as the burden of hiring someone relatively inexperienced would be felt more at this level. It remains to be seen whether this is indeed the case. Nonetheless, the ETI remains a useful reference for a progressive subsidy design.

- **Contribution Subsidisation** occurs when contributions are subsidised or waived by the state. This has happened during the COVID-19 pandemic, where countries such as Argentina, China, Greece, Germany, Hungary, Lithuania and Malaysia either waived social insurance payments or subsidised a portion of the contribution for certain groups [46]. Since broad coverage implies higher contributions, previous research on a National Social Security Fund (NSSF) in South Africa has advised that contribution subsidisation will be a necessity, in order to avoid disincentivising job creation or formal sector participation [13]:

> *"A contribution subsidy is therefore proposed, with government paying all or a portion of the NSSF contribution for low-income employees. This subsidy*

will be paid from the fiscus. Its design will encourage formalisation of employment, and contribute more broadly to protecting decent terms and conditions of work."

Consequently, subsidisation to assist with the implementation of broad social insurance will need to consist of a combination of cross subsidisation (albeit to a lesser degree), wage subsidisation and contribution subsidisation.

3 The Social Insurance and Labour Market Landscape

In designing a subsidy to target those most vulnerable and incentivise broad participation, it is essential for the social security and labour market context in South Africa to be described.

3.1 Social Security in South Africa

Social security in South Africa is two pronged, comprising of social assistance and social insurance. Broadly, the former aims to reduce poverty and promote human capital development while the latter serves to mitigate the risk of an individual falling into poverty.

Social Assistance
Provided through income grants from the state, social assistance is pervasive in South Africa. These consist of the State Old Age Pension, the largest programme, the Disability Grant and the Child Support Grant [7]. In terms of necessity, cash transfers have been found to bring over 50 percent of households above the poverty line, narrowing the poverty gap. Despite having a progressive grant system, high levels of inequality and poverty persist, where social grants do not compensate for unemployment (giving rise to wide support for broadening social assistance [7]).

The large reliance on social assistance indicates the infeasibility for many individuals to partake in a contributory social security system such as social insurance, limiting the reach thereof [18]. Having said that, social insurance remains particularly important during recessionary periods, preventing those who lose their jobs from falling into poverty.

Social Insurance
The pandemic has highlighted the need for comprehensive cover. Social insurance in South Africa has been described as limited, consisting of the Unemployment Insurance Fund (UIF), Compensation for Occupational Injuries and Diseases Fund and the Road Accident Fund [17]. The state is responsible for these mechanisms as well as the regulation of voluntary pension and medical aid schemes [48]. Individuals employed in the formal economy are required to contribute to the UIF and can voluntarily elect to enter into a pension fund and/or medical insurance scheme (depending on company policy).

The reason for deeming the system as limited is found in comparing South Africa's social insurance system with that of the ILO Social Security (Minimum Standards) Convention No. 102 of 1952, which specifies nine arms of social security that are necessary in society. These include an unemployment benefit, old-age benefit, employment injury benefit, maternity benefit, sickness benefit, invalidity benefit, medical benefit, survivors' benefit and family

benefit [17] & [14]. Lacking universal old age and medical insurance, South Africa's social insurance system does not cover all of these areas. Kaseke believes that this displays the "absence of a comprehensive social insurance system, and this is in itself an impediment to poverty prevention" [17].

A further limitation is the coverage gap. As social insurance targets those in the formal sector, South Africa's high rate of unemployment and informal (and *semi*-formal) sector work has resulted in a system that fails to cover those most vulnerable [3].

The remainder of this paper will focus on unemployment and old age insurance, being most relevant to recessionary periods. While health insurance remains a significant limitation, movements towards a National Health Insurance (NHI) are underway in South Africa [17], where further examination of the proposed NHI is beyond the scope of this paper.

Unemployment Insurance

The UIF, a large constituent of South Africa's social insurance system, covers all formal sector workers except civil servants, foreigners on contract work, employees whose earnings are commission based and those employed for less than 24 hours per month [18]. The UIF provides relief to workers who become unemployed due to retrenchment, retirement, dismissal or illness, those who are on maternity or adoption leave as well as relief to the dependants of deceased contributors. Recently, workers placed on reduced working time have been included as a category qualifying for UIF relief [8].

The fund is set up so that it is mandatory for both the employer and employee to make monthly contributions. These contributions are collectively equal to 2 percent of the employee's remuneration, with the employer and employee paying 1 percent each. If a contributor qualifies for UIF relief, it will come in the form of an income replacement benefit. The magnitude of this benefit is determined by the income replacement rate (IRR) which is between 38% and 60% of the original wage, where the IRR is progressive in that it is higher for those with lower wages. Benefits are further capped at the "benefit transition income level" of R17,712.00 a month, corresponding to an IRR of 38% or a monthly payment of R6,730.48. Lastly, one day of credit is generated for every 4 days of employment, up to a maximum of 365 days of benefits within the four year period immediately preceding the day after the date of employment ending. Here, it is important to note that although benefits can be earned for 365 days, the benefit is reduced to a 20% rate for the days beyond 238 days [1].

The fund experienced a steady increase in claims and contributors in the early 2000s, likely because domestic and seasonal workers were included in the system in 2003. In 2009, UIF claimants surged during the recession [45]. In 2020, research during the COVID-19 pandemic by NPO, *Phaphama SEDI*, revealed that self-employed individuals in small enterprises, despite meeting the criteria for UIF participation, frequently do not comply with UIF regulations - indicating that there has been no perceived net-benefit of participation within this group. However, when the COVID-19 Temporary Employer/Employee Relief Scheme (TERS) was implemented, small enterprise owners faced an immediate net-benefit and sought assistance from *Phaphama SEDI* in order to become registered with the UIF and apply for the benefit [4][3].

[3]A robust quantitative analysis of this trend, using data from the Quarterly Labour Force Survey, will be performed in section 6 of this paper.

It is important to emphasise that UIF cover is not indefinite, designed to facilitate a re-entry into employment. If an elderly individual loses employment, having pension cover (from contributions to a pension scheme over their employed lifetime) would be an appropriate fallback, bringing this analysis to a further avenue of necessary reform: old age insurance.

Old Age Insurance

Comprehensive pension cover remains a gap in South Africa. While proposals have been put forward [13], a national pension scheme has not been implemented [17]. This is deemed a major weakness of the social insurance system, as those who do not have occupational pensions will fallback on the non-contributory old age pension [18] - implying a substantial reduction in income.

Retirement and insurance benefits assist in covering the risk of a substantial decline in income and living standards in old age as well as unexpected expenditure that may arise during the individual's life cycle. It has been proposed that contributions towards retirement savings should be made mandatory for those employed in the formal sector, with SARS overseeing the enforcement thereof and withdrawals being limited to the case of a member becoming unemployed [7].

When designing a pension system, it is recommended that the future value of contributions is equivalent to 40-50% of previous earnings after 30 years [14]. Employee contributions are advised to lie within the 10-20% contribution band [11].

A National Social Security Fund

In 2012, the Inter-Departmental Task Team (IDTT) devised a plan for broad social insurance coverage in South Africa - namely, the National Social Security Fund (NSSF) [13]. Workers and employers would contribute a combined 12% of the employee's income to finance pension, disability, survivor and unemployment benefits. The state would assist low income earners and full participation would not be mandatory for this group (while UIF contributions would continue to be mandatory). Those earning above the UIF ceiling (R149,736 in 2012) were not required to contribute on income above this level. The system was not designed to be exhaustive, with low income earners still receiving assistance from the old age grant and higher earners supplementing income in order to arrive at a retirement payment roughly equivalent to 40% of their income whilst working.

The IDTT further proposes that pension and other risk be combined such that:

> *Contributions to the pension and risk benefit components of the NSSF will be pooled, sharing risk across all contributors* [13].

Overall, the NSSF aims to broaden coverage. However, failure to incentivise participation will remain a limitation. To counter this, the labour force context needs to be understood.

3.2 The Labour Force Landscape

Those in the *semi*-formal sector, having not contributed towards social insurance while being employed or self-employed in an otherwise formal business, are particularly exposed to the risk of falling into poverty due to job loss. While it has been thought that lost formal sector jobs can be absorbed by *semi*-formal and informal spaces during recessions, this was not the

Table 3: **Overview of the Self-Employed Relative to the Employed Population**

	Business Owners				**Employed population**			
	Mean	sd	se(m)	N	Mean	sd	se(m)	N
UIF	0.43	0.50	0.03	340	0.62	0.49	0.00	403,916
Pension	0.40	0.49	0.03	338	0.49	0.50	0.00	403,734
Informal	0.69	0.46	0.00	67,858	0.29	0.45	0.00	483,235
Rural	0.26	0.44	0.00	26,525	0.24	0.42	0.00	179,412
Age	41.97	10.46	0.04	67,858	38.95	10.58	0.02	483,235
Matric	0.47	0.50	0.00	67,858	0.53	0.50	0.00	483,235
Tertiary	0.11	0.31	0.00	67,858	0.10	0.30	0.00	483235
Female	0.35	0.48	0.00	67,858	0.44	0.50	0.00	483,235
Black	0.74	0.44	0.00	67,858	0.74	0.44	0.00	483,235
White	0.17	0.38	0.00	67,858	0.12	0.32	0.00	483,235
Coloured	0.05	0.21	0.00	67,858	0.10	0.31	0.00	483,235
Indas	0.04	0.20	0.00	67,858	0.03	0.18	0.00	483,235

se(m): standard error of the mean estimate;
UIF: UIF contributor;
Pension: pension fund contributor;
Matric: has a matric or higher.
Source: QLFS 2014-2020 (author's calculations).
Sampling weights applied.

case for South Africa in 2009 - employment declined by 14% in the informal sector[4], closely following the formal sector trend [45]. Since the risk of job loss ought to be covered by social insurance [14], preventable economic stress will exist until full participation is achieved.

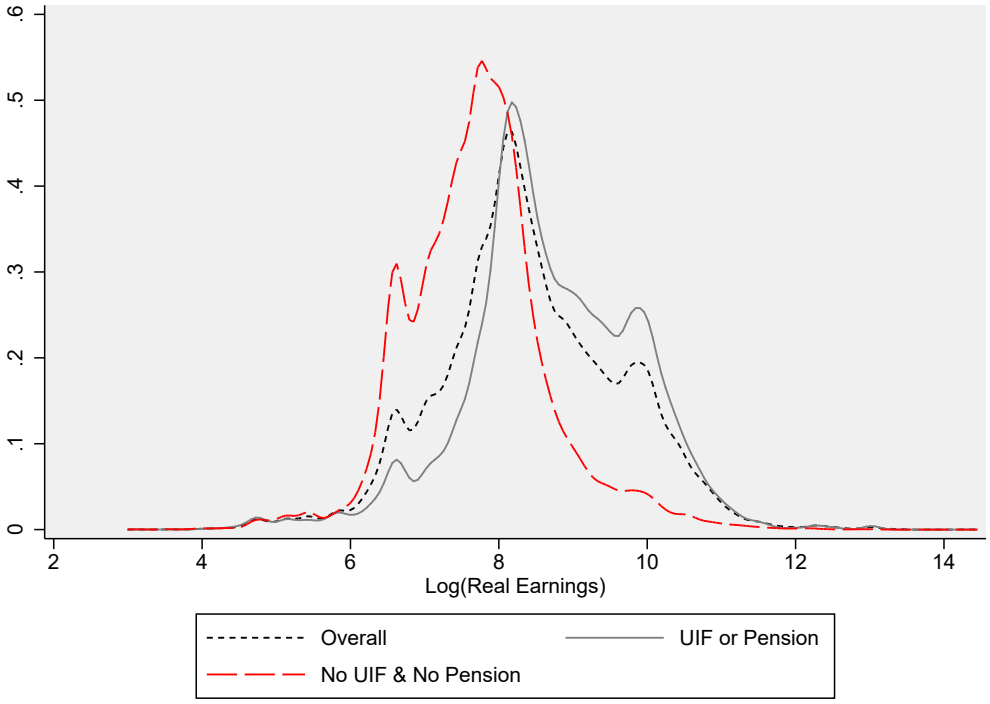
Table 3 provides a description of business owners in comparison to the overall employed population in South Africa. Since the data does not provide a semi-formal sector identifier, businesses of this nature will be captured under the 'informal' variable. Nonetheless, it can be seen that approximately 69% of business owners exist in the informal sector, in comparison to 29% of the employed population. Furthermore, the rate of UIF participation among business owners is far lower than that of the employed population (43% relative to 62%) and pension fund participation also shows a disparity (40% relative to 49%).

Figure 1[5] supports the notion that social insurance participation is positively correlated with income. Those who do not participate in social insurance have a wage distribution skewed to the left, indicating lower wages for this group relative to the overall mean. Here, incentivising participation has proven difficult among low income workers since contributions can be perceived as a 'tax', especially when the likelihood of being a beneficiary is low [7]. These deterrents have been so strong in emerging economies that when contributions are made mandatory in the formal sector, workers have been found to prefer informal labour

[4]The research did not separate informal and 'semi'-formal groups, hence the informal segment highlighted here would include those considered to be 'semi'-formal.

[5]Data Source: QLFS & PALMS 2017 (author's calculations using a Gaussian kernel). Although outliers have been excluded and bracket weights applied, there are collections of responses at two distinct points along the distribution - likely still due to bracketed responses.

Figure 1: **Wage Distribution by Social Insurance Participation**



contracts [21][47]. Holzmann finds that "when the perceived value of the bundle of social insurance benefits is below the contribution rate workers might choose to take informal sector jobs" [12]. From a low-income employer's perspective, setting up a formal labour contract is risky. Being beholden to labour laws and employment rigidity in the face of cyclical economic activity makes employers vulnerable [34]. As such, enforcing commitment of this nature without providing tangible benefits may disincentivise employment altogether.

Beyond incentivising participation in the *semi*-formal sector, there is a case for the inclusion of informal sector workers [28][34]. Unlike *semi*-formal businesses with an established workplace, the informal sector consists of businesses not registered in any way, seldom having workplaces and being small in nature [34]. Arguments have been made for those who are willing and able to contribute to be given access to the system as "some of these workers could contribute, given an opportunity to participate in social insurance programmes or should these programmes be tailored to their needs [34]".

4 Data Description

This paper uses the Quarterly Labour Force Survey (QLFS)[40], including[6] variables derived and imputed in the Post Apartheid Labour Market Series (PALMS)[19], to assess social insurance dynamics since 2014 and generate a costing analysis for comprehensive cover [41].

PALMS is a stacked cross section, while the QLFS is a rotating panel, collected quarterly. The cross sections in PALMS consist of all the October Household Surveys (OHS), Labour Force Surveys (LFS) and QLFSs to date, including additional calculated variables.

The panel component of the QLFS works as follows: for each rotation, 25% of the

[6]Data from PALMS is easily merged with the QLFS, as the unique household identifiers are the same.

previous sample is retained at random. While the panel component of the QLFS is limited in sample size and time frame, each cross section has a large sample of roughly 30,000 dwellings (covering the non-institutional population, barring workers' hostels) and has been weighted to be nationally representative, with a stratified two-stage design [43]. Having said that, the panel component of this data can be exploited over the 2020 lockdown - as restrictions halted in-person interviews and gave rise to telephonic quarter 2 interviews over the same sample of dwellings interviewed in quarter 1. This led to a more balanced panel (albeit with some significant attrition) [42] in comparison to earlier iterations.

The QLFS includes recent indicators of UIF and pension scheme participation for those who are currently employed, each being outcome variables of interest. Additionally, the data provides indicators for those who are unemployed and receiving assistance from the UIF and/or from an old age benefit. Unfortunately, the old age benefit has not been further disaggregated and the measure includes income from the SOAP as well as that of private pension funds, making it unhelpful in assessing the use of social *insurance*. Since UIF benefit recipients comprise a small subsample, the variable is unsuitable for more robust statistical analysis. Hence, this paper will look at social insurance contributions as the salient measure of participation, rather than the current beneficiaries.

The period from 2014-2020[7] is highlighted in this paper as it should reflect recent trends in participation. Incorporating 2020 data allows for the impact of the lockdown period on social insurance participation to be assessed.

5 Methodology

5.1 Probit Model

A probit model will first be used to generate quantitative evidence of the existence of limited social insurance participation. This will be done by assessing the likelihood of social insurance participation among different demographics and whether there has been a significant change between 2014 and 2019. The time frame is chosen to get a sense of recent participation outside of a significant recessionary period - as recessions add complexity to be dealt with in the next section. The model is described as follows:

$$\mathrm{y}_\mathrm{i}^* = \alpha + \gamma \mathrm{t}_\mathrm{i} + \beta \mathrm{x}_\mathrm{i} + \mathrm{e}_\mathrm{i} \quad (1)$$

The latent variable, y_i^*, measures the net benefit of social insurance participation, where a positive net benefit results in participation, while a negative net benefit would indicate the opposite. The latent variable cannot be directly observed and is estimated using a the binary indicator of participation, y, such that:

$$\mathrm{y} = \begin{array}{c} 1 \; if \; y^* > 0 \\ 0 \; otherwise \end{array}$$

In model (1), γ will reflect how the time indicator has impacted the likelihood of participation, having controlled for covariates $\mathbf{x}$, while $\mathbf{t}$ will correspond to the year covariate.

[7]Weighting changes occurred in the QLFS in 2013 (changing the sampling weights to reflect the 2011 census)[50]. Hence, 2014 is chosen as the starting period for consistency.

5.2 Transition Matrix

While the probit model may give insight into social insurance participation for a period without significant churning in the labour force, recessionary periods add complexity best suited to panel analysis. This is because labour force composition is expected to significantly change over these periods. Here, the sample of working individuals who retain work over a recessionary period may be more likely to participate in social insurance - which would signal a 'recession effect' while in fact being due to sampling changes.

In order to mitigate these effects, the panel component of the QLFS over the lockdown period in 2020 will be used. The uptake of social insurance over the contractionary period will be examined, reflecting the respective probabilities of social insurance gain and loss without noise from time invariant effects. This should give a fairly confident indication as to whether social insurance uptake changed significantly over the period.

5.3 Wage and Contribution Subsidy Designs

Following the literature, this paper proposes a wage and contribution subsidy to reach universal social insurance coverage. Two designs will be presented and costed, the first for comprehensive social insurance and the second being purely for unemployment insurance. The costing analysis for the comprehensive subsidy is particularly important to explore, as the cost is expected to be significant and hence the short term feasibility needs to be assessed relative to the long term gain. The unemployment insurance subsidy serves as a less costly alternative, more suitable for immediate implementation however less impactful to workers' livelihoods in the long run. The designs for each subsidy will be presented in this section, while the expected costs of each will be projected in the later analysis.

Subsidising Comprehensive Social Insurance

The previously put forward NSSF suggests mandatory contributions of 12% of workers' incomes [13] - being enough to cover basic pension and unemployment insurance needs, while giving room for the private pension market to provide additional cover. This paper follows the NSSF suggestion, where the subsidy model proposed is designed to facilitate and incentivise a 12% contribution.

Those targeted by the subsidy are low income earners - ranging from minimum wage to those earning marginally above the tax threshold. Since higher income earners (earning above the tax threshold) already enjoy tax benefits from retirement savings, an incentivisation strategy is already in place for this group and thus they do not form part of the target group for the subsidy.

In saying this, a mandatory 12% income contribution would place those above the tax threshold (R83,100 per annum) effectively below the threshold after payment [37]. Subsidisation extending over the group for which this is the case is proposed, such that:

$$x = \textit{maximum income level requiring subsidy}$$

$$(\textit{R83, 100 per annum} = \textit{tax threshold})$$

$$x - 0.12x = 83,100$$

$$x(1 - 0.12) = 83,100$$
$$x(0.88) = 83,100$$
$$x = 94,431$$
$$(R7,869 \ per \ month)$$

Hence, the subsidy will support, to various extents, all workers earning below R7869 per month who contribute to a NSSF.

The subsidisation will happen through two avenues: contributions and wages. The former covers the costs of contributions for low income earners, while the latter serves to incentivise participation among employers. Since it will be the responsibility of the employer to contribute on behalf of their employees, any subsidy amount above the 12% income contribution will form part of a wage subsidy accruing to the employer. To be progressive, the subsidy rate will decline as wage increases. Following the ETI, a flat rate monthly subsidy of R450 per worker earning up to R4,500 is proposed - giving rise to the desired progressive effect while being administratively simple. This means that for an individual working full time and earning minimum wage (R3,470 per month), the subsidy rate will be equivalent to 13% of earnings. This rate will decline as earnings rise. Once the subsidy rate is at 12% of the employee's income (this corresponds to those earning R3,750 per month), it will cease to be a wage subsidy for the employer and serves exclusively as a contribution subsidy for the employee.

In order for the subsidy to be fiscally prudent, those earning above R4,500 will be provided with a contribution subsidy that decreases at an increasing rate as wage level increases (see Figure 2). Those earning above the tax threshold will receive a subsidy closely equivalent to the tax benefit that they would otherwise receive in a retirement savings scheme, in order for the subsidy design and tax benefit initiative to be incentive compatible. Hence, those at the upper bound (monthly income of R7,869) will receive a R170 monthly subsidy - which is equivalent to the tax benefit that they would receive from contributing 12% of their earnings towards a pension scheme[8].

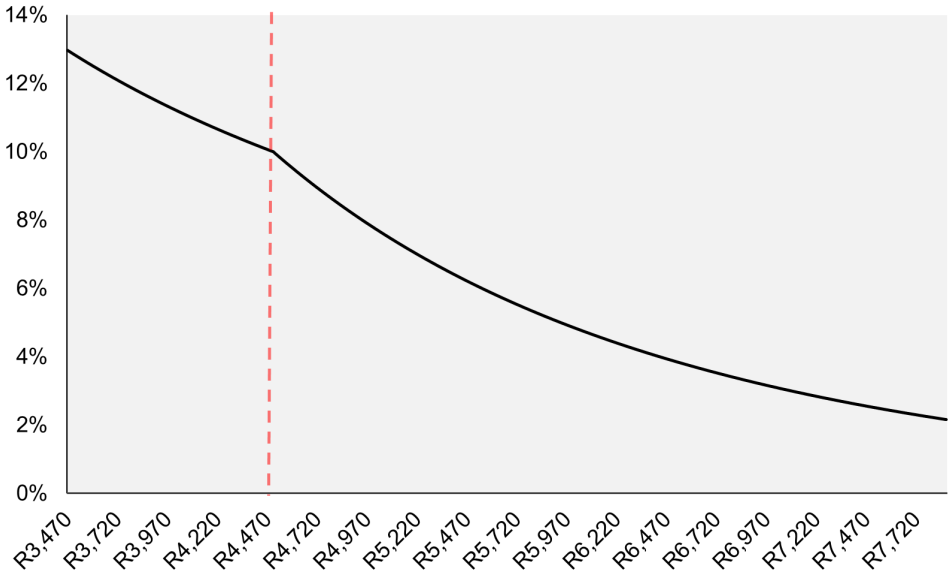
To construct a subsidy that declines at an increasing rate (exponential decay) for those earning above R4,500 per month, monthly wages between R4,500 and R7,870 have been divided into 337 categories (so that each consecutive category is R10 more than its prior). Any individual with earnings between categories will be grouped into the nearest category. To ensure that lower bound earners receive a R450 subsidy while upper bound earners have a R170 subsidy, the following formula has been constructed:

$$z = decay \ factor; \quad n = 337 = number \ of \ wage \ categories;$$
$$450(1 - z)^{337} = 170$$
$$1 - z = (170/450)^{1/337}$$
$$z = 1 - (170/450)^{1/337} = 0.997116$$
$$z = 0.002884$$

[8]12% of R7,869 is R944, corresponding to the individual's monthly contribution to the NSSF; 18% of R944 is R170, which is the tax benefit accruing to an individual (in this income bracket) who saves a monthly amount of R944 for retirement.

Using the above formula successfully produces the desired exponential decay effect for those earning above R4,500, seen in Figure 2[9]. Those with a monthly wage below R4,500, for whom the subsidy is fixed at R450 per month, experience a subsidy rate that declines linearly. Later analysis will determine the potential costs (accruing to the state) of rolling out such a subsidy.

Figure 2: **Effective Rate of Comprehensive Subsidy by Wage Level**



From here, the individual benefit of participation will be calculated. The 'benefit' will consist of the return on contributions and the payout over a retirement period. To estimate the future value of the monthly payout over retirement, an annuity formula will be used:

$$FV = \frac{[(12C)(((1+r)^N)-1)]}{r}$$

$$C = monthly\ contributions \quad r = interest\ rate^{10} \quad N = years$$

Subsidising Unemployment Insurance

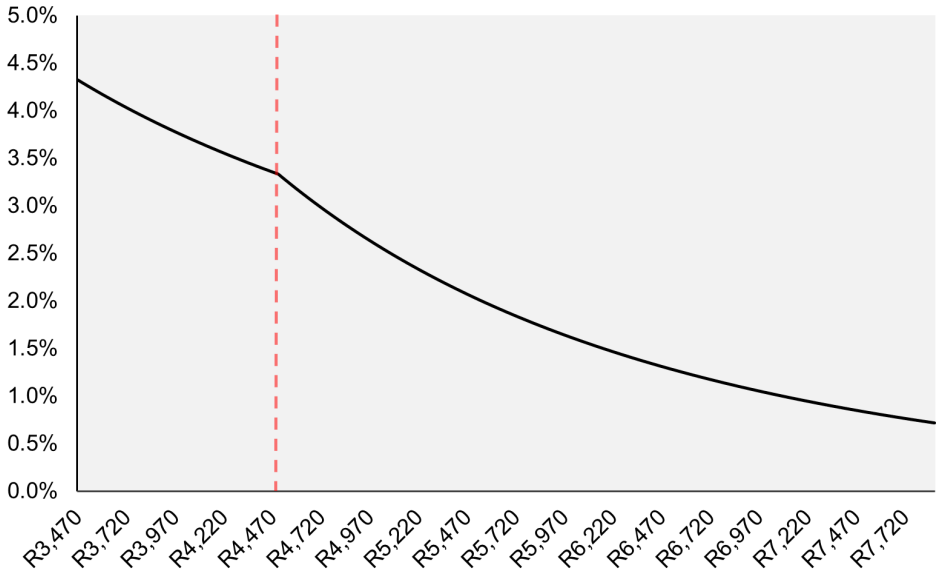
While the comprehensive social insurance subsidy proposed is certainly required in the context of South Africa, the affordability of implementation (especially in light of COVID-19) is restricted given present circumstances. Since the immediate need identified over the

[9]The full income distribution and corresponding subsidy sizes and rates used to construct this figure can be found in Table 10 in the appendix.

[10]Assumed to be 5% for the purposes of this analysis. This assumption draws from that fact that the Public Investment Corporation (PIC) has generated 4.75% nominal returns from 2016-2019 and 6.65% from 2014-2019 [30]. Nominal rates are used to approximately reflect the fact that wages are expected to be indexed to inflation, meaning that the value of contributions should rise at roughly the nominal rate.

lockdown period was that of unemployment insurance for *semi*-formal SMEs, this paper will now explore a smaller subsidy (for the UIF only) that may be more suitable for timely action.

Figure 3: **Effective Rate of UIF Subsidy by Wage Level**



The target population remains identical to the one discussed in the prior subsection (all workers earning below R7,869 per month). Similarly, the subsidy will be a flat rate of R150 per worker until an earnings level of R4,500 per month, thereafter declining at the rate $(1-z)$ used previously. This subsidy is presented in Figure 3. Here, it can be seen that the subsidy rate remains higher than the required rate of contribution (2%) until a wage level of R5,540 - indicating the presence of both a contribution and wage subsidy for workers earning below this level. The higher rates aim to incentivise employers to register with the UIF and make contributions on behalf of their employees, simultaneously formalising business operations.

6 Analysis

6.1 Social Insurance Participation: 2014 - 2019

As highlighted in the methodology section, the analysis begins by using probit models in order to display statistical evidence of gaps in social insurance participation. This is done by showing the state of participation over recent years and understanding the likelihood of participation for certain demographics.

Four probit models are presented in this section and the average partial effects (APEs) for each are given in Table 4. Columns 1 and 2 correspond to the APEs predicting UIF participation, while columns 3 and 4 reflect that of pension participation. Columns 1 and 3 use a discrete 'year' variable to assess the yearly trend across the time period from 2014 to 2019, while columns 2 and 4 utilise year dummies (from 2015 to 2019 - denoted by Year15 to Year19) to assess the trends in participation relative to 2014 (the base category).

From 2014 to 2019, columns 1 and 3 indicate that yearly changes in UIF and pension participation were statistically insignificant. Column 2 shows that, in 2017, workers were

Table 4: **Likelihood of Social Insurance Participation**

	(1) UIF	(2) UIF	(3) Pension	(4) Pension
Year	0.001		-0.001	
	(0.001)		(0.001)	
Year15		-0.005		-0.016***
		(0.004)		(0.005)
Year16		-0.006		-0.014***
		(0.005)		(0.005)
Year17		-0.011**		-0.013**
		(0.005)		(0.005)
Year18		0.001		-0.011**
		(0.004)		(0.005)
Year19		0.009*		-0.005
		(0.005)		(0.006)
Remote	-0.032***	-0.037***	-0.035***	-0.039***
	(0.004)	(0.005)	(0.006)	(0.006)
Informal	-0.201***	-0.201***	-0.415***	-0.415***
	(0.005)	(0.005)	(0.008)	(0.008)
Public employment	-0.232***	-0.232***	0.180***	0.180***
	(0.003)	(0.003)	(0.004)	(0.004)
Own business	-0.034	-0.034	-0.088***	-0.088***
	(0.027)	(0.027)	(0.034)	(0.034)
Employment contract	0.296***	0.295***	0.097***	0.097***
	(0.005)	(0.005)	(0.009)	(0.009)
Observations	334,308	334,308	334,199	334,199

Standard errors in parentheses

$***p < 0.01, **p < 0.05, *p < 0.1$

Industry, hours worked, race, age and gender have been controlled for. Sampling weights have been applied; clustering and stratification have been accounted for. Sample: Employed Population. Data Source: QLFS and PALMS (author's calculations).

1.1 percentage points less likely to participate in the UIF relative to 2014, significant at the 5% level (holding all else equal), while other years were not significant relative to 2014. Column 4 indicates that, relative to 2014, workers were 1.6 and 1.4 percentage points less likely to contribute to a pension fund in 2015 and 2016 respectively, significant at the 1% level. Relative to 2014, workers were 1.3 and 1.1 percentage points less likely to contribute to a pension fund in 2017 and 2018 respectively, significant at the 5% level. While some of these yearly changes are statistically significant, the magnitude of the average partial effects are small, indicating little economic significance. Hence, participation has been relatively stagnant, marginally decreasing over certain years.

While trends in participation are slight, the other covariates indicate the likelihood of participation among various population groups. Here, public employment has been controlled

for, as workers in various state positions are excluded from UIF contributions. Column 3 indicates that government employees are 18 percentage points more likely to participate in a pension scheme than those privately employed. This is expected due to the Government Employees Pension Fund (GEPF) which receives contributions from 320 participating employers – including all national and provincial state departments and the South African National Defence Force [10].

From columns 1 and 3, those in informal employment are 20.1 and 41.5 percentage points less likely than those in formal employment to contribute to the UIF and a pension fund respectively. Business owners are 3.4 and 8.8 percentage points less likely to contribute to UIF and a pension. Those with an employment contract are 29.6 and 9.7 percentage points more likely than those without a contract to contribute to the UIF and a pension fund, significant at the 1% level (holding all else equal), while those in remote areas are 3.2 and 3.5 percentage points less likely than those in urban areas to contribute in social insurance.

Hence, notable predictors of social insurance participation are formal employment, urban living, business ownership, state employment and possession of an employment contract. Predictors with the largest APE include informal and public employment as well as having an employment contract. These covariates provide evidence of a disparity in participation and confirm the need for intervention among business owners who are not in the formal sector and who do not provide workers with a formal contract. The absence of a significant trend in participation signals that direct action needs to be taken to increase participation, as uptake over time is not experiencing a natural rise.

6.2 Participation Dynamics over Lockdown

Having looked at the trend in participation over an arguably 'constant' economic climate, this paper will briefly assess changes in social insurance participation over the lockdown in 2020. Given an attrition rate of roughly 40%, the probability of social insurance gain and loss between quarter 1 and 2 of 2020 will be estimated using both inverse probability weights (IPWs) and the general sampling weights given in the QLFS[11]. In correcting for attrition using the IPWs, Table 5 shows that these weights lead to minor variation in estimates.

Table 5: **Probability of Social Insurance Gain/Loss in 2020**

	Pr(Gain)		**Pr(Loss)**	
	SW	IPW	SW	IPW
UIF	19.98	18.72	9.67	9.48
Observations	*2317*	*2299*	*4149*	*4118*
Pension	14.09	13.74	9.02	8.61
Observations	*2755*	*2734*	*3694*	*3670*

SW: QLFS sampling weights used.
IPW: inverse probability weights used (author's calculations).
Data Source: QLFS Panel by Dr. A. Kerr.

[11]Here, the probability used in the IPWs was calculated using a probit, which estimated the likelihood of attrition given relevant covariates such as informal employment, education level, race, self-employment and gender.

Nonetheless, the IPW estimates suggest that the probability of gaining unemployment insurance was 18.72% over the lockdown period, while that of old age insurance (pensions) increased by 13.73% over the employed population. The probability of discontinuing unemployment insurance contributions was 9.48% while that of pensions was 8.61%.

Hence, a significant increase in participation is seen. Borrowing from behavioural theory, this increase in participation could be due to the availability heuristic, whereby a recessionary period such as the one induced by COVID-19 could make the risk of job loss more prevalent - prompting individuals to participate in insurance [44]. Having said that, behavioural effects are not able to be observed using the QLFS data and hence the analysis is limited to observing quantitative shifts in participation, where reasons for these changes require further research. A portion of the change (especially for that of UIF participation) is likely attributed to the COVID-19 TERS benefit which started in the lockdown and offered immediate benefits to workers experiencing a loss of income, requiring UIF registration in order to receive benefits [29]. Again, further research formally linking COVID-19 TERS beneficiaries with UIF participation is required to more robustly determine the effect of the TERS benefit on UIF participation.

6.3 Estimating the Cost of Subsidising Social Insurance

Having looked at the recent trends and demographic composition of social insurance participants, evidence that social insurance participation is limited among business owners and those in the informal sector is clear, with changes in participation prior to 2020 being limited. While movement in participation is observed over the lockdown period in South Africa, the shift is not large enough to reach broad coverage and further interventions are needed. Here, subsidisation has been highlighted as a successful approach in developing countries [25]. Hence, the analysis now assesses the feasibility of using subsidisation (introduced in the methodology section) to incentivise wider social insurance participation.

Target Population Estimates

The target population for the subsidy are those earning below R7,869 per month. To estimate the population size, nationally representative QLFS data is used. Here, the latest available earnings data for the QLFS is from 2017 and so this "normal" year is chosen to generate population estimates[12]. Outliers in the 2017 earnings data were removed, only non-zero earnings were included and income data has been inflated to 2020 prices. Despite using bracket weights to counter the higher frequency of bracketed responses, the distribution (shown earlier in Figure 1) is not as smooth as would be desired, with spikes at the lower and upper ends. Nonetheless, the earnings data does confirm that lower earners are the appropriate target for incentivising participation.

Table 6 indicates that 9,413,380 individuals form part of the target population. Of this group, 3,391,732 workers do not contribute towards the UIF and 5,177,583 workers do not contribute to a pension - indicating the scope for incentivisation. Although estimates from the overall population indicate that there is further scope for incentivisation among higher earners, it can be seen in that the bulk of non-participation arises among lower earners,

[12]Regardless of the earnings data constraint, 2017 is a good year to generate "normal" labour force population estimates, since the latest 2020 QLFS data was conducted over the COVID-19 lockdown period which saw a large amount of job uncertainty.

hence making the target population apt.

Table 6: **Population Estimates**

	Total Persons	**Std. Err.**	**[95% Conf. Int.]**	
Employed Population				
Overall	16,200,000	211,497	15,800,000	16,600,000
No uif	5,194,542	79,824	5,038,012	5,351,072
No pension	6,839,425	109,465	6,624,779	7,054,072
No uif, no pension	3,618,923	59,778	3,501,690	3,736,156
Earning below R7869				
Overall	9,413,380	132,840	9,152,907	9,673,853
No uif	3,391,732	57,096	3,279,758	3,503,705
No pension	5,177,583	88,573	5,003,892	5,351,274
No uif & no pension	2,965,294	52,134	2,863,045	3,067,543

Source: QLFS 2017 Q1 (author's calculations).
Sampling weights applied.
2017 earnings data inflated to 2020 prices.

6.3.1 Comprehensive Social Insurance Cover

The subsidy to facilitate comprehensive cover (that of old age and unemployment) will be considered here. As discussed, this subsidy begins at a flat rate of R450 per employee for those earning below R4,500 per month, thereafter declining at a fixed rate and reaching R170 per employee at the upper threshold of the target population, corresponding to a monthly income of R7,869.

To reduce complexity, seven wage categories have been used to cost the subsidy. This approach should keep cost estimates conservative, as more individuals in the target population exist at the lower end of the income distribution and the subsidy amount used for this costing exercise will correspond to the smallest wage level in each category (since the subsidy is declining with wage, this ensures that each category's cost will reflect the maximum possible cost).

These estimates are presented in Table 7. As expected, those earning below R4500 per month are the most pervasive and costly group. Thereafter, both beneficiaries and subsidy size per category decrease, with the highest earners (R7,869 per month) receiving a subsidy that is equivalent to the tax benefit they would have received had they saved their 12% contribution in a retirement fund. Overall, the yearly cost accruing to the government of this subsidy is projected to be R48,075,764,769.00 - roughly R48 billion, in the event of full participation.

Having looked at the state's costs, the benefits of comprehensive social insurance are now considered. While full incentivisation would mean that the additional 3 391,732 UIF participants and 5 177,583 pension contributors would constitute the 'national benefit', quantitative

Table 7: **Costing the Comprehensive Subsidy**

Wage	Total Employees	Subsidy per Employee	Monthly Cost
<=R4,500	7,244,908	R450	R3,260,208,600
R4,500-R5,000	575,512	R449	R258,233,351
R5,000-R5,500	345,692	R389	R134,641,063
R5,500-R6,000	452,993	R337	R152,705,435
R6,000-R6,500	195,937	R292	R571,682,12
R6,500-R7,000	370,374	R253	R93,530,771
R7,000-R7,869	227,965	R219	R49,826,299
	Total Monthly Cost		**R4,006,313,731.00**
	Total Yearly Cost		**R48,075,764,769.00**

Source: QLFS 2017 Q1 (author's calculations).
Sampling weights applied.
2017 earnings data inflated to 2020 prices.

benefits can be calculated at the individual level. Table 8 indicates the benefits accruing to the individual at the minimum, median and maximum wage levels over the target population. For each individual contributing 12% of their monthly income over a period of 30 years at an interest rate of 5%, their future savings allow for monthly retirement payouts (over a retirement period of 15 years) larger than the monthly state old age pension (SOAP). At higher income levels, further savings with private pension institutions would facilitate an increasingly comfortable retirement, while low income earners who still qualify for the SOAP will be able to increase their standard of living substantially.

Table 8: **Individual Benefit**

	Wage	12%	Annual	Savings	Payout
Min	R3,470	R416.4	R4,996.8	R331,981.63	R1,844.34
Median	R5,670	R680.4	R8,164.8	R542,459.90	R3,013.67
Max	R7,870	R944.4	R11,332.8	R752,938.17	R4,182.99

12%: monthly contribution.
Annual: yearly contribution.
Savings: future value after 30 years of contributions.
Payout: monthly payout (after 30 years of contributions) over a 15 year period.

6.3.2 UIF Cover

While the prior comprehensive subsidy is expected to lead to higher welfare for the working population, it is costly. In this subsection, the subsidy design specifically targeting unemployment insurance contributions will be analysed.

Again, those earning below R4,500 per month constitute the most costly group. In total, the state would need to spend roughly R16,025,254,923.00 per year (R16 billion) in order to finance this UIF subsidy, in the event of full participation. It can be seen that this

subsidy design is far less costly than that of the comprehensive social insurance subsidy, putting less pressure on the state purse while providing UIF cover to the identified group at risk - *semi*-formal SMEs. Having said that, more extensive pension cover would go further towards mitigating the risk of this group falling into poverty in the event of job loss or old age. Further investigation will be required in order to resolve the apparent trade-off between government spending (and the opportunity costs of that spending) and higher welfare for the employed population accruing from comprehensive social insurance.

Table 9: **Costing the UIF Subsidy**

Wage	**Total Employees**	**Subsidy per Employee**	**Monthly Cost**
<=R4,500	7,244,908	R150	R1,086,736,200
R4,500-R5,000	575,512	R150	R86,077,783.59
R5,000-R5,500	345,692	R130	R44,880,354.2
R5,500-R6,000	452,993	R112	R50,901,811.57
R6,000-R6,500	195,937	R97	R19,056,070.76
R6,500-R7,000	370,374	R84	R31,176,923.77
R7,000-R7,869	227,965	R73	R16,608,766.36
	Total Monthly Cost		**R1,335,437,910.00**
	Total Yearly Cost		**R16,025,254,923.00**

Source: QLFS 2017 Q1 (author's calculations).
Sampling weights applied.
2017 earnings data inflated to 2020 prices.

7 Conclusion

This paper examines the case for a comprehensive statutory social security scheme and estimates the cost of subsidising participation by low-wage contributors. The literature review has explored how behavioural interventions can be used to reach broad social insurance coverage, highlighting subsidisation as one technique that may be particularly viable in the South African labour market - as subsidisation has been shown to incentivise formalisation as well as social insurance uptake in developing countries. Subsidisation is particularly relevant in the transition from a non-statutory to statutory pension scheme - as UIF participation findings show that making contributions mandatory does not necessarily predict compliance, and hence further incentivisation mechanisms are needed. The probit analysis provides evidence of the significant gaps in UIF and pension coverage, showing limited participation among business owners, workers employed outside the formal sector and those without an employment contract. It was confirmed that state employees enjoy significantly higher pension coverage than those privately employed. Barring the 2020 lockdown period, participation rates have generally remained stagnant. While participation only marginally decreased in some instances between 2014 and 2019, a significant and positive shift in participation was identified using a transition matrix over the 2020 lockdown period. Further research is required to determine whether this may be a result of the availability heuristic or the COVID-19 TERS benefit, which could have created an incentive for workers and em-

ployers to participate in the UIF. Yet, despite the recent quarterly increase in participation, the trend has not been sufficient to provide the widespread increase in coverage needed, requiring further intervention.

This paper analysed various behavioural interventions and proposed that mandatory participation with wage and contribution subsidies at lower income levels would be a possible approach in the South African context. Given findings from the probit analysis confirming limited social insurance uptake, two subsidy designs were explored as a means to incentivise broad social insurance uptake: a comprehensive subsidy (including pension and UIF cover) and a UIF subsidy (covering only unemployment insurance and designed for immediate action, especially relevant to *semi*-formal business owners in light of COVID-19). The former is costed at R48 billion per year while the latter has a cost of R16 billion per year, with the large cost differential representing the fact that the comprehensive plan is based on a mandatory 12% income contribution while UIF contributions remain at 2% of income.

Areas for further research include the trade off between the significant investment required to implement a comprehensive subsidy and the long term societal benefit. Much of the analysis has been at the individual level, where a repetition of this analysis at the firm level would be insightful - as employers are often the drivers of unemployment and old age insurance plans for their employees. Looking through this lens may provide further insight into which incentivisation methods work best for employers. Additionally, further research examining the behavioural change of workers following the introduction of a social insurance subsidy needs to be examined. This paper was limited in that the observational data used was only able to provide evidence of gaps in participation, rather than a quantification of the behavioural effects arising from the suggested intervention, which would confirm whether subsidisation would indeed give rise to the desired effect.

Nevertheless, this analysis advises policymakers to actively expand social insurance coverage, empowering more citizens to protect themselves from falling into poverty during times of crisis, such as the one currently being faced. Subsidisation, constituting one of several potential interventions, is an incentivisation mechanism that has been shown to expand coverage. Low income earners, being those who require this support the most, remain vulnerable to the risks of income loss due to unemployment as well as significant drops in their standard of living during old age. Hence, creating an apparent, positive net benefit from social insurance participation by way of a subsidy is an immediate means to incentivise wider participation, protecting the employed arm of the population while fostering resilience against further economic shocks.

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Appendix

Table 10: Subsidies (size and rate) over the Target Population

Wage	**Comprehensive**		**Just UIF**	
	Subsidy	Rate	Subsidy	Rate
3470	R450.00	0.13	R150.00	0.04
3480	R450.00	0.13	R150.00	0.04
3490	R450.00	0.13	R150.00	0.04
3500	R450.00	0.13	R150.00	0.04
3510	R450.00	0.13	R150.00	0.04
3520	R450.00	0.13	R150.00	0.04
3530	R450.00	0.13	R150.00	0.04
3540	R450.00	0.13	R150.00	0.04
3550	R450.00	0.13	R150.00	0.04
3560	R450.00	0.13	R150.00	0.04
3570	R450.00	0.13	R150.00	0.04
3580	R450.00	0.13	R150.00	0.04
3590	R450.00	0.13	R150.00	0.04
3600	R450.00	0.13	R150.00	0.04
3610	R450.00	0.12	R150.00	0.04
3620	R450.00	0.12	R150.00	0.04
3630	R450.00	0.12	R150.00	0.04
3640	R450.00	0.12	R150.00	0.04
3650	R450.00	0.12	R150.00	0.04
3660	R450.00	0.12	R150.00	0.04
3670	R450.00	0.12	R150.00	0.04
3680	R450.00	0.12	R150.00	0.04
3690	R450.00	0.12	R150.00	0.04
3700	R450.00	0.12	R150.00	0.04
3710	R450.00	0.12	R150.00	0.04
3720	R450.00	0.12	R150.00	0.04
3730	R450.00	0.12	R150.00	0.04
3740	R450.00	0.12	R150.00	0.04
3750	R450.00	0.12	R150.00	0.04
3760	R450.00	0.12	R150.00	0.04
3770	R450.00	0.12	R150.00	0.04
3780	R450.00	0.12	R150.00	0.04
3790	R450.00	0.12	R150.00	0.04
3800	R450.00	0.12	R150.00	0.04
3810	R450.00	0.12	R150.00	0.04
3820	R450.00	0.12	R150.00	0.04
3830	R450.00	0.12	R150.00	0.04
3840	R450.00	0.12	R150.00	0.04
3850	R450.00	0.12	R150.00	0.04

3860	R450.00	0.12	R150.00	0.04
3870	R450.00	0.12	R150.00	0.04
3880	R450.00	0.12	R150.00	0.04
3890	R450.00	0.12	R150.00	0.04
3900	R450.00	0.12	R150.00	0.04
3910	R450.00	0.12	R150.00	0.04
3920	R450.00	0.11	R150.00	0.04
3930	R450.00	0.11	R150.00	0.04
3940	R450.00	0.11	R150.00	0.04
3950	R450.00	0.11	R150.00	0.04
3960	R450.00	0.11	R150.00	0.04
3970	R450.00	0.11	R150.00	0.04
3980	R450.00	0.11	R150.00	0.04
3990	R450.00	0.11	R150.00	0.04
4000	R450.00	0.11	R150.00	0.04
4010	R450.00	0.11	R150.00	0.04
4020	R450.00	0.11	R150.00	0.04
4030	R450.00	0.11	R150.00	0.04
4040	R450.00	0.11	R150.00	0.04
4050	R450.00	0.11	R150.00	0.04
4060	R450.00	0.11	R150.00	0.04
4070	R450.00	0.11	R150.00	0.04
4080	R450.00	0.11	R150.00	0.04
4090	R450.00	0.11	R150.00	0.04
4100	R450.00	0.11	R150.00	0.04
4110	R450.00	0.11	R150.00	0.04
4120	R450.00	0.11	R150.00	0.04
4130	R450.00	0.11	R150.00	0.04
4140	R450.00	0.11	R150.00	0.04
4150	R450.00	0.11	R150.00	0.04
4160	R450.00	0.11	R150.00	0.04
4170	R450.00	0.11	R150.00	0.04
4180	R450.00	0.11	R150.00	0.04
4190	R450.00	0.11	R150.00	0.04
4200	R450.00	0.11	R150.00	0.04
4210	R450.00	0.11	R150.00	0.04
4220	R450.00	0.11	R150.00	0.04
4230	R450.00	0.11	R150.00	0.04
4240	R450.00	0.11	R150.00	0.04
4250	R450.00	0.11	R150.00	0.04
4260	R450.00	0.11	R150.00	0.04
4270	R450.00	0.11	R150.00	0.04
4280	R450.00	0.11	R150.00	0.04
4290	R450.00	0.10	R150.00	0.03
4300	R450.00	0.10	R150.00	0.03
4310	R450.00	0.10	R150.00	0.03

4320	R450.00	0.10	R150.00	0.03
4330	R450.00	0.10	R150.00	0.03
4340	R450.00	0.10	R150.00	0.03
4350	R450.00	0.10	R150.00	0.03
4360	R450.00	0.10	R150.00	0.03
4370	R450.00	0.10	R150.00	0.03
4380	R450.00	0.10	R150.00	0.03
4390	R450.00	0.10	R150.00	0.03
4400	R450.00	0.10	R150.00	0.03
4410	R450.00	0.10	R150.00	0.03
4420	R450.00	0.10	R150.00	0.03
4430	R450.00	0.10	R150.00	0.03
4440	R450.00	0.10	R150.00	0.03
4450	R450.00	0.10	R150.00	0.03
4460	R450.00	0.10	R150.00	0.03
4470	R450.00	0.10	R150.00	0.03
4480	R450.00	0.10	R150.00	0.03
4490	R450.00	0.10	R150.00	0.03
4500	R450.00	0.10	R150.00	0.03
4510	R448.70	0.10	R149.57	0.03
4520	R447.41	0.10	R149.14	0.03
4530	R446.12	0.10	R148.71	0.03
4540	R444.83	0.10	R148.28	0.03
4550	R443.55	0.10	R147.85	0.03
4560	R442.27	0.10	R147.42	0.03
4570	R440.99	0.10	R147.00	0.03
4580	R439.72	0.10	R146.57	0.03
4590	R438.45	0.10	R146.15	0.03
4600	R437.19	0.10	R145.73	0.03
4610	R435.93	0.09	R145.31	0.03
4620	R434.67	0.09	R144.89	0.03
4630	R433.42	0.09	R144.47	0.03
4640	R432.17	0.09	R144.06	0.03
4650	R430.92	0.09	R143.64	0.03
4660	R429.68	0.09	R143.23	0.03
4670	R428.44	0.09	R142.81	0.03
4680	R427.20	0.09	R142.40	0.03
4690	R425.97	0.09	R141.99	0.03
4700	R424.74	0.09	R141.58	0.03
4710	R423.51	0.09	R141.17	0.03
4720	R422.29	0.09	R140.76	0.03
4730	R421.07	0.09	R140.36	0.03
4740	R419.86	0.09	R139.95	0.03
4750	R418.65	0.09	R139.55	0.03
4760	R417.44	0.09	R139.15	0.03
4770	R416.24	0.09	R138.75	0.03

4780	R415.04	0.09	R138.35	0.03
4790	R413.84	0.09	R137.95	0.03
4800	R412.65	0.09	R137.55	0.03
4810	R411.46	0.09	R137.15	0.03
4820	R410.27	0.09	R136.76	0.03
4830	R409.09	0.08	R136.36	0.03
4840	R407.91	0.08	R135.97	0.03
4850	R406.73	0.08	R135.58	0.03
4860	R405.56	0.08	R135.19	0.03
4870	R404.39	0.08	R134.80	0.03
4880	R403.22	0.08	R134.41	0.03
4890	R402.06	0.08	R134.02	0.03
4900	R400.90	0.08	R133.63	0.03
4910	R399.74	0.08	R133.25	0.03
4920	R398.59	0.08	R132.86	0.03
4930	R397.44	0.08	R132.48	0.03
4940	R396.29	0.08	R132.10	0.03
4950	R395.15	0.08	R131.72	0.03
4960	R394.01	0.08	R131.34	0.03
4970	R392.87	0.08	R130.96	0.03
4980	R391.74	0.08	R130.58	0.03
4990	R390.61	0.08	R130.20	0.03
5000	R389.48	0.08	R129.83	0.03
5010	R388.36	0.08	R129.45	0.03
5020	R387.24	0.08	R129.08	0.03
5030	R386.12	0.08	R128.71	0.03
5040	R385.01	0.08	R128.34	0.03
5050	R383.90	0.08	R127.97	0.03
5060	R382.79	0.08	R127.60	0.03
5070	R381.69	0.08	R127.23	0.03
5080	R380.59	0.07	R126.86	0.02
5090	R379.49	0.07	R126.50	0.02
5100	R378.39	0.07	R126.13	0.02
5110	R377.30	0.07	R125.77	0.02
5120	R376.21	0.07	R125.40	0.02
5130	R375.13	0.07	R125.04	0.02
5140	R374.05	0.07	R124.68	0.02
5150	R372.97	0.07	R124.32	0.02
5160	R371.89	0.07	R123.96	0.02
5170	R370.82	0.07	R123.61	0.02
5180	R369.75	0.07	R123.25	0.02
5190	R368.68	0.07	R122.89	0.02
5200	R367.62	0.07	R122.54	0.02
5210	R366.56	0.07	R122.19	0.02
5220	R365.50	0.07	R121.83	0.02
5230	R364.45	0.07	R121.48	0.02

5240	R363.40	0.07	R121.13	0.02
5250	R362.35	0.07	R120.78	0.02
5260	R361.30	0.07	R120.43	0.02
5270	R360.26	0.07	R120.09	0.02
5280	R359.22	0.07	R119.74	0.02
5290	R358.19	0.07	R119.40	0.02
5300	R357.15	0.07	R119.05	0.02
5310	R356.12	0.07	R118.71	0.02
5320	R355.09	0.07	R118.36	0.02
5330	R354.07	0.07	R118.02	0.02
5340	R353.05	0.07	R117.68	0.02
5350	R352.03	0.07	R117.34	0.02
5360	R351.02	0.07	R117.01	0.02
5370	R350.00	0.07	R116.67	0.02
5380	R348.99	0.06	R116.33	0.02
5390	R347.99	0.06	R116.00	0.02
5400	R346.98	0.06	R115.66	0.02
5410	R345.98	0.06	R115.33	0.02
5420	R344.98	0.06	R114.99	0.02
5430	R343.99	0.06	R114.66	0.02
5440	R343.00	0.06	R114.33	0.02
5450	R342.01	0.06	R114.00	0.02
5460	R341.02	0.06	R113.67	0.02
5470	R340.04	0.06	R113.35	0.02
5480	R339.06	0.06	R113.02	0.02
5490	R338.08	0.06	R112.69	0.02
5500	R337.10	0.06	R112.37	0.02
5510	R336.13	0.06	R112.04	0.02
5520	R335.16	0.06	R111.72	0.02
5530	R334.19	0.06	R111.40	0.02
5540	R333.23	0.06	R111.08	0.02
5550	R332.27	0.06	R110.76	0.02
5560	R331.31	0.06	R110.44	0.02
5570	R330.36	0.06	R110.12	0.02
5580	R329.40	0.06	R109.80	0.02
5590	R328.45	0.06	R109.48	0.02
5600	R327.51	0.06	R109.17	0.02
5610	R326.56	0.06	R108.85	0.02
5620	R325.62	0.06	R108.54	0.02
5630	R324.68	0.06	R108.23	0.02
5640	R323.74	0.06	R107.91	0.02
5650	R322.81	0.06	R107.60	0.02
5660	R321.88	0.06	R107.29	0.02
5670	R320.95	0.06	R106.98	0.02
5680	R320.02	0.06	R106.67	0.02
5690	R319.10	0.06	R106.37	0.02

5700	R318.18	0.06	R106.06	0.02
5710	R317.26	0.06	R105.75	0.02
5720	R316.35	0.06	R105.45	0.02
5730	R315.44	0.06	R105.15	0.02
5740	R314.53	0.05	R104.84	0.02
5750	R313.62	0.05	R104.54	0.02
5760	R312.71	0.05	R104.24	0.02
5770	R311.81	0.05	R103.94	0.02
5780	R310.91	0.05	R103.64	0.02
5790	R310.02	0.05	R103.34	0.02
5800	R309.12	0.05	R103.04	0.02
5810	R308.23	0.05	R102.74	0.02
5820	R307.34	0.05	R102.45	0.02
5830	R306.45	0.05	R102.15	0.02
5840	R305.57	0.05	R101.86	0.02
5850	R304.69	0.05	R101.56	0.02
5860	R303.81	0.05	R101.27	0.02
5870	R302.93	0.05	R100.98	0.02
5880	R302.06	0.05	R100.69	0.02
5890	R301.19	0.05	R100.40	0.02
5900	R300.32	0.05	R100.11	0.02
5910	R299.45	0.05	R99.82	0.02
5920	R298.59	0.05	R99.53	0.02
5930	R297.73	0.05	R99.24	0.02
5940	R296.87	0.05	R98.96	0.02
5950	R296.01	0.05	R98.67	0.02
5960	R295.16	0.05	R98.39	0.02
5970	R294.31	0.05	R98.10	0.02
5980	R293.46	0.05	R97.82	0.02
5990	R292.61	0.05	R97.54	0.02
6000	R291.77	0.05	R97.26	0.02
6010	R290.93	0.05	R96.98	0.02
6020	R290.09	0.05	R96.70	0.02
6030	R289.25	0.05	R96.42	0.02
6040	R288.42	0.05	R96.14	0.02
6050	R287.59	0.05	R95.86	0.02
6060	R286.76	0.05	R95.59	0.02
6070	R285.93	0.05	R95.31	0.02
6080	R285.10	0.05	R95.03	0.02
6090	R284.28	0.05	R94.76	0.02
6100	R283.46	0.05	R94.49	0.02
6110	R282.64	0.05	R94.21	0.02
6120	R281.83	0.05	R93.94	0.02
6130	R281.02	0.05	R93.67	0.02
6140	R280.21	0.05	R93.40	0.02
6150	R279.40	0.05	R93.13	0.02

6160	R278.59	0.05	R92.86	0.02
6170	R277.79	0.05	R92.60	0.02
6180	R276.99	0.04	R92.33	0.01
6190	R276.19	0.04	R92.06	0.01
6200	R275.39	0.04	R91.80	0.01
6210	R274.60	0.04	R91.53	0.01
6220	R273.80	0.04	R91.27	0.01
6230	R273.01	0.04	R91.00	0.01
6240	R272.23	0.04	R90.74	0.01
6250	R271.44	0.04	R90.48	0.01
6260	R270.66	0.04	R90.22	0.01
6270	R269.88	0.04	R89.96	0.01
6280	R269.10	0.04	R89.70	0.01
6290	R268.32	0.04	R89.44	0.01
6300	R267.55	0.04	R89.18	0.01
6310	R266.78	0.04	R88.93	0.01
6320	R266.01	0.04	R88.67	0.01
6330	R265.24	0.04	R88.41	0.01
6340	R264.48	0.04	R88.16	0.01
6350	R263.71	0.04	R87.90	0.01
6360	R262.95	0.04	R87.65	0.01
6370	R262.19	0.04	R87.40	0.01
6380	R261.44	0.04	R87.15	0.01
6390	R260.68	0.04	R86.89	0.01
6400	R259.93	0.04	R86.64	0.01
6410	R259.18	0.04	R86.39	0.01
6420	R258.43	0.04	R86.14	0.01
6430	R257.69	0.04	R85.90	0.01
6440	R256.95	0.04	R85.65	0.01
6450	R256.20	0.04	R85.40	0.01
6460	R255.47	0.04	R85.16	0.01
6470	R254.73	0.04	R84.91	0.01
6480	R253.99	0.04	R84.66	0.01
6490	R253.26	0.04	R84.42	0.01
6500	R252.53	0.04	R84.18	0.01
6510	R251.80	0.04	R83.93	0.01
6520	R251.08	0.04	R83.69	0.01
6530	R250.35	0.04	R83.45	0.01
6540	R249.63	0.04	R83.21	0.01
6550	R248.91	0.04	R82.97	0.01
6560	R248.19	0.04	R82.73	0.01
6570	R247.48	0.04	R82.49	0.01
6580	R246.76	0.04	R82.25	0.01
6590	R246.05	0.04	R82.02	0.01
6600	R245.34	0.04	R81.78	0.01
6610	R244.63	0.04	R81.54	0.01

6620	R243.93	0.04	R81.31	0.01
6630	R243.22	0.04	R81.07	0.01
6640	R242.52	0.04	R80.84	0.01
6650	R241.82	0.04	R80.61	0.01
6660	R241.13	0.04	R80.38	0.01
6670	R240.43	0.04	R80.14	0.01
6680	R239.74	0.04	R79.91	0.01
6690	R239.04	0.04	R79.68	0.01
6700	R238.36	0.04	R79.45	0.01
6710	R237.67	0.04	R79.22	0.01
6720	R236.98	0.04	R78.99	0.01
6730	R236.30	0.04	R78.77	0.01
6740	R235.62	0.03	R78.54	0.01
6750	R234.94	0.03	R78.31	0.01
6760	R234.26	0.03	R78.09	0.01
6770	R233.58	0.03	R77.86	0.01
6780	R232.91	0.03	R77.64	0.01
6790	R232.24	0.03	R77.41	0.01
6800	R231.57	0.03	R77.19	0.01
6810	R230.90	0.03	R76.97	0.01
6820	R230.23	0.03	R76.74	0.01
6830	R229.57	0.03	R76.52	0.01
6840	R228.91	0.03	R76.30	0.01
6850	R228.25	0.03	R76.08	0.01
6860	R227.59	0.03	R75.86	0.01
6870	R226.93	0.03	R75.64	0.01
6880	R226.28	0.03	R75.43	0.01
6890	R225.63	0.03	R75.21	0.01
6900	R224.98	0.03	R74.99	0.01
6910	R224.33	0.03	R74.78	0.01
6920	R223.68	0.03	R74.56	0.01
6930	R223.03	0.03	R74.34	0.01
6940	R222.39	0.03	R74.13	0.01
6950	R221.75	0.03	R73.92	0.01
6960	R221.11	0.03	R73.70	0.01
6970	R220.47	0.03	R73.49	0.01
6980	R219.84	0.03	R73.28	0.01
6990	R219.20	0.03	R73.07	0.01
7000	R218.57	0.03	R72.86	0.01
7010	R217.94	0.03	R72.65	0.01
7020	R217.31	0.03	R72.44	0.01
7030	R216.68	0.03	R72.23	0.01
7040	R216.06	0.03	R72.02	0.01
7050	R215.44	0.03	R71.81	0.01
7060	R214.81	0.03	R71.60	0.01
7070	R214.19	0.03	R71.40	0.01

7080	R213.58	0.03	R71.19	0.01
7090	R212.96	0.03	R70.99	0.01
7100	R212.35	0.03	R70.78	0.01
7110	R211.73	0.03	R70.58	0.01
7120	R211.12	0.03	R70.37	0.01
7130	R210.51	0.03	R70.17	0.01
7140	R209.91	0.03	R69.97	0.01
7150	R209.30	0.03	R69.77	0.01
7160	R208.70	0.03	R69.57	0.01
7170	R208.10	0.03	R69.37	0.01
7180	R207.50	0.03	R69.17	0.01
7190	R206.90	0.03	R68.97	0.01
7200	R206.30	0.03	R68.77	0.01
7210	R205.71	0.03	R68.57	0.01
7220	R205.11	0.03	R68.37	0.01
7230	R204.52	0.03	R68.17	0.01
7240	R203.93	0.03	R67.98	0.01
7250	R203.34	0.03	R67.78	0.01
7260	R202.76	0.03	R67.59	0.01
7270	R202.17	0.03	R67.39	0.01
7280	R201.59	0.03	R67.20	0.01
7290	R201.01	0.03	R67.00	0.01
7300	R200.43	0.03	R66.81	0.01
7310	R199.85	0.03	R66.62	0.01
7320	R199.27	0.03	R66.42	0.01
7330	R198.70	0.03	R66.23	0.01
7340	R198.12	0.03	R66.04	0.01
7350	R197.55	0.03	R65.85	0.01
7360	R196.98	0.03	R65.66	0.01
7370	R196.41	0.03	R65.47	0.01
7380	R195.85	0.03	R65.28	0.01
7390	R195.28	0.03	R65.09	0.01
7400	R194.72	0.03	R64.91	0.01
7410	R194.16	0.03	R64.72	0.01
7420	R193.60	0.03	R64.53	0.01
7430	R193.04	0.03	R64.35	0.01
7440	R192.48	0.03	R64.16	0.01
7450	R191.93	0.03	R63.98	0.01
7460	R191.37	0.03	R63.79	0.01
7470	R190.82	0.03	R63.61	0.01
7480	R190.27	0.03	R63.42	0.01
7490	R189.72	0.03	R63.24	0.01
7500	R189.18	0.03	R63.06	0.01
7510	R188.63	0.03	R62.88	0.01
7520	R188.09	0.03	R62.70	0.01
7530	R187.54	0.02	R62.51	0.01

7540	R187.00	0.02	R62.33	0.01
7550	R186.46	0.02	R62.15	0.01
7560	R185.93	0.02	R61.98	0.01
7570	R185.39	0.02	R61.80	0.01
7580	R184.85	0.02	R61.62	0.01
7590	R184.32	0.02	R61.44	0.01
7600	R183.79	0.02	R61.26	0.01
7610	R183.26	0.02	R61.09	0.01
7620	R182.73	0.02	R60.91	0.01
7630	R182.20	0.02	R60.73	0.01
7640	R181.68	0.02	R60.56	0.01
7650	R181.15	0.02	R60.38	0.01
7660	R180.63	0.02	R60.21	0.01
7670	R180.11	0.02	R60.04	0.01
7680	R179.59	0.02	R59.86	0.01
7690	R179.07	0.02	R59.69	0.01
7700	R178.56	0.02	R59.52	0.01
7710	R178.04	0.02	R59.35	0.01
7720	R177.53	0.02	R59.18	0.01
7730	R177.02	0.02	R59.01	0.01
7740	R176.51	0.02	R58.84	0.01
7750	R176.00	0.02	R58.67	0.01
7760	R175.49	0.02	R58.50	0.01
7770	R174.98	0.02	R58.33	0.01
7780	R174.48	0.02	R58.16	0.01
7790	R173.97	0.02	R57.99	0.01
7800	R173.47	0.02	R57.82	0.01
7810	R172.97	0.02	R57.66	0.01
7820	R172.47	0.02	R57.49	0.01
7830	R171.98	0.02	R57.33	0.01
7840	R171.48	0.02	R57.16	0.01
7850	R170.98	0.02	R56.99	0.01
7860	R170.49	0.02	R56.83	0.01
7870	R170.00	0.02	R56.67	0.01