FULL COLOUR THINKING

GRADUATE SCHOOL OF BUSINESS
UNIVERSITY OF CAPE TOWN

Impact of the tax burden on long run economic growth: A BRICS perspective

A Thesis

presented to

The Graduate School of Business

University of Cape Town

In partial fulfilment

of the requirements for the

Master of Commerce in Development Finance Degree

by

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February 2017

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ABSTRACT: *The topic of taxation and its impact on economic growth remains a widely debated one. This study contributes to literature by assessing the impact of the tax burden on GDP growth on the BRICS countries for the period 2000-2012 by using panel data estimation techniques. The three panel data estimation techniques examined in this study are: the fixed effects model, random effects model and the pooled regression model. In evaluating the tax effect on GDP growth, the paper reviews both theoretical and empirical literature. In line with literature that seems to prefer the fixed effect modelling technique, the tests in this study show that the appropriate model for the empirical data is the fixed effects model. The tax burden is defined as the tax revenue-to-GDP ratio. The explanatory variables explored against GDP growth in the study are: the tax burden, government expenditure, government debt, fixed investment, labour, education and population. Findings of the study show that there is a positive tax effect on GDP growth for the BRICS countries for the period explored.*

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GLOSSARY OF TERMS

ACRONYM	ACRONYMS EXPLAINED
BRICS	*The association of five major emerging market economies: Brazil, Russia, India, China and South Africa*
FDI	*Foreign Direct Investment*
GDP	*Gross Domestic Product*
GMM	*Generalized Methods of Moments*
IMF	*International Monetary Fund*
OECD	*Organisation for Economic Co-operation and Development*
OLS	*Ordinary Least Squares*
PIT	*Personal Income Taxes*
UNDP	*United Nations Development Programme*
UNESCO	*United Nations Educational, Scientific and Cultural Organization*
USD	*United States dollar*
VAR	*Vector autoregression model*
VAT	*Value Added Tax*

ACKNOWLEDGEMENT

A special word of thanks to my supervisor, Harvey Pamburai. It is through your commitment and support throughout this journey that has made this project that much a success. I will forever be grateful for your guidance and opinions – and for pushing me to do the best I could all the time. Thank you… Juggling work and academics has been an interesting challenge, requiring one to frequently tap into family time. Kabelo Mohale, thank you for taking the load when I had to dedicate some time to school. You've been an absolutely amazing husband. I hope I make you proud!!!

CHAPTER ONE: BACKGROUND OF THE STUDY

1.1. Introduction and background:

Tax policy remains a topical area in the field of economics – it is an important source of government revenue. It is defined as mandatory savings by taxpayers to government, which enables the state to reach its objective of redistribution and the provision of basic government services (Howard, 2001). Public finance continues to stir debate globally, particularly over recent years when the 2008/09 global financial crisis has resulted in an increase in public debt-to-GDP ratios and budget deficits globally. This has been more severe in advanced economies, however developing economies have not been completely shielded – particularly over the last year or two. In 2012, a study conducted by Steenkamp (2012) showed that countries such as South Africa face fiscal austerity that could lead to lower government expenditure and/or tax increases. A couple of years later, South Africa still finds itself under severe fiscal pressure and in need of some adjustments to fiscal policy – with an increasing likelihood of a Value Added Tax (VAT) hike in order to generate revenue. The debate towards a higher VAT rate comes after the growing challenge by the National Treasury to juggle between rising government debt pressures and poor GDP growth performances. Similar trends can be observed in countries such as Brazil and Russia, whose fiscal positions have shown signs of deterioration over the past few years.

In the South African context, where the National Treasury's consideration of a possible VAT hike, amongst proposals to increase fuel/electricity levies was tabled in the National Budget of 2015, highlights one angle of fiscal policy, that is: the government's need to generate revenue to finance its obligations. However, equally important for public finance is the study of how fiscal policy actually affects a given economy's growth performance. The purpose of this study is to therefore assess the effect of the tax burden on long-run growth for emerging economies, such as those in the BRICS trading block. When doing this, it is important to note that for emerging-market economies, structural dynamics such as high unemployment and inequality pose an interesting dynamic to tax policy. As Johansson et al. (2008) write, tax systems are not only used for financing public expenditure, but can be used to promote equity, and address other social and economic objectives. In South Africa, for example, inclusive growth and employment remain the key priorities of government – in line with the objectives of the National Development Plan (NDP). So as governments seeks to deliver on its welfare

responsibilities (made possible by tax collection), it is important that governments do not distort efficiency within the market. As Howard (2001) argues, an efficient tax system is one that does not result in changes to production units (resource allocation) or consumption patterns that lead to a decline in welfare. In other words, the excess tax burden (also referred to as deadweight loss) is a result of an inefficient tax system. According to Howard (2001), the excess burden can be defined as the loss in consumer surplus due to an increase in tax in excess of the revenue paid to government. In practice, it is almost impossible to find a tax system that does not impose an excess burden. Instead, a prudent fiscal policy framework aims for a good tax system to minimize the welfare loss to the economy as the government seeks to fulfill its objectives. In fact, as illustrated by the Davis Tax Committee (2015), the excess burden of a tax system can be measured by how much producers and consumers change their behaviour to avoid tax payments.

In South Africa for example, one cannot look at fiscal policy without considering the political background – which plays a key role in explaining today's tax policies and the various tax reforms that evolved over time to address the unjust legislation of the apartheid era. As such, when assessing the South African tax system, it is important to also briefly consider how the tax system has historically evolved over time. Post-apartheid, in 1994 to be exact, the South African government established the Katz Commission with the objective to assess the tax design as South Africa transitioned from an apartheid era to the new government. The motivation for tax reforms during this period was to primarily widen the tax base and also improve upon the neutrality and fairness of the tax system. In later years, 2013 to be specific, the Davis Tax Committee was established – with the primary mandate to assess the South African tax policy framework and its role on inclusive growth, employment development and fiscal sustainability. These tax commissions have contributed and continue to play an integral role in tax developments in the South African economy. The evolution of the tax system in South Africa is however beyond the scope of this particular study and can be explored separately for future research projects.

1.2. Objectives of the study:

As the Davis Tax Committee (2015) finds, several tax policy research gaps exist in South African literature. Amongst the identified research gaps, the committee argues that there are insufficient quantitative studies on the correlation between growth and taxation in South

Africa – particularly research that links employment and inequality, and the effect of these on growth. It is found that while empirical literature zooms into specific avenues of tax (example: VAT and PIT) there is very little work that has been done to assess the impact of taxation on a macroeconomic level. This research paper does not make direct links between employment and taxation in South Africa, however it contributes to the literature by attempting to give a quantitative macroeconomic analysis of the tax system (primarily using the tax burden measure) on South African long-run growth prospects. In addition to this, it compares South Africa to its BRICS peers. The main goal of this paper is to establish the direction of the relationship between the tax burden and real GDP growth. While the primary country of interest is South Africa, due to data constraints, panel estimation techniques have been used comparing South Africa to its BRICS peers. More specifically, panel data regressions are applied – methodology that is in line with what has been applied in international literature to date. The expectation is to find that a high tax burden will not necessarily have a negative effect on the BRICS countries used in this study.

1.3. Problem statement:

The hypothesis question is therefore written in equation form as follows:

$$Real\ GDP\ growth = \alpha + \beta_1\ tax + \beta_2\ govtspend + \beta_3\ debt + \beta_4\ invest + \beta_5\ labour + \beta_6\ schooling + \beta_7\ population + \mu$$

The expectation from the above equation being that the value of the coefficient β_1 will be greater than zero.

1.4. Structure of the study:

This paper is therefore arranged into the following Chapters: Chapter two covers the literature review, which is split into the theoretical and empirical literature. Chapter three introduces the research objective and hypothesis, together with the methodology to be used. Chapter four critically analyses the data and presents the main findings. Finally, the concluding remarks are presented in Chapter five.

CHAPTER TWO: LITERATURE REVIEW

2.1. Theoretical literature review – evolution of growth models over time

2.1.1. Exogenous growth models:

In studying the impact of taxation on growth, the various determinants of growth are considered – and in so doing, the evolution of the neoclassical growth models to new growth models therefore becomes a critical component of the research. Considering the nature of this study, it is important to refer to the benchmark theoretical growth theory framework presented by the Solow model. Using the work of Harrod-Domsar in 1946, Solow (1956) extended on the model to make valuable contributions to growth theory that has been widely accepted as the base model for long-run economic growth. Within the realm of neoclassical economics, the Solow model based its foundations on the Cobb-Douglas production function – that analysed the behaviour of a single representative agent. Solow (1956) explains long-run growth by capital accumulation, population growth (or otherwise referred to as labour) and productivity (referred to as technological progress). Several key assumptions underpin the Solow model: firstly, that capital accumulation is subject to diminishing marginal returns. In addition, that economic growth is influenced by technological progress that is determined exogenously – hence the classification of the model as an exogenous growth model. Solow (1956) found that over the short run, growth was influenced by changes in capital, the labour force and the depreciation rate of capital. While long-run growth could only be achieved by the exogenously determined technological progress.

2.1.2. Endogenous growth models:

While exogenous growth models provided a simplified framework to explain long-run growth, the assumption that growth is purely explained by external forces posed some limitation to empirical evidence. As Turnovsky (1995) illustrates, the biggest challenge with these types of models was the implication that conventional macroeconomic policy would have no impact on long-run growth. In other words, exogenous growth models assumed that the only efficient type of policy is one that would either increase the population growth rate or improve labour force efficiency. As time evolved, and focus leaned more towards inflation and unemployment, there was a growing need to adjust the exogenous models to accommodate for economic shocks that were clearly evident over time. New growth models

therefore provided an alternative way of thinking – proposing that technological progress is endogenously determined through factors such as individual firms' decisions to invest in research and development (R&D) and individual workers' choice to enter the labour market. In essence, the move towards endogenous growth models was a response to the limitations of the neo-classical models to respond to data/empirics.

The work of Lucas (1988) leans more towards empirical evidence that he observed in the US economy where he extends on the standard neoclassical models by Solow, in a context consistent with economic development. In this study, he considers three models, each emphasizing capital accumulation (and technological change), human capital accumulation (through education) and human capital accumulation (through learning-by-doing). Similarly, Romer (1986) finds that growth rates can be increasing over time and that capital accumulation is primarily driven by profit-seeking agents. He further highlights another key distinction of these types of models to exogenous growth models and that being: that capital is subject to constant returns to scale (in contrast to diminishing returns proposed by the Solow model).

Leaning more towards endogenous growth theory, King and Rebelo (1990) find that national taxation can have a significant impact on long-term growth rates – as public policies can incentivize or discourage capital accumulation. In other words, changes in tax policy can explain periods of subdued economic growth or high growth. King and Rebelo (1990) further explain that within the endogenous growth framework, one is able to assess the welfare costs of taxation – unlike the exogenous growth theory.

Ireland (1994) contrasts the Solow exogenous growth model against Knight's[1] endogenous growth model and finds that there is no clear consensus as to which model type is better suited to explain the effects of taxation on growth. In his study, Ireland (1994) shows that with the Solow model, tax policy changes affect the level of GDP – but not the growth rates. The reason for this is that although tax may influence agents' behaviour to affect levels of output, tax does not impact on the technological progress that influences long-run economic growth rates. Furthermore, Ireland (1994) proposes that in Knight's model, tax policy does

[1] According to Ireland (1994), this is based on Frank Knight's earlier theory of endogenous growth theory.

affect long-run growth. Importantly however, it is argued that time series studies should clearly distinguish between short-run and long-run tax effects.

In later years, Jaimovich and Rebelo (2015) propose a model underpinned by two key observations: firstly that the different tax rates between economies are not correlated with the economy's growth performance. Secondly, they argue that economies that sharply decrease the private incentive to invest, pose a severe adverse impact on the economy's growth rates. They find that the effect of tax on growth is highly non-linear. The model used in the paper is based on the work of Romer – where growth is driven by innovation and where agents choose to be workers or entrepreneurs. To allow for an effective way of assessing the effect of taxation on growth, they specify the distribution of entrepreneurial ability in the market. They find that low tax rates have a negligible impact on long-run GDP growth rates. However, as tax rates increase, the negative impact on growth increases substantially. In other words, factors that act as a disincentive to invest or productivity have a disproportionately large impact on long-run growth. Jaimovich and Rebelo (2015) further explain that this non-linear relationship can be best described by the heterogeneity in entrepreneurial ability: where in a low-tax economy, the ability of marginal entrepreneur is relatively low and therefore when tax rate rises, low-ability entrepreneurs exit the market which results in a modest decline in the GDP growth rate.

2.2. Empirical literature review:

2.2.1. Introduction to modelling empirical data:

Following the theoretical foundations presented in the 1980s, in later years, Engen and Skinner (1996) focus more on empirical data and find that lower taxes correlate with modest positive effects on economic growth. Consistent with literature, they find that tax policy has the potential to discourage productivity growth by mitigating R&D. Furthermore, it is argued that high taxation on labour supply can discourage workers from entering the labour market. To do this, they first consider a simple time series analysis in tax changes and output growth over time. As Engen and Skinner (1996) explain, this approach does not use any form of growth accounting, but merely asks whether there have been significant changes in growth following tax changes. However, they argue that the time-series method is best equipped to

analyse short-run effects of tax changes on growth. Also, Engen and Skinner (1996) find that it is difficult to isolate the exact impact of the tax reform on growth. For example: it becomes difficult for one to figure out whether it is the change in depreciation allowances, tax rates, tax progressivity that leads to changes in growth rates.

In addition to the above, Engen and Skinner (1996) also present literature that looks at the empirical approaches using cross-country investigations. By doing so, it is also argued that one is able to consider the different tax systems assumed by different countries – especially considering the fact that countries' methods of tax collection also differ. As Engen and Skinner (1996) explain, the advantage of a comparative study is that it gives one the ability to make a comparison across countries with varying tax structures and GDP rates to test for correlation. While this approach provides some conclusion about the adverse effect of higher taxes on growth, the study highlights the limitations on drawing the benefits that could be possibly derived from the additional government spending that is made possible by higher tax revenues. In addition, Engen and Skinner (1996) argue that it is difficult to draw a conclusion on the causality. They explain that it is not clear whether regression coefficients reflect the impact of investment on growth rates or the converse, that is, influence of GDP on investment.

The last measure they introduce is a "bottom up" micro level study. This "bottom up" approach separately calculates the effect of taxes on disaggregated components of the growth equation[2], such as: labour supply, human capital, investment and technological growth. These effects are then aggregated to a "bottom up" measure (Engen and Skinner, 1996). Although this method too is not without its disadvantages, the advantage of this is that one is able to accurately measure how economic agents respond to tax changes. Using the growth equation, Engen and Skinner (1996) sought to assess how tax changes affect each variable (considering both the short-term and long-run effects).

Interestingly, Engen and Skinner (1996) find that the implied effects of the "bottom up" approach and the cross-country regressions render a similar result – that is, a significant tax reform that decreases all marginal tax rates by 5 percentage points and average tax rates by

[2] The growth equation presented is: $y_i = \alpha_i k_i + \beta_i m_i + \mu_i$, where y_i is the real GDP growth rate, k_i is the capital stock, m_i is the percentage growth rate in the effective labour force over time and μ_i measures the economy's overall productivity growth, (Engen & Skinner, 1996).

2.5 percentage points is estimated to increase long-run growth rates by between 0.2 and 0.3 percentage points.

In a separate study, Fölster and Henrekson (2001) also use a cross-country comparison to find the effect of taxation on the growth performance of rich countries. They restrict the panel study to rich countries based on the rationale that government's scope on average rises as a country's income level increases – a phenomenon that is referred to as Wagner's law[3]. The study however does not find any robust negative relationship between government size and economic growth. As Fölster and Henrekson (2001) explain, this finding possibly reflects the idea that a negative relationship between government and economic growth exists for rich countries with a big public sector. While this particular study does not directly compare to the emerging market context, the techniques applied to get to these results add value to the literature. Panel regressions over five-year periods are used to assess the relationship between tax and growth. The following independent variables are included in every regression: the gross investment-to-GDP ratio, growth rate of the labour force and the growth of human capital (which is measured as the growth rate of the average years of schooling). In line with what other cross-Chapteral studies have done, the study further includes initial income as part of the independent variables list. As Fölster and Henrekson (2001) explain, this follows the assumption that the level of development of any given economy is critical when assessing the tax effects on its growth performance. Lastly, two measures of government size are used, namely: the tax-to-GDP ratio and total government expenditure-to-GDP ratio. In line with literature, initial income is taken at the beginning of a period, while the tax measures are used as averages over a particular period (Fölster and Henrekson, 2001).

Justifying their choice of a panel study, they highlight two key problems associated with cross-Chapteral studies. Firstly, the simultaneity problem: where Fölster and Henrekson (2001) argue that cross-country regressions are typically based on average values of government expenditure and growth – and that over the long run government may be a function of demographics (more specifically: a rising share of the elderly) as well. The challenge specifically in their study is that OECD countries are typically found to have a high correlation between the share of the elderly and the tax ratio. Similarly, a close correlation

[3] According to Fölster and Henrekson (2001), Wagner's Law can be defined as the phenomenon where public expenditure tends to increase with national income over the long run – implying that the income elasticity of demand for government is greater than one. The theory of Wagner's Law is explored in later Chapters of this paper.

between share of the elderly and GDP is found. This is identified as a potential bias to the result – because over the long run, when GDP increases, the share of the elderly may increase together with government expenditure. This, according to Fölster and Henrekson (2001), implies that the errors in the growth regression could influence GDP, the demographics and government spending. In addition, it is found that cross-Chapter studies over extended period of times may possibly limit the ability to fully capture the growth effects of taxation due to the endogenous selection of tax policy when studying countries over an extended period.

In a similar study, Furceri and Karras (2008) assess the impact of a tax change on growth outcomes using a panel study covering 26 OECD countries between 1965 and 2007. The study is based on a dynamic model approach that relates growth and tax which uses fixed and random effects, without country or time-specific effect. As Furceri and Karras (2008) illustrate, they find that an increase in the tax rate by 1% of GDP, leads to a long-run GDP per capita impact of between -0.5% and -1.0%. It is important to note that the results of these types of studies are highly dependent on how the tax variables are measured. For example, this impact of between -0.5 and -1.0% is highly dependent on how the tax shock is defined. Furceri and Karras (2008) compare their work to that done by Romer and Romer (2007) – who defined the tax shock differently and whose GDP measure is an aggregate (instead of per capita). The bottom line however is that the empirical findings, for advanced economies, do indeed show that an increase in tax has a negative and persistent shock to GDP growth.

The work explored above closely resembles a recent study by Macek (2014), in which the impact of individual tax type changes is evaluated on OECD countries between the years 2000 and 2011. Similar to the "bottom up" approach by Engen and Skinner (1996), it is argued that to effectively measure the effect of tax on GDP growth, one must calculate the impact on the individual growth variables. To account for insufficient data points, the panel regression method is used in the paper. Two models are used, using different tax measures: one uses the total tax revenue-to-GDP ratio (which they refer to as the tax quota) as an explanation of economic growth, and the second one uses the World Tax Index. In both models, the dependent variable used is real GDP per capita (in USD purchasing power

parity). The list of explanatory variables is as follows: the real investment-to-GDP ratio, human capital[4], government spending-to-GDP ratio and the tax rate of the different tax types[5]. In the above study, Macek (2014) further explains the importance of how you define your tax measure (particularly when comparing across countries) – as this influences your results. A comparison of tax systems between countries is done by using a statutory or nominal tax rate – the most common measure, based on its simplistic nature. However, as further explained, the explanatory power of this nominal rate is limited if one considers the different legislative rules across countries. It is for this reason that Macek (2014) proposes the combined use of the total tax quota and World Tax Index.

Using the total tax revenue-to-GDP ratio presents a host of advantages, primarily because it is readily available and is a simpler way of comparing between countries. However, a key disadvantage of this measure would be the way it is constructed. According to Macek (2014), this is because this indicator is an expression of an economy's GDP redistributed to the public budget. This therefore presents limitation on correctly incorporating the shadow economy and the real administrative costs of paying tax. The World Tax Index is therefore introduced as an alternative indication of taxation – as it expresses the tax burden using both hard and soft data. As explained by Macek (2014), the World Tax Index is an aggregate tax burden indicator that includes soft data on the perceived tax conditions in a particular country, the range of tax exemptions, and factors such as tax progressivity. The higher the value of the World Tax Index for a country, the higher the tax burden assumed in that particular country.

In the results of Macek (2014), it is shown that when the tax burden is approximated by the tax quota, there is a negative relationship between economic growth and all the tax types explored. The deduction made here is that an increases in PIT, corporate taxes and social security contributions decreases GDP growth through their impact on capital accumulation, savings creation or the labour market. On the other hand, no negative relationship is found with the property taxes. Interestingly, the results for VAT seem to contradict economic theory – something Macek (2014) pins down to tax quota being insufficient to explain the tax impact on growth. Comparing these results to the model that uses the World Tax Index, similar results are found for PIT and corporate taxes. Furthermore, with this model, it is found that

[4] Similar to the study by Fölster and Henrekson (2001), this is calculated as the share of people with a minimum of secondary education in the total labour force (Macek, 2014).
[5] This is approximated by the total tax revenue-to-GDP ratio and the World Tax Index – further explanation of this index is given in the Chapter below.

VAT has a negative correlation with economic growth (Macek, 2014) – consistent with their expectations and literature for advanced economies.

2.2.2. Modelling the impact of taxation within emerging market economies:

Despite the fact that the literature that has been explored to date provides a solid foundation for the econometric analysis that measures the impact of taxation on growth, it still does not sufficiently address the challenges within developing economies. The Davis Tax Committee (2015) argues that even though international trends provide excellent benchmarks, domestic factors such as economic structures, labour market institutions, policies and public expenditure distinguish emerging market economies from developed economies in as far as fiscal policy is concerned. To further reiterate this, one draws onto Easterly and Rebelo's (1993) finding that there is a clear relationship between the level of development of a given economy and its fiscal structure. This implies that there should be a clear distinction between the behaviour of advanced economies to less developed economies. To demonstrate this, Easterly and Rebelo (1993) summarise the statistical relationship between the level of development, rate of growth and the level of development using panel data for 28 countries between the 1970 and 1988 period. One of the findings in this study is that while there is a negative relationship between the GDP growth and the tax-revenue-to-GDP ratio for OECD countries, this negative relationship diminishes when one controls for the initial level of income – once again, suggesting that an economy's level of development is important (Easterly and Rebelo, 1993). This result, however, cannot be taken at face value – as they further find that initial level of income is not statistically significant for all tax types, but rather for marginal income tax (Easterly and Rebelo, 1993). In fact, as Easterly and Rebelo (1993) argue, the dependence they find of both tax policy and growth on initial income is an indication of the challenges that come with isolating tax policy effects on GDP growth.

The above presents one of the challenges presented by these types of research. In South Africa, for example, research challenges are further aggravated by the fact that the number of quantitative studies that critically asses South African tax effects on growth still remain rather limited. Nonetheless, some assessment is drawn from previous studies done in other emerging market peer countries. The first comparison used is Brazil – which according to Gobetti and Orair (2016), had a high overall tax burden compared to other developing economies at

approximately 34 per cent of its GDP in the year 2014. Using Brazil as a case study, Adrogué, Cerisola and Gelos (2006) seek to explain Brazil's long-term growth performance using cross-country and panel estimation techniques. While their study does not specifically look at the tax burden, but rather focuses on the overall determinants of Brazil's long-run growth performance, it does provide an excellent framework to assess the impact of tax on Brazil's GDP growth over time. This study first addresses the issue of robustness by using a Bayesian procedure that uses a set of regressions estimated for GDP per capita growth between 1960 and 2000. However, they find that this approach does not adequately capture the significant disparity in Brazil's GDP performance before and after the 1980s (Adrogué et al, 2006). A dynamic panel model is therefore presented as an alternative to sufficiently handle the growth dynamics and its determinants.

In this panel model, the reduced-form equation[6] is estimated initially for 79 countries. As Adrogué et al. (2006) show, the equations are estimated using ordinary least squares (OLS)[7] and generalized methods of moments (GMM)[8] methods with a set of variables (amongst these being the government consumption-to-GDP ratio, population growth, initial GDP per capita and public infrastructure – measured as the number of telephone lines per capita)[9] used to explain average GDP per capita. Adrogué et al. (2006) find that macroeconomic stability, together with some of the reforms they explore in their study, have contributed to increasing the per-capita GDP growth rate in Brazil since the 1990s.

In India, Trivedi and Rajmal (2011) assess the impact of overall fiscal policy on economic growth between the periods 1980-2007. In their study they incorporate key elements of fiscal policy – with fiscal deficit, government expenditure and capital expenditure as the fiscal sector explanatory variables. Apart from these major fiscal policy variables, the interest rate is also added as an explanatory variable – with the expectation that monetary policy also plays a significant contribution to economic growth over the long run. They use panel data estimation

[6] According to Wooldridge (2002), in simultaneous equation analysis, a reduced form equation involves writing the endogenous variables as a linear projection onto all exogenous variables. In other words, it is a system of equations where endogenous variables are just shown as a function of exogenous variables.

[7] Ordinary least squares (OLS) is a method used to estimate unknown parameters in a linear regression model, by minimising the squared residuals (Wooldridge, 2002).

[8] Generalized methods of moments (GMM) is a generic estimation method where estimators are derived from moment conditions (Wooldridge, 2009).

[9] The other explanatory variables are as follows: trade openness, cost of capital, lack of price stability, real exchange rate misalignment, systematic banking crises, terms of trade shocks, international liquidity, balance of payment pressure (Adrogué, Cerisola and Gelos, 2006).

techniques (that is: pooled regression, fixed effects model and random effects model). In line with literature, they argue that the fixed effects model is the most appropriate model and therefore solely report these results. Trivedi and Rajmal (2011) find that fiscal policy does indeed play an integral role in promoting growth within the states of India – and that when high levels of fiscal deficits are driven by revenue expenditures, they have an adverse impact on growth. Interestingly and most probably aligned to findings for emerging market economies, they also do not find a significant tax impact on growth (Trivedi and Rajmal, 2011).

It is important to remember that there are several key elements to fiscal policy, particularly in the developing context. Of these, Trivedi and Rajmal (2011) specifically mention the levels and structure of taxation and expenditure, quality of expenditure, means of financing the fiscal deficit and the overall developmental goals of fiscal policy. Furthermore, Trivedi and Rajmal (2011) make a critical point (which probably underlies most literature) being that although the direction of research tends to lean more towards on the impact of fiscal policy on growth, there is also the notion that economic growth has an impact on fiscal policy – an avenue worth exploring beyond the purpose of this research paper. In addition to this, Trivedi and Rajmal (2011) also highlight the challenge that comes with specifically isolating tax impacts on growth and the reason for this primarily being with the interlinkages between taxation and other non-tax fiscal policy variables (such as: government expenditure) that also have an effect on GDP growth.

Similar to Trivedi and Rajmal (2011), Ocran (2009) uses quarterly data to examine the effects of fiscal policy-related increases in government consumption and investment expenditures, tax revenues and the budget deficit on South African economic growth for the period between 1990 and 2004. Similarly, the interest rate is also used to evaluate its impact on long run growth in South Africa. This is done by estimating five structural-VAR[10] models. With each VAR, four variables are used (where each model consists of at least 2 fiscal variables, output and interest rates – resulting in various combinations of fiscal policy variables being used in each model). The total list of variables used is: government consumption, government fixed investment, government budget deficit, total revenue and grants (used as a proxy for taxes),

[10] A Vector-Autoregressive (VAR) model is a forecasting tool that is used by capturing linear interdependencies amongst multiple time series. As its name suggests, it's a modelling technique that comprises of vectors/series that are modelled in terms of their respective pasts or lagged values (Wooldridge, 2002).

GDP growth and interest rates. It is important to note that total revenue and grants were used as proxies due to data limitations with regards to obtaining quarterly consolidated tax collections data. Ocran (2009) argues that given the significant proportion of grants to government expenditure in South Africa, total revenue and grants are arguably good approximations of taxation that accrues to government. For the monetary policy variable, the 30-day Treasury bill is used as a proxy – this is due to its close link to the interest rate in history. By shocking the various monetary and fiscal policy variables, impulse-response functions based on structural-VARs within the Blanchard-Quah identification scheme were then used to evaluate the reactions on output.

In his findings, Ocran (2009) highlights that fiscal shocks through the government consumption, government investment, tax revenue and budget deficit channels have a modest but persistent effect on real output. In contrast to most of the literature for advanced economies that find a negative relationship between the government size and economic growth, Ocran (2009) finds a positive relationship. As Ocran (2009) explains, the positive relationship he finds could be attributed to the social imbalances that continue to pose as hurdles for economic development in South Africa – and hence government's role in attempting to address these imbalances. These sort of challenges are not only limited to South Africa, but represent many of the inequalities that governments need to address across emerging market economies. This therefore explains why literature for advanced economies find a negative tax effect on GDP growth, while studies in the emerging market context may find a positive tax effect. Furthermore, government fixed investment is also found to positively contribute to economic growth – although to a lesser magnitude than that observed for government consumption (Ocran, 2009). Finally, tax revenue is also found to have positive effect on economic growth, while the size of the budget deficit has no statistical significance on GDP growth. Ocran (2009) further explains that the positive relationship he finds with a tax shock is consistent with the findings of Mirdala (2010). As his findings suggest, it would seem that fiscal policy tools such as government fixed investment and consumption are critical tools to use to stimulate economic growth in the developing world context.

In another South African study, using annual data between 1960 and 2002, Koch, Schoeman and Van Tonder (2005) find evidence that taxation has a significant impact on growth, unlike in other developing economies where taxation is found to have minimal impact on growth.

Furthermore, they also make the argument that the impact of taxation on GDP growth in developing economies hugely differs from the effects observed within developed economies (Koch et al, 2005). To be more specific, Koch et al. (2005) argue that the macroeconomic impact of taxation is greater in developing economies than it is in developed economies.

Adapting on the endogenous growth framework by Lucas (1988), Koch et al. (2005) propose a two-stage procedure to estimate the relationship between fiscal policy and economic growth. The first stage of the model uses a technique they refer to as Data Envelopment Analysis[11] to provide for estimates of the exogenous factors for unobservable data such as the potential GDP growth. Following this, the second stage uses the estimates obtained from the initial stage to normalize the economic growth rates – a technique that is used to generate unbiased estimates of the relationship between potential GDP growth and taxation. Importantly, as Koch et al. (2005) clearly illustrate, two measures of taxation are considered as part of the determinants of GDP growth, namely: the tax burden (which is basically the total tax revenue-to-GDP ratio) and the tax mix (measured as the ratio of indirect taxes to direct taxes).

The overall conclusions from the Koch et al (2005) study are that higher taxes are correlated with a lower growth potential. Furthermore, Koch et al. (2005) suggest that efforts by the South African government to lower taxes could be beneficial to economic growth – although tax collection may, in part, mitigate these gains. Furthermore, they also find that efforts to lower the tax mix during the sample period have proven beneficial to economic growth (Koch et al, 2005). In fact, it is argued that the negative tax mix elasticity is the main difference between South Africa and other developed economies.

From the literature review above, it is evident that studies that look at taxation on a macroeconomic level remain rather limited in emerging markets compared to advanced economies. This is particularly the case for South Africa. Nonetheless, the quantitative analysis used in some of these studies can be applied to the emerging market context. What is particularly clear from the literature available is the importance of panel data/pooled regression techniques in assessing the impact of taxation on long run economic growth. The

[11] Koch et al. (2005) describe Data Envelopment Analysis as an analytical method used for the estimation of production frontiers in where the observations on the edge of the envelope are used to generate the frontier (Koch et al., 2005).

rest of this paper therefore focuses on these estimation techniques and outlines the models used to assess the impact of the tax burden in the BRICS countries and its impact on GDP growth over time.

CHAPTER THREE: RESEARCH METHODOLOGY

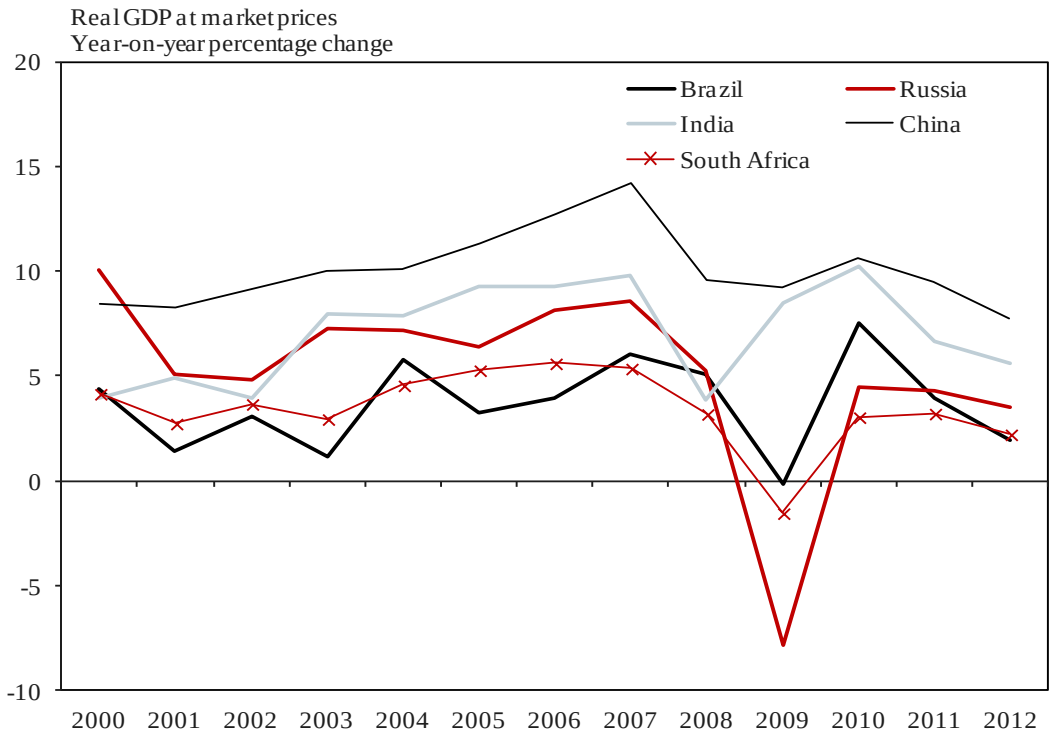
3.1. Data sources:

The data used in this study is annual in frequency, and spans over 13 years: from the year 2000 to 2012. The tax revenue data for Brazil, Russia, India and South Africa is all sourced from the Development Indicators of the World Bank's DataBank – which is primarily sourced from the various Ministries of Finance and Treasuries. However, due to an incomplete dataset available for China on the World Bank's DataBank and to allow for consistency with the data, tax-revenue data for China has been sourced from the People's Bank of China. The tax-revenue ratio is calculated as total taxes (in 100 million yuan) as a percent of GDP (in 100 million yuan). It is important to note that the tax revenue data used in this study is strictly tax revenue data, and not total government revenue. Specifically referring to the data sources, the World Bank defines the tax revenue variable as the compulsory transfers made by individuals or companies to the central government for public use. Some compulsory transfers (for example: penalties, fines and most social security contributions) are not included. In addition, the World Bank further highlights that refunds and corrections of incorrectly collected tax revenue is treated as negative revenue. Similarly, the Chinese data collected from the People's Bank of China is strictly tax revenue data (mainly the sum of VAT, consumption tax, business tax, corporate and individual taxes and other tariffs), and does not represent overall government revenue.

Supplementary to the tax-revenue data explained above, the average numbers of school years data has been obtained from the United Nations Development Programme's (UNDP) Human Development Reports – which are based on the UNESCO Institute for Statistics, which uses the methodology by Barro and Lee (2013). In addition to this, the total; fixed investment data for all the countries is sourced from the World Bank's DataBank. Finally, the rest of all the other macroeconomic data has been sourced from the IMF's World Economic Outlook Database.

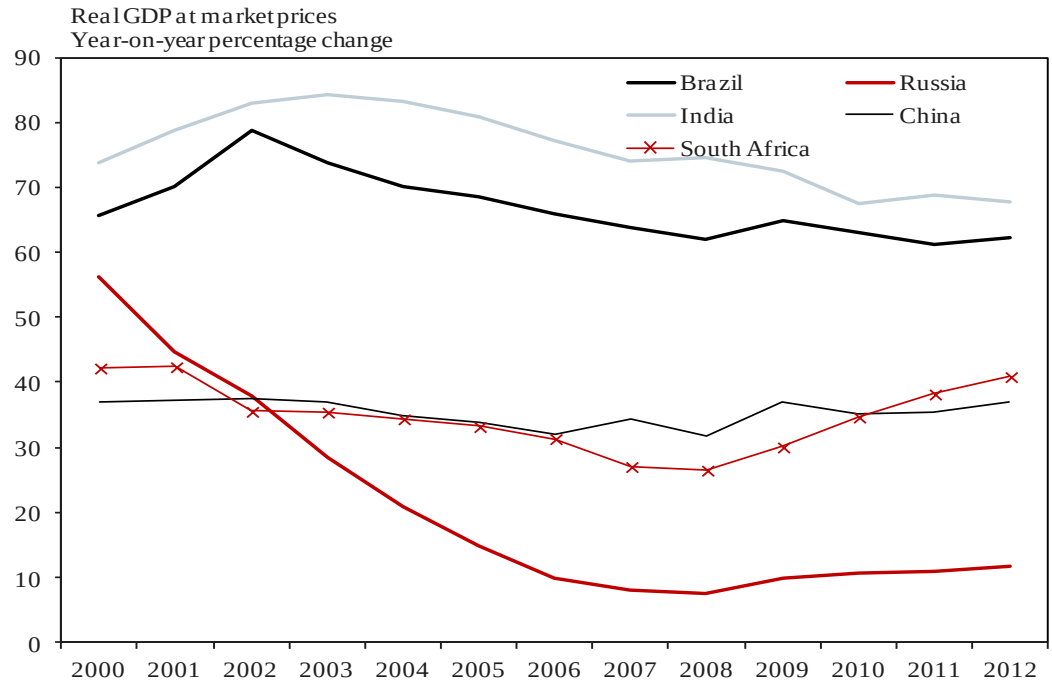
To give a graphical illustration of how some of the key macroeconomic indicators for the BRICS countries have moved over recent years following the 2009 global financial crisis, figures 1 and 2 and are presented below.

Figure 1: GDP growth over time across BRICS countries



Source: IMF World Economic Outlook Database

Figure 2: Government debt evidently on the rise across most BRICS countries



Source: IMF World Economic Outlook Database

The dependent variable is the real GDP growth rate for the various countries (given as the year-on-year percentage change in GDP at constant prices). Figure 1 above shows the GDP growth rate movements amongst the BRICS countries over time. As the graph illustrates, the general GDP growth trend following the 2009 global financial crisis has been slow – a trend that has not just been limited to the sampled economies, but global trends on average. On the other hand, fiscal policy has become increasingly topical as economies have accumulated debt in efforts to boost economic growth performance. Figure 2 above shows how government debt, one of the explanatory variables in the study, has on average increased over recent years amongst the BRICS countries (particularly for Brazil and South Africa). The fiscal policy variables used to explain GDP growth in this study are therefore: the government debt (which is shown in figure 2 above), the tax-revenue-to-GDP ratio (defined as the tax burden) and general government total expenditure. Importantly, the tax burden represents the key explanatory variable underpinning the null hypothesis. Based on the work of Solow (1956) that explains long-run growth by capital accumulation, population growth (also referred to as labour) and productivity (technological progress), this study also primarily uses the following explanatory variables to explain GDP growth for the BRICS countries: the total investment-to-GDP ratio, the growth rate of the total labour force and the growth rate of number of people in each economy. While the labour force growth rate does not directly measure the growth rate of productivity, it is used as a proxy to tell the labour story in the respective economies. In addition to the above explanatory variables, the average number of schooling years for each country has also been used as an explanatory variable. This aligns with some of the literature findings that seem to suggest that the level of development for a given economy plays an integral role in its fiscal policy dynamics.

3.2. Theory underlying the analytical techniques:

As briefly introduced above, to account for the short data series, pooled regression techniques are used – which incorporate both cross-Chapteral and time series elements. Before analysing the data, it is worthy to explore the underlying theory of panel/pooled data. Importantly, it should be noted that there is a clear distinction between independently pooled cross Chapter data and pure panel data (which is also referred to as longitudinal data). Wooldridge (2002) defines independently pooled cross Chapteral data as data that has been obtained by randomly sampling from a large population at different points in time. While panel data differs from the above, in the sense that, the data is collected from the same individuals or units across time.

In simpler terms, pooled data is randomly sampled over different time periods (example: GDP data in country X is collected in 2000-2005 and GDP data in country Y is collected in 2010-2015). Panel data however follows the same set of data over a given time period (example: GDP data for both country X and Y are collected during the period 2000-2015). There is however careful consideration with panel data – as Wooldridge (2002) explains, it cannot be assumed that the observations are independently distributed over time. For example: unobserved factors that influence GDP growth in a given year, may also affect GDP growth in the following year or another year in the sample. These unobserved effects often lead to a bias in estimation results. Due to this, various techniques are introduced to eliminate the time-constant unobservable effect in a particular study, and these are discussed below.

Wooldridge (2002) demonstrates this by using the model of a single independent variable denoted as follows:

$$Y_{it} = \beta_0 + \alpha_0 B1 + \beta_1 x_{it} + b_i + u_{it},\ t = 1,2 \qquad (1)$$

From the above, variable b_i (which is constant over time) captures all the unobserved, time-constant factors that explain the dependent variable (Y_{it}). As Wooldridge (2002) explains, this variable could be considered the unobserved effect, or even as used empirically, the fixed effect.

Theoretically, there are two major pitfalls that come with pooled cross Chapter data. Firstly, this form of model estimation does not solve the omitted variables problem. Secondly, according to Wooldridge (2002), for the model to generate unbiased and consistent estimation results, we need to assume that the unobserved effect is not correlated with the independent variable. However, the possible correlation of the unobserved effect with the independent variables cannot be ignored – hence the reason for first differencing techniques (or alternatively, using the fixed effect transformation) to eliminate the unobserved effect. Both these methods seek to account for the possible changes one may observe in the dependent variables that may not be explained by the independent variables. The choice between these two methods primarily lies on the assumptions we make allowances for – according to Wooldridge (2002), fixed effects estimators are more efficient when the errors are serially uncorrelated.

It is also important to remember that the pooled regression method is simply adapted from an OLS technique for each equation in the system. The difference between the pooled regression model and both the fixed effects and random effects model is that the pooled regression assumes that the mean values of the variables and their relationship do not vary over time, contra to the other two models (Trivedi & Rajmal, 2011). Trivedi and Rajaml (2011) further demonstrate these key distinctions with the following equation:

$$Y_{it} = \beta_0 + \beta_1 x_{it} + u_{it} \quad (2)$$

Where the subscript "i" denotes the cross-Chapter and the subscript "t" denotes the time period. The vector X_{it} contains all the explanatory variables and vector β_1 contains all the coefficients of the explanatory variables. B_0 is the intercept term and u_{it} is the random error term. The different assumption between this equation and both the fixed effects and random effects model, is the reason for the difference in the equation setups. As has been shown in equation 1 above, with both the fixed effects model, there is a further disaggregation of the error term, better shown by the equation 3 below:

$$Y_{it} = \beta_0 + \beta_1 x_{it} + b_i + u_{it}, \quad (3)$$

As Trivedi and Rajmal (2011) explain, and as can be seen in equation 3 above, the error term has now been disaggregated into the b_i (which represents the cross-Chapter observation) and u_{it} (which represents the residual error term). Importantly, both b_i and u_{it} vary over time. Trivedi and Rajmal (2011) further explain that the random effects model on the other hand requires that the newly introduced cross-Chapteral error term is independent of both the explanatory variables and the individual observation error term u_{it}, with zero mean and constant variance.

In a nutshell, with either the fixed effects or first differencing technique, one eliminates the unobserved effect based on the assumption that it may be correlated with the other independent variables. However, if we believe that the unobserved effect is not correlated with all the independent variables at all time periods, than eliminating the unobserved effect becomes inefficient (Wooldridge, 2009). In this instance, the best model to use would be a random effects model, as opposed to either fixed effects or first differencing. The question then becomes, which is a better model to use. This is largely answered by the assumptions one makes – as Wooldridge (2002) highlights, fixed effects are often argued to be the better

estimation tool merely because the technique allows for some random correlation of the fixed effects and the independent variables. Literature shows a clear trend – where both the fixed effects and random effects model are run and the Hausman test is then run to test if there is any statistically significant difference between the coefficients of the independent variables that vary over time.

Wooldridge (2002) further argues that the Hausman test assesses the null hypothesis that coefficients estimated by the random effects model are the same as those estimated by the fixed effects model. The notion is to use the random effects (which is considered efficient), unless the Hausman test rejects the null hypothesis. A rejection of the null hypothesis means that the coefficients estimated by these models are statistically significantly different – implying that the assumptions of the random effects model (the primary one being: that the unobserved effect is uncorrelated with the independent variables) do not hold. In this case, the fixed effect (which at least is considered to be consistent) is then used. On the other hand, failure to reject the null hypothesis means that either the fixed effects or random effects can be used. Wooldridge (2002) further illustrates that failure to reject the null hypothesis could mean that the sampling variations are big in the fixed effects estimators that it cannot be concluded that the differences are statistically significant.

3.3. Estimation techniques used in the study:

In line with what literature suggests, this paper uses panel data estimation techniques to empirically analyse the impact of the tax burden on long-rung growth in South Africa and its BRICS peers. The three panel data estimation techniques used are: the pooled regression, fixed effects and random effects models. Empirical literature findings seem to suggest that the preferred modeling method is the fixed effect model, and this is because it allows for random correlation of the fixed effects and the independent variables. In line with what empirical literature finds, the econometric tests performed in this study show that the fixed effects model is the appropriate model to conduct using this empirical data. It is therefore the main model for the statistical inference. For purposes of comparison however, all three models are presented in this study.

3.4. Statement of research objectives:

The main goal of this paper is to establish the direction of the relationship between the tax burden and real GDP growth. While the primary country of interest is South Africa, due to data constraints, panel estimation techniques have been used comparing South Africa to its BRICS peers. It is important to note that although the initial expectation would be that a high tax burden would have a negative impact on GDP growth, in the emerging market context this is not necessarily the case (as has been shown with the literature review). As such, the expectation is to find that a high tax burden will not necessarily have a negative effect on the BRICS countries used in this study. The null hypothesis is therefore formulated as follows:

H_0: there is a positive tax burden effect on real GDP growth over time.

As such, it follows that the alternative hypothesis is:

H_1: there is no positive tax burden effect on real GDP growth over time.

Using panel data estimation techniques, the hypothesis question can be written in equation form as follows:

$$Real\ GDP\ growth = \alpha + \beta_1\ tax + \beta_2\ govtspend + \beta_3\ debt + \beta_4\ invest + \beta_5\ labour + \beta_6\ schooling + \beta_7\ population + \mu$$

The expectation from the above equation being that the value of the coefficient β_1 will be greater than zero.

The variables used above are best explained figure 3, which follows on the next page.

Figure 3: Comprehensive explanation of the variable list

Variable name	Description in full
GDP	*Real GDP growth rate* *(measured as a year-on-year percentage change)*
Tax	*Tax revenue* *(measured as a percent of GDP)*
Govtspend	*Total government expenditure of general government* *(measured as a percent of GDP)*
Debt	*Gross government debt* *(measured as a percent of GDP)*
Invest	*Total fixed investment* *(measured as a percent of GDP)*
Labour	*Total labour force growth rate* *(measured as a year-on-year percentage change)*
Schooling	*Average number of schooling years*
Population	*Growth rate of the number of persons* *(measured as year-on-year percentage change)*

CHAPTER FOUR: EMPIRICAL ANALYSIS

4.1.1. Descriptive statistics of the variables:

Figure 4 below presents the descriptive statistics of the variables used in the study. While the table does not necessarily give a clear comparison of fiscal policy (and the macroeconomic picture at large) between countries, these statistics enable one to see how the variables used in this particular study differ across countries.

Figure 4: Descriptive statistics of variables for the period 2000-2012

Variables	Observations	Mean	Minimum	Maximum	Standard Deviation
GDP	65	5.868	-7.821	14.200	3.595
Tax	65	17.235	12.681	27.596	4.233
Govtspend	65	28.650	16.224	38.770	5.534
Debt	65	46.751	7.480	84.243	22.606
Invest	65	26.553	15.557	47.330	9.791
Labour	65	1.215	-1.847	4.585	1.360
Schooling	65	7.631	3.600	11.700	2.600
Population	65	0.917	-0.725	2.782	0.725

It is evident from the table above that the variable with the biggest variance is government debt, with a standard deviation of 22.606. In fact, the extreme values of the minimum and maximum observations are also an indication of how widely the government debt variable varies across the BRICS countries. With further analysis of this government debt variable, it is found that this minimum value of 7.480 represents Russia (whose average government debt over the sample period is also lowest compared to the other BRICS countries). Interestingly however, further analysis of the data over time shows that during the early 2000s, Russia's debt levels (as a percent of GDP) were in excess of 20%. It is only post the year 2000 that these debt levels have gradually declined (with a slight increase only post the 2009 global financial crisis). On the other hand, the country with the highest debt levels, on average, over the sample period is India (representing the maximum value in the sample of 84.240 as shown in figure 4 above).

Similar to government debt that shows a high variance, the total fixed investment variable comes second with a standard deviation of 9.791. Similar to government debt, this is an

indication of how vastly total fixed investment as percent of GDP differs across the BRICS countries for the period sampled. For instance, while the mean value of the total fixed investment variable is 26.553, there is a minimum value that goes as low as 15.557 and a maximum value as much as 47.330. An important observation is however made between the government debt and total fixed variable, and that is: the outlier minimum and maximum values are not necessarily indicative of the general trend. For example while the outlying minimum value of 15.557 represents the lowest value for Russia, it is not Russia that has the lowest average trend for fixed investment over the sampled period, but rather Brazil (followed by South Africa). On the other hand, the maximum value of 47.330 represents the peak value for China (followed by India), which also has the highest average fixed investment levels compared to the other BRICS peers. To a large extent, it is expected that the fixed investment variable would represent the variable with the one of the highest standard deviations in the sample. Part of this trend can be explained by how investment decisions are highly correlated with the business cycle. In simpler terms, when business conditions are tighter, businesses have less incentive to invest and thus why private fixed investment generally shows a slowing pattern during times of economic downswings. This view can be further corroborated by the fact that the minimum value observed for Russia is between the years 2008-2009, at the peak of the global financial crisis.

Following government debt and total fixed investment, the government expenditure also shows high variance (with a standard deviation of 5.534). The relatively high variance of the government expenditure variable is similarly explained by the correlation of the variable with the business cycle, and how different economies choose to respond via the fiscal policy channel. A point in case is South Africa, which assumed a countercyclical fiscal stance post the global financial crisis in the effort to boost GDP growth. On the other hand, some governments opt to assume a more procyclical fiscal policy position – that is, governments choose to spend more during times of economic booms, and less during recessions/economic troughs. As such, a positive relationship between the economic cycle and government expenditure is observed, in contrast to the negative relationship one would expect within an economy that has assumed a more countercyclical fiscal stance). Referring back to figure 4 above, from the BRICS panel data used in the study, it is found that the minimum government expenditure value is from China – which also happens to be on average, the economy with the lowest proportion of government expenditure as a percent of GDP over the entire sample

period. Brazil and Russia, on the other hand, show the highest average value of government expenditure.

The following variable of interest is the tax burden variable. While not necessarily the highest level of variance in the sample, with the standard deviation of 4.233, tax revenue (as a percentage of GDP) seems to also show some level of volatility across the BRICS countries. The minimum value of 12.681 comes from China (although it is India on average that has the lowest tax burden). On the other hand, the data shows that South Africa is the country with the highest average tax burden trend, compared to the other BRICS countries. It is important to note: this is in contrast to the expectation that Brazil would represent the country with the highest tax burden within/amongst the BRICS peers. An important caveat should be noted with the tax-burden data. As explained above, the tax burden variable is purely restricted to tax revenue as a ratio to GDP. The data is sourced from the World Bank's DataBank (as opposed to general government revenue data as released by the IMF). The difference between these two variables is best presented in figure 5 below.

Figure 5: Comparison of total tax revenue vs. general government revenue data

	Brazil		Russia		India		China		South Africa	
	Tax revenue*	Govt. revenue	Tax revenue*	Govt. revenue	Tax revenue*	Govt. revenue	Tax revenue**	Govt. revenue	Tax revenue*	Govt. revenue
2000	13.77	31.162	13.726	33.663	8.658	17.372	12.681	13.318	23.344	23.664
2001	14.560	33.061	15.778	34.359	7.940	16.946	13.954	14.729	24.186	24.079
2002	15.720	34.497	13.649	34.394	8.527	17.732	14.656	15.458	23.278	23.759
2003	15.244	35.818	13.314	33.854	8.951	18.195	14.738	15.700	23.038	23.642
2004	15.753	35.363	13.234	34.108	9.406	18..897	15.115	16.220	24.282	24.243
2005	16.529	36.251	16.623	36.951	9.914	19.062	15.561	16.729	25.743	25.647
2006	16.182	35.637	16.568	36.740	11.025	20.338	16.090	17.070	27.270	27.930
2007	15.831	34.895	16.551	37.422	11.893	21.962	17.163	18.130	27.596	28.596
2008	15.509	35.883	15.818	36.458	10.751	19.708	17.266	22.369	26.813	28.316
2009	14.383	33.921	12.956	32.616	9.641	18.518	17.460	23.751	24.397	26.934
2010	14.195	36.078	13.048	32.221	10.188	18.821	18.234	24.600	25.042	26.871
2011	14.908	35.129	14.051	34.935	9.078	19.292	18.968	26.914	25.169	27.139
2012	14.093	34.768	13.996	35.016	10.829	19.800	19.369	27.757	25.520	27.333

**According to the World Bank development indicators databank 2016, the tax revenue data is defined as the compulsory transfers made to central government for public purposes. Certain compulsory transfers (examples: fines, penalties and most social security contributions) are excluded. Furthermore, refunds and corrections of erroneously collected tax revenue are treated as negative revenue.*

***Data collected from the People's Bank of China. Data is also only restricted to tax revenue and not general government revenue.*

Firstly, an interesting observation can be made from the above table, and that is: it is mostly South Africa whose tax revenue data is almost the same as the total government revenue data. It can therefore be deduced that South Africa's government revenue is mostly sourced from tax collection, while for the other countries, total government revenue is a fairly balanced combination of tax collections and other sources of revenue. A point in case is that of Russia, which has one of the highest world oil reserves in the world, and that is highly reliant on its oil and gas sector for the generation of government revenue. The Russian government is highly involved in its State Owned Entities (SOEs) and depends on these for other sources of government revenue, unlike in South Africa where the government is not as reliant on the parastatals that it runs for government revenue. In Russia, a good example is shown with Gazprom, a key global player in the energy sector and the only producer and exporter of natural gas in Russia. The government owns majority of this entity and therefore relies heavily on it for the generation of other government revenue. The above arguments seeks to highlight one of the key limitations in comparing between these economies.

Secondly, another key limitation of the study is tax data used. An important consideration is given specifically to the case in Brazil, which is typically known for its high tax burden compared to other emerging market economies. The tax system in Brazil is rather complex, and as such, implies excessive administrative bureaucracy and often presents limitations for doing business (particularly for foreign entities) – one of the reasons why recent studies have argued for the need for tax reform. In addition to this, it should also be considered that a significant portion of the social contributions are included within the Brazilian tax system. For the purpose of this study, that uses data that mostly excludes social contributions, it is important to highlight the distinction of how taxes and social contributions are defined. According to the work of Afonso, Soares & Castro (2013), there is a legal distinction between tax (known as imposto), a contribution (contribuição) or fee (taxa). Both tax and contributions (which can be further distinguished between social and economic contributions) are compulsory transfers made to the government. They further explain that the difference however is that tax is the transfer to government that bears no obligation to the state, while social contributions are used for social purposes (grants and assistance) and cannot, for example, be used for government salaries. Generally, Brazil's overall tax burden is considered as the sum of all these mandatory collections by government, that is: taxes, social and economic contributions and fees – which is in contrast to how the tax burden is defined within

this particular study. Furthermore, using Brazil data, Afonso et al. (2013) show that for instance in 2010, social contributions accounted for about 8% of GDP. This shows that this is a significant component of the overall tax basket of Brazil. It is therefore not surprising that in this particular study, it is South Africa that averages as the country with the highest tax burden (instead of Brazil). Considering that the World Bank's tax revenue data excludes certain transfers made to the government, it does however imply that there may be some underestimation of the total tax burden in Brazil.

The above concludes the discussion on some of the key variables in the study. An interesting observation emerges, and that is: the standard deviations of the public finance policy variables (both government expenditure and the tax burden variable, with the exception of total government debt) are comparatively less variable than the variance observed with the total fixed investment variable. As briefly explained above, while all these variables would be correlated to the movements of the business cycles and the various fiscal policy responses across countries, this correlation is at varying degrees. It is therefore to a large extent expected that total fixed investment decisions would be more variable than, for example, compared to the decisions underlying what government chooses to consume. The main reason for this being that government consumption expenditure is mostly driven by mandatory expenditure on public goods – providing government with less scope to adjust spending patterns. This is especially the case for emerging market economies, where the government typically plays a more dominant role in addressing economic development objectives. Nonetheless, government expenditure patterns should not be misinterpreted at totally inelastic, as they are still influenced by business cycle movements. Especially over the past few years, when rising government debt levels (interplayed with poor macroeconomic performance) have resulted in the growing trend of sovereign rating downgrades by key credit rating agencies – and hence the need for many governments to resort to fiscal consolidation.

Lastly, the variables with the least variance are the average number of schooling years and both the growth rates of the labour force and the population – as evident with the lower values of standard deviation. This possibly an indication of how the general economy changes at a comparatively quicker rate than some of these social economic conditions. In fact, the underlying dynamics of these variables are more complex to assess, as opposed to the macroeconomic data that has been discussed above. However complex, it is important to consider the weight that these variables carry as they could all be considered as proxies of the

level of development for the respective economies. Following some of the literature findings that have suggested that the initial level of development for a given economy can be an important contribution to how fiscal policy decisions impact on long run GDP growth, it is therefore important that these variables are included in the analysis. Contra to the trends that have been observed above, where the lowest average ratios for total fixed investment were observed for South Africa and Brazil, it is found that these two countries represent the highest growth rate of the labour force over the sample period. In fact, the maximum value of 4.585 as shown in figure 4 above, is the rate at which the South African labour force grew by in 2005. Before this year of robust growth, there were two years where the South African labour was declining. Assessment of the labour force growth rate cannot be done in insolation, but goes hand in hand with the unemployment figures of a given economy. This argument is followed by the fact that on average, South Africa and Brazil (particularly over recent years) have the highest average rate of unemployment in the pool. This suggests that the growth rate of a given economy's labour force is largely explained by the base effect. In other words, the higher the number of unemployed people, the greater the scope for the labour force to grow (because although some of the unemployed people could have been part of the labour force, in some instances the official unemployment rate underestimates the number of discouraged workers which are not included in the labour force calculations).

On the other hand, while the average number of schooling years makes for an interesting analysis and comparison between countries, it is slightly more complex and is beyond the scope of this study. The reason for this being that legislation differs across countries, therefore implying different mandatory schooling years. For example, while the number of mandatory schooling years in South Africa is twelve years (split between seven years in primary schooling and 5 years of secondary education), China's mandatory schooling years are at least nine years (made up of six years of primary education and three years of secondary junior education. Following which there is an additional three years of high school that completes secondary education – although not mandatory).

4.1.2. Correlation coefficients of the variables:

In addition to the descriptive statistics, it is important to consider if the explanatory variables are correlated and the reason for this simply being the issue of multicollinearity. According to

Wooldridge (2002), multicollinearity can be defined as the phenomenon where two or more of the explanatory variables are highly (but not perfectly) correlated, enough to allow for the linear estimation of either of the variables using the other with some degree of accuracy. Figure 6 below presents the correlation coefficient matrix of the variables used in this study:

Figure 6: Correlation coefficient matrix

Variable	*GDP*	*Invest*	*Invest* $_{t-1}$	*Labour*	*Population*	*Schooling*	*Tax*	*Tax* $_{t-1}$	*Debt*	*Govtspend*
GDP	1									
Invest	0.701***	1								
Invest $_{t-1}$	0.629***	0.977***	1							
Labour	-0.0593	-0.219*	-0.227*	1						
Population	-0.426***	-0.431***	-0.411***	0.276**	1					
Schooling	-0.229*	-0.430***	-0.428***	-0.270**	-0.340***	1				
Tax	-0.193	-0.188	-0.185	0.0558	0.220*	0.242*	1			
Tax $_{t-1}$	-0.277**	-0.229*	-0.209	0.00228	0.271**	0.253*	0.971***	1		
Debt	0.00868	0.0631	0.0792	0.344***	0.568***	-0.860***	-0.272**	-0.267**	1	
Govtspend	-0.632***	-0.632***	-0.627***	0.0671	0.442***	0.275**	-0.113	-0.0751	0.110	1

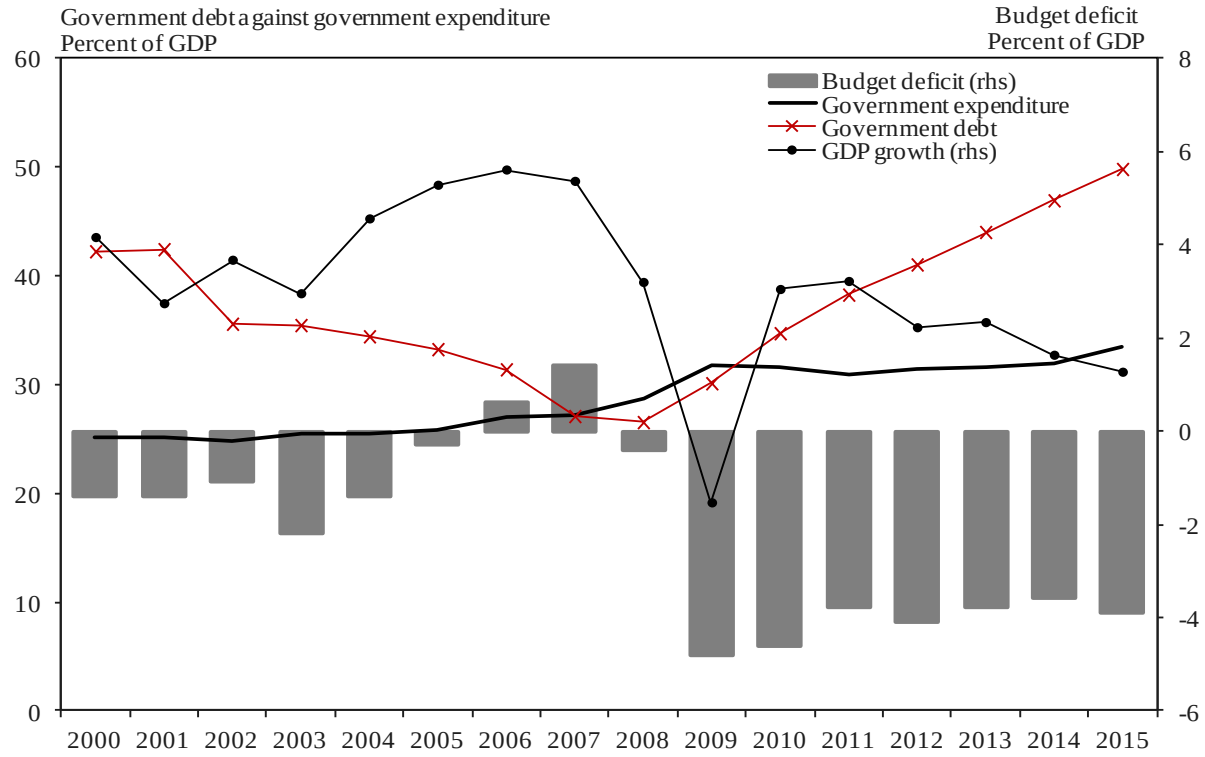
***p<0.01, **p<0.05.

According to Wooldridge (2002), the issue of multicollinearity is not properly defined, and this stems from the fact that there is no absolute value that is used to determine or conclude if multicollinearity is a problem in a given dataset. For example, although figure 6 above demonstrates that there is a 70.1% positive correlation between total fixed investment and GDP growth, one cannot conclude that this poses a problem of multicollinearity. In other words, the high level of correlation between the two variables does not automatically imply that there may be inaccuracies with the model results. However as Wooldridge (2002) explains, despite the fact that multicollinearity (and the challenges it gives rise to) cannot be concluded, one still prefers less correlation between the explanatory variables. Put simply, while one cannot conclude if the level of correlation between variables is high enough to cause problems in a given dataset, it is preferred that correlation coefficients between variables are low.

While all variables presented in the above correlation coefficient matrix are important, not all will be discussed below. A comprehensive discussion of the relationships is limited to only some of the key variables in the study, mostly those that rendered different results to what was expected. From the correlation coefficient matrix presented above, a few interesting findings emerge – some in contrast to what was initially expected. An example of this is the direction of relationship that is found between government expenditure and real GDP growth. Drawing on the Keynesian hypothesis, one would expect that there is a positive relationship between government expenditure and real GDP growth. However, the empirical data used here suggests otherwise. It would seem that the relationship between the two variables is not as simple as one would have expected. In fact, drawing upon the likes of Salih (2012) and Hasnul (2015), it is evident that there is no clear consensus between government expenditure and the role it plays in the expansion of an economy. Literature shows that there are two clear opposing schools of thought: the Keynesian hypothesis and Wagner's lawyer (which was briefly mentioned earlier on this paper). As explained by Salih (2012), the Keynesian school of thought proposes that as government expenditure grows, so does economic activity – and as such, one would expect a positive relationship between the two variables. On the other hand, Wagner's hypothesis assumes that government expenditure is a function of a given economy and that government expenditure increases as the economy grows. In simpler terms, with the Keynesian theory, one assumes that government expenditure is not a by-product of GDP growth but rather plays an integral role in growing an economy. Whereas Wagner's law, on the other hand, can be interpreted to mean that the size of the government sector, or rather government's expenditure in a given economy, is to a large extent determined by how much an economy is growing. Both theories have been empirically tested. For example, further corroborating the negative relationship between government expenditure and GDP, Hasnul (2015) finds a negative correlation between these variables by using Malaysian data between the period 1970 – 2014. The findings in the Hasnul (2015) study show that it is specifically the housing sector expenditure and development expenditure that leads to lower long run economic growth (as opposed to government expenditure items such as education, defense, healthcare and operating expenditure which do not seem to show a clear significant impact on economic growth). It is important to note that these results are specific to the study conducted using Malaysian data, but not necessarily true for all economies. Using data from Sudan, for the period 1970-2010, Salih (2012) similarly finds support for the Wagner's hypothesis. However, Salih (2012) found a positive relationship between the government expenditure-to-GDP ratio and GDP capita.

In further explaining the negative correlation between government expenditure and real GDP found in this study, it is important to distinguish between the short run and long run, and the possible varying effects this has on the relationship between government expenditure and real GDP growth. In other words, from a national accounts perspective, it would seem logical that government expenditure results in higher economic growth over the short term. However over the long run, the impact of government expenditure on GDP growth becomes slightly more complex. The reason for this being: government expenditure is typically funded by the revenue generated by government or loans that government acquired (sourced both within the domestic borders of a given economy or even abroad). Provided that many economies sit with budget deficits and high debt levels, it is safe to conclude that much of government's consumption is financed by debt that is only paid off in the future. As such, government expenditure that is financed by debt that bears interest over the long run, is not necessarily a positive contribution to a given economy's long run growth performance. To expand upon this, South Africa is used as a point in case. To do this, the graphical illustration below shows some key macroeconomic indicators in South Africa over time.

Figure 7: South Africa's fiscal policy indicators against its long run GDP performance



Source: IMF WEO database, National Treasury

As illustrated in the graph above, along with an increasing budget deficit, South Africa's government debt has been gradually on the rise. The rise in the government debt ratio has been particularly pronounced over recent years – partly explained by South Africa's countercyclical fiscal policy stance following the global financial crisis. It is important to note that South Africa has a medium term debt strategy that smoothens and lengthens its repayment obligations in line with prudential debt management requirements that ensure that payment obligations are met at reasonably low costs over the medium to long run (National Treasury, 2015). Although the debt strategy remains prudent, it can also be argued that due to the interest obligations that accrue from the debt accumulated, government expenditure does not necessarily have a positive correlation with real GDP growth over the long run. It should however be clearly noted that this does not take away from the development need of government expenditure in economies, particularly emerging market economies. South Africa is yet another good example to demonstrate this: where a significant proportion of government expenditure is allocated to social transfers and subsidies – which are in line with the country's development goals.

Another unexpected relationship found between the key variables is that of government expenditure and the tax burden variable. While initial expectation was for a positive relationship, a negative correlation is found between the two variables – although relationship is found not to be statistically significant at the 5% significance level. If one now reconsiders the negative correlation between government expenditure and real GDP growth, it is therefore not surprising that there is a negative relationship between government expenditure and the tax burden variable as well. The negative relationship suggests that while tax revenue plays a significant role in government spending, it is not the only means. That is, one cannot conclude that as taxation increases, so does government expenditure. As discussed above, other means of financing government expenditure can be government debt (which is found to be the case, although not statistically significant). As such, the negative relationship observed between these variables is therefore justified. Part of this narrative would be linked to Afonso and Jalles' (2013) finding that there is a negative impact on growth (from taxation from income, profits and capital gains) for economies with budget deficits larger than 3% of GDP. Another key factor with this debate is how tax revenues are measured. This is particularly applicable to countries like Russia and Brazil, where it has been shown that there is a significant difference between tax revenue and total government revenue. So while one finds a negative correlation between tax revenue and government expenditure, it would not be surprising to find that the relationship between total government revenue is actually positive. In addition to this, another statistical measurement consideration is that while there is no positive correlation between the tax burden (which is a ratio of tax to GDP) and GDP growth, comparing the growth rate of tax revenue (instead of measuring tax a ratio to GDP) against the GDP growth rate may give a different result.

Another relationship worthy of mentioning is that of government spending and investment. Literature suggests that government expenditure can either have a positive (crowding-in) or negative (crowding-out) effect on investment. The correlation coefficient matrix presented above shows a negative correlation coefficient of -0.632 between government expenditure and GDP – suggesting that the empirical data used in this study leans more towards the crowding out effect. In simpler terms, the crowding out effect can be explained to be the phenomenon where excessive government spending is financed by debt, resulting in the increase in the real interest rate and therefore discouraging the private sector from investing because of the high interest rates (Ifeakachukwu, Omadadepo & Oluseun, 2013). This theory stems from the fact that governments have the ability to borrow in large sums, and therefore

can be market players and influence the interest rate. Due to private sector investment, also being partly financed through borrowing, higher interest rates therefore imply a higher opportunity cost of borrowing money and therefore discourage private sector firms from investing in capital projects. In their paper, Ifeakachukwu et al (2013) use Nigerian data to show that the various components of government consumption expenditure have different effects on private sector fixed investment over the short and long term. Firstly, they find that recurrent and final government consumption has a crowding out effect over the short run, while it is capital expenditure by government that has a crowding out effect on private sector fixed investment over the long run (Ifeakachukwu et al, 2013). In a separate study, Sinevičienė (2015) also finds a similar result, and that increased government expenditure can either have a negative or positive relationship with private sector fixed investment. The important contribution of this particular study is that it explores the different dynamics between small and large economies. With the focus on small open economies, Sinevičienė (2015) argues that small economies are different to large economies due to economic, social and political factors. It is therefore these exact factors that may often result in different reactions by private sector investment to government spending. Nonetheless, in line with the results presented in the correlation coefficient matrix presented above, a negative correlation is found between government spending and private sector fixed investment.

4.2 Analysis of estimation results

4.2.1. Model output:

As shall be explained below, from the statistical tests that were run (and in line with many of the literature findings), it is found that the most appropriate model for this empirical data is the fixed effects model. However, for the purpose of comparison and to justify the fixed effects model as the main model of choice, all three model outputs are presented below. The model of choice is highlighted in bold.

Figure 8: Empirical results of the model

VARIABLES	**(1) Fixed effects**	(2) Random effects	(3) Pooled OLS
Invest	**0.649*** **	0.722***	0.549***
	(0.129)	*(0.131)*	*(0.177)*
Invest $_{t-1}$	**-0.564*** **	-0.522***	-0.320*
	(0.128)	*(0.129)*	*(0.177)*
Labour	**0.191**	0.241	0.303**
	(0.191)	*(0.207)*	*(0.144)*
Population	**-0.209**	-0.059	-0.068
	(1.108)	*(0.703)*	*(0.479)*
Schooling	**1.542***	0.741*	*1.184****
	(0.771)	*(0.425)*	*(0.344)*
Tax	**0.586** **	0.323	0.0410
	(0.287)	*(0.285)*	*(0.235)*
Tax $_{t-1}$	**0.050**	-0.463*	-0.205
	(0.293)	*(0.277)*	*(0.212)*
Govt spending	**-0.604*** **	-0.278***	-0.328***
	(0.122)	*(0.090)*	*(0.095)*
Debt	**0.065**	0.062	0.110***
	(0.040)	*(0.044)*	*(0.040)*
Constant	**-5.229**	1.755	*-4.857*
	(6.246)	*(5.735)*	*(4.707)*
Observations	**65**	60	60
Number of country ID	**5**	5	
F_test	**10.190*** **		22.99***
Chi^2_test		169.3***	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1*

4.2.2. Choice of model explained:

As mentioned above, the model of choice for the empirical data used in this study is the fixed effects model. The reason for this can be found in the statistical results presented in figure 9 below.

Figure 9: Statistical justification for the fixed effects model as the primary model

Hausman's test	Chi^2 = 18.05 *Prob > Chi^2 = 0.035*

The theoretical background as to why the Hausman's test is used to decide between the fixed effects and random effects model is comprehensively explained in Chapter 3 above. As a quick recap, Wooldridge (2002) explains that the null hypothesis of the Hausman's test prefers the random effects model. In other words, it assumes that the coefficients generated by both the fixed effects and random effects model are not statistically different and therefore the random effects model (which is theoretically considered to be more efficient) is therefore preferred. From figure 9 above, the p-value of the Chi^2 statistic is less than 0.05, and it is for this reason that the null hypothesis (that renders the random effects model as being more appropriate) is rejected. The statistics above can therefore be interpreted as that the coefficients are in fact systematically different. For this reason, the random effects model is not used, and the fixed effects model is therefore the model of choice for this study – which also aligns with the general trend of the literature that has been mostly covered.

4.2.3. Interpretation of the model results:

While all the model results are presented in figure 8 above, the discussion below is mostly directed towards the key variable of the hypothesis, that is: the tax burden on GDP growth. Furthermore, the discussion is limited to those variables that are found to be statistically significant. The first variable of interest is total fixed investment and its strong positive effect on GDP growth, with a coefficient of 0.649. Interestingly however, and somehow in contrast to what one would expect, the lagged investment variable has a different effect on real GDP growth. When lagged by one time period, the positive effect of investment on GDP changes to a contractionary effect on GDP growth. Furthermore more interesting is the fact that this relationship similarly shows statistical significance even at that 1% significance level. It is important to note that this is an annual model and that lagging investment by one period measures the effect of investment on real GDP growth a year later. Assuming that investing capital projects only typically generate returns over the medium term (rather than immediately), one would expect that a positive contribution to GDP should come through when investment is lagged instead of a contemporaneous effect. On the other hand, the expenditure and production approaches of GDP should be considered. That is, from an expenditure approach, the investment in capital projects is immediately captured in the national accounting of GDP. Using the Keynesian aggregate demand (AD) equation[12],

[12] Macroeconomic theory shows that according to Keynes concept of aggregate demand, GDP is the sum of consumption demand by households, total investment demand (inclusive of households, businesses and

national accounting implies that an increase in total fixed investment leads to an increase in GDP. However from the production side, the production capacity of investment only bears fruitful results much later. Bearing in mind the negative coefficient of investment on GDP presented above, one can argue that one year is too short a period to see any positive contribution on GDP growth. As such, it would not be impossible to find that a different result would emerge if the investment variable was lagged at a longer time period.

Although contrast to expectations, the results found above can further be corroborated by the work of Ledyaeva and Linden (2008) that assess the determinants of growth in Russia by distinguishing between low growth years (1996-1999) and high growth years (2000-2005). The strongest contributions to GDP growth are found to be investment and the export variable. They found that while domestic investment and export variables are important in the first period, the statistical significant falls away during the 2000-2005 period. The take home message here being that while a variable like total fixed investment may play a key contribution role to GDP growth over time, in empirical studies like these, the specification of such variables and factors such as the sample period also play a key contributing role to the results.

Further supporting evidence of this negative contribution of investment can be found in the study by Vong and Ichihashi (2012), where they find that the two most important positive contributors to GDP for a sample of 15 Asian countries are private investment and foreign direct investment (FDI). On the other hand, government fixed investment is found to have a negative contribution to GDP growth. Interestingly, although beyond the scope of this particular study, the work of Vong and Ichihashi (2012) aligns to the work done by Agrawal (2015) that specifically zooms into the BRICS countries and find that an increase in the levels of FDI are supportive of economic growth. As such, it is suggested that investment-friendly policies and other sources of economic development (that also attract foreign investment) should be encouraged amongst these BRICS countries. It is important to note that there is a clear distinction between fixed investment and FDIs, however this avenue of FDI is specifically mentioned here as an alternative to finance government spending (which is expected to prove more favourable than government spending financed by debt). This

government), government expenditure and net exports from abroad. Importantly, net exports are calculated as given economy's total exports less its total imports.

however is beyond the scope of this study, and could present an interesting research topic on its own.

The next statistically significant variable discussed is government expenditure. Following the earlier discussion on government spending generally being financed by both government revenue and debt (and with debt increasingly dominating over recent years post the global financial crisis), it is not surprising that government spending have a negative contribution to GDP growth over the long run. Interestingly, this contractionary effect is in fact evident across all three models, with the base model showing the most pronounced magnitude (as evident with the coefficient of -0.432 at even the 1% significance level). The take home message here however is that similarly to what Vong and Ichihashi (2012) argue, it is not necessarily all types of investment that lead to increases in real GDP. As such, one would probably need to disaggregate the fixed investment variable further to fully analyse this.

Before alluding to the discussion of the tax burden variable, the last other statistically significant variable in the model (that is: number of years of schooling) is discussed. The relationship of education to economic growth is an interesting one – that has often led to various debates over recent years. In a World Bank research on education quality and its effect on economic growth, Hanushek and Wößmann (2007) argue that while most literature demonstrates a clear positive relationship between education and long run growth, how education is measured in these quantitative studies often presents some limitations. So while Hanushek and Wößmann (2007) themselves present research findings that each year of schooling is linked to a 0.58 percentage point contribution to long run growth, they note an important caveat is discussed. This being that by simply using the years of schooling as a proxy for education, one assumes that an additional year of schooling leads to roughly similar increases in learner knowledge and skills irrespective of the vast differences amongst the education systems across countries. According to Hanushek and Wößmann (2007), this assumption fails to consider the cross-country differences in the quality education and therefore poses a major limitation to most quantitative study.

The argument presented by Hanushek and Wößmann (2007) above is an important one, particularly in relation to the results presented in figure 8 above. At the 10% significance level, the schooling variable shows a positive contribution on GDP growth. This suggests that a higher average number of schooling years is associated with higher long run GDP over the

sampled years for the BRICS countries. Despite the technical drawbacks of the schooling variable as discussed above, these results do however contribute to the discussion that the schooling (as a proxy of human capital) has an important positive contribution to long run GDP growth. Although once more Hanushek and Wößmann (2007) note that that it should be remembered that the number of years of schooling undermines the fact that all skills and human capital come as a result of formal education.

More directly related to the hypothesis tabled in chapter three, attention is now given to the tax burden variable. Although literature finds that the tax effect on long run growth is negative for most advanced economies and mostly positive for emerging market economies, one thing is also clear from the literature review: that the effects of tax policy on GDP performance is not as clear as one would hope for. In fact, it is found that the effect of tax burden on GDP growth varies depending on the model specification. Similarly, this study finds that the contemporaneous effect of the tax burden on GDP is strongly positive (in line with what most literature finds for emerging market economies) for the fixed effects model. However, this coefficient decreases (and the statistical significant falls away) as one moves away from the fixed effects model (and to the random effects and pooled regression models). Furthermore, lagging the tax burden by one period also shows different results, with both the random effects and pooled regression model showing a contractionary effect of the tax burden on GDP growth. Although a slight positive effect still holds for the fixed effects model, the statistical significance of the model however falls away. From the results above, there is not enough evidence to reject the null hypothesis (that assumes that there is a positive effect of the tax burden on real GDP growth over time) holds, and as such one fails to reject the alternative hypothesis. If anything, considering the positive sign of the contemporaneous relationship of the tax burden variable to GDP, the results seem to align with general literature findings that the tax burden has a positive effect on GDP growth for emerging market economies (although there is no clear consensus on this issue). These opposing results (both in terms of how the sign of the coefficients change between the contemporaneous and lagged variables, and the level of statistical significance) however suggest that the effect of taxation on long run GDP growth remains a rather complex one, and that cannot be taken at face value.

Considering how the results can change by just the way the variable is specified (that is: contemporaneous versus lagged), it is clear that this is an important consideration and should

possibly be further explored. The results above align to the work of Reed (2008) that finds that when using annual data and the study is restricted to contemporaneous effects, the tax burden has a positive effect on GDP growth. Furthermore, it is argued that the tax coefficient varies as the model specification changes too. In addition, similar to the findings presented above, Reed (2008) also shows that when the lagged values of the tax burden variables are included, the tax effects on GDP growth change from positive to negative. The reason cited for this varying tax effects is possibly the interaction of variables over time, which therefore makes it difficult to sufficiently model the results. More specific to the work by Reed (2008), the argument is that annual data at the state level possibly suffers from measurement error, and this is the reason why a robust relationship between taxation and GDP growth may not be found. It is however important to note that the work of Reed (2008) uses state level data in the US (instead of federal government tax data, which is almost double the size of state level taxes and also much more progressive in nature). Despite this important caveat, these findings provide some important insight that is applicable to the results discussed above.

Although the point made above with regards to the different nature of taxes between the state and local level compared to the federal level goes beyond the scope of this study, it is nonetheless an important discussion. It closely alludes to the argument made by McBride (2012) about how it is also important to distinguish between tax types as different tax types have varying effects on economic growth. As McBride (2012) writes, income taxes mostly affect labour and savings decisions by consumers, while corporate and capital gains taxes affect total fixed investment decisions. In addition to this, consumption taxes (such as sales tax) affect the decisions of the suppliers of labour and capital – although neutral. McBride (2012) further highlights that over time, empirical studies have found that the most adverse effects on economic growth emanate from corporate and personal income taxes, which are then followed by consumption taxes. It can therefore be concluded that the issue of tax policy is a complex one, which not only differs across countries but also has various effects (depending on the tax type within any tax system) on a given economy. This potentially provides opportunity for future research (with much more disaggregation according to tax type) amongst the BRICS countries.

CHAPTER FIVE: CONCLUDING REMARKS

The aim of this paper has been to analyse the tax burden on long-run growth, particularly amongst the BRICS countries. This follows the research gaps that have been found – that there remains an insufficient number of quantitative studies on the correlation between long run GDP growth and the overall tax system in countries like South Africa. This analysis is however not only limited to South Africa, but further extends to the BRICS countries – also contributing to the literature that still remains rather limited on this front too.

Drawing on literature, the paper finds its base on the theoretical frameworks of both exogenous and endogenous growth models. In so doing, the evolution of neoclassical growth models to new growth models is briefly introduced. Considering the nature of this study, considerations are made to the important contributions made by the Solow model to the growth theory framework. Furthermore alluding more closely to the work that has been done on tax policy and how it relates to long run economic performance, the literature review further extends to the some of the empirical findings

With annual data that spans over thirteen years, this study uses panel data regression techniques to explain the tax burden effects on long run GDP growth for South Africa and its BRICS peers – a methodology generally in line with what has been applied in international literature to date. Three models are presented: the fixed effects, random effect and pooled regression model). However, based on the statistical tests that are run, it is the fixed effects model that is found to be the model of choice for the data employed. The dependent variable used is the real GDP growth rate for the various countries (given as the year-on-year percentage change in GDP at constant prices). The explanatory variables on the other hand are a combination of key fiscal policy variables and other developmental/macroeconomic data. The list of explanatory variables is as follows: the tax burden, government debt, government expenditure, total fixed investment, the labour force, population and schooling. It is important to note that tax burden here is strictly defined as the tax revenue generated by government (and is not inclusive of other government revenue).

In line with most of the literature findings that find a negative tax effect on growth for advanced economies and positive effect for emerging market economies, the expectation was that the tax burden variable would have a positive impact on real economic growth over time.

Similarly, the research findings here are supportive of this – finding that the tax burden variable positively contributes to long run GDP growth for the BRICS countries over the sampled period. However, these results are not as clear and strong as one would hope for. In fact, it is found that the effect of tax burden on GDP growth varies depending on the model specification. Similarly, this study finds that the contemporaneous effect of the tax burden on GDP is strongly positive (in line with what most literature finds for emerging market economies) for the fixed effects model. However, this coefficient decreases (and the statistical significant falls away) as one moves away from the fixed effects model (and to the random effects and pooled regression models). Furthermore, lagging the tax burden by one period also shows different results, with both the random effects and pooled regression model showing a negative effect of the tax burden on GDP growth. The statistical significant of this relationship however remain questionable.

It can therefore be concluded that the issue of tax policy is a not a simple one. As has been found, the effect of tax policy is highly dependent on how the model is specified. Furthermore, not only do tax effects on long run economic performance differ across countries (which in itself proves challenging in comparing across countries), they also have various effects (depending on the tax type within any tax system) in one given country. As such, tax policy decisions (and overall fiscal policy debates) are still expected to remain highly topical going forward.

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