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The Relationship Between Labour Productivity and Economic Growth in South Africa from 2000-2016

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A research report submitted to the Faculty of Management, University of the Witwatersrand, in 50% requirement of the requirements for the degree of Master of Management (in the field of Public and Development Management

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Abstract

Labour Productivity is associated with the acceleration or slowing down of the rate of economic growth, at times without discerning the extent of the relationship between the two. The relationship is generally assumed and in the context of South Africa, it is mostly regarded as negative without an in-depth study of the nature of the relationship and concrete proposals on what should be done to turn it into a positive relationship. Now, especially after the global economic crises, there is a need to understand the nature of the relationship and how what consideration should be made by policy makers to take South Africa out of a growth slump.

This quantitative study examines the relationship between labour productivity and economic growth from 2000 to 2016 in South Africa. The study relies on Gross Domestic Production, labour productivity and total factor productivity sourced from the South African Reserve Bank from 2000-2016. The study then applies a simple linear regression method to determine the strength of the relationship between labour productivity and economic growth. The results shows that in the period under review the contribution of labour towards growth have declined significantly whilst the economy has become capital intensive. We conclude the study with recommendations for policy makers on what should be done to improve labour productivity and ensure that the economy is driven from capital intensity to labour intensity.

Declaration

I declare that this report is my own, unaided work. It is submitted in partial fulfillment of the requirements of the degree of Master of Management (in the field of Public Policy) in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.

_____

Kgwaridi Buti Manamela
26 April 2017

Dedication

To Iris Towers, and to Sihle and Sibusiso whom we lost in the course of Making Education Fashionable

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Chapter One: Introduction

1.1. Introduction and Background

The correlation between labour productivity and economic growth is assumed almost without question, and in the case of South Africa, labour factors have been cited as significant in maintaining lower levels of growth for the last twenty years. (McCarthy, 2005)

South Africa is a middle-income, developing country that emerged in 1994 from years of economic and political isolation as a result of the policies of apartheid since 1948. These polices imposed various structural constrains on the ability of the economy to grow, yield higher employment and realize an increase in overall productivity levels. The exclusion of the majority of black South Africans from education and skills development is arguably the major cause of high unemployment, poverty and inequality (McCarthy, 2005; Faulkner, Loewald & Makrelov, 2003) that resulted in low productivity and inefficient use of inputs (Bhattacharya & Lowenberg, 2010).

South Africa's history of colonialism and neo-colonialism weighs heavily on the efforts of the current government to deal with these three challenges. Although there are other factors that influence economic growth, due to the long history of apartheid and colonisation, labour factors such as skills, education, wages and morale will play a significant role in influencing the country's economic growth.

The pre-1994 economic crisis was as a result of a dualism of, on the one hand, long period of international isolation and that of an internal structural crises on the other. International isolation resulted in punitive economic measurers that were applied by the international

community to force the apartheid regime to democratize, and therefore denied the country of needed foreign investments and technological progress. The results of the internal structural crises pronounced race-oriented class differences, expressed in terms of wealth and income; a statutory race-based labour division; and the low productivity levels of a large unskilled labour force. These imbalances have necessarily exerted an inhibiting effect on the expansion of economic activity and economic growth (Wessels, 1999).

After the election of a democratic government in 1994, the aim of economic policy as detailed in the Reconstruction and Development Plan (ANC, 1994) was to address the political, social and economic crises posed by the apartheid policies (Du Toit, Ingelzi-Lotz & Van Eyden, 2014). Although we will be focusing on the productivity of the economy since 2000, it is important to note that the South African economy has on average grown at 3,2% a year from 1994-2012 (with a GDP of USD136b in 1994 to a GDP of USD349 billion in 2014) (World Bank, 2015).

By global standards, the economy performed reasonably well for most of the period, which equaled the average for upper-middle-income economies excluding China. From 2008 however South Africa has lagged compared to other middle-income economies since (Presidency, 20 Year Review). This shows that the country benefited heavily from the 'apartheid dividend', although it was below what was initially expected given the euphoria of the international community after the release of Nelson Mandela and the elections (Munck, 1994). This has made it one of the largest economies not only in the continent, but amongst the largest compared to some economies in the Pacific, Latin America and the Caribbean (and lately, Central and Eastern Europe).

The South African economy was not spared from the 2008 global economic crisis, which resulted in a sharp decline in GDP growth and employment levels. Although targets for job creation that were set ten

years earlier by the government's macro-economic policy (GEAR) were still not reached (with the highest being 5,5 in 2007), unemployment was either stagnant or on the decline and have actually reached its lowest levels since 1994 (Heintz, 2002). According to data provided by Statistics South Africa, unemployment reached a high of 31% in 2003 and a low of 20% in 2008, the lowest since 1994.

The major question that arises therefore is whether is there a correlation between the patterns of growth and those of labour productivity, and whether that productivity is derived from an impact by factors such as skills, education, health, poverty, spatial development and the structural issues as imposed by colonization and apartheid. To which extent productivity is growth enhancing?

1.2. Problem Statement

Labour is a major factor in the production process, and therefore a higher labour productivity results in economic growth and consequently an improvement in the quality of life of the majority of the population (Haydam, 2002). The connection between labour productivity and economic growth has presented an interesting conundrum for the South African economy compared to countries such as Malaysia, which experienced growth, both in terms of GDP and employment.

In the aftermath of the global economic crises labour productivity has been on the decline, with South Africa's economy being on a slow recovery mode. There are reasons why this has been the case in South Africa. This has not been a peculiar case as some economies have been on a gradual catch-up since 2008 both in terms of economic growth and labour productivity (OECD, 2011). Germany, Italy and the UK, for instance, have been lagging in terms of productivity compared to the US and China which have shown signs of full recovery (Arnaud et al, 2011).

Similarly, before the 2008 global economic crises, high economic growth rates and labour productivity have not necessarily led to increase in employment. In fact higher labour productivity output has been at the expense of employment (McCarthy, 2005).

McCarthy (2005) further asserts that over the years, South Africa has experienced higher labour productivity and economic growth. However, higher labour productivity levels post-2005 have not necessarily resulted in higher growth and employment. This study is therefore interested in establishing the impact of labour productivity on economic growth from 2000 to 2016.

1.3. Purpose Statement

The purpose of this study is to determine whether there is a relationship between labour productivity and economic growth in South Africa between 2000 and 2016. The findings and recommendations of the study can be used by policy makers to sway the economy towards labour intensity since there has been significant decline in employment after the global economic crises and therefore, a decline in labour productivity and technological progress.

1.4. Research Objectives

We determine whether there is a relationship between labour productivity and economic growth in South Africa between 2000 and 2016.

We also:

- Explain the nature of the relationship;
- Determine the growth potential of the economy if labour productivity is increased; and

- Look into the impact of labour productivity on economic growth, while controlling for factors such as investment growth, growth in employment, fiscal policy, and monetary policy.

We conclude by making recommendations on how South Africa can improve the productivity of labour in order to have a positive impact of economic growth.

1.5. Research Questions

The quantitative research questions (Hypothesis) for this study are:

- H1: There is a relationship between Labour Productivity and Economic Growth in South Africa between 2000 and 2016.
- H2: All economic factors of production have an impact on the growth of the economy

1.6. Significance of this Study

Through its various policies and plans, especially with the recently adopted National Development Plan, South Africa has identified the need for economic growth as crucial to resolve the challenges of inequality, poverty and unemployment. Labour, and its productivity, is said to play a crucial role in this regard. Is this the case? And if so, what are the levers that need to be pushed in order to ensure that the economy grows?

This study will contribute in the economic policy development discourse in relation to understanding what the relationship and contribution of labour productivity is towards economic growth, and fully arm policy makers in ensuring that they change the discourse and broaden their considerations in increasing employment and growing the South African economy. Since there has not been an investigation into the relationship between the two phenomena, in the said period and in South Africa, this study will also contribute into the broader academic knowledge base on the subject.

1.7. Research Method

We use the Quantitative Explanatory Method, specifically the State-Space Model and Ordinary Least Square (OLS) Method to extract the Total Factor Productivity (TFP) and to determine the effects of labour productivity on economic growth in South Africa between 2000—2016. The OLS is more suitable for the analysis than a mere correlation between labour productivity and economic growth rate.

1.8. Limitations of the Study

According to our knowledge, there are no known limitations of the study. However, this study can benefit from a sectoral analysis of productivity instead of a broad investigation.

1.9. Conclusion

South Africa has experienced a slump in economic growth in the course of the global economic crises and is yet to recover. The TFP and capital stock were the main drivers of the potential growth rate in early 2000 and then the contribution of the TFP declined gradually since 2003 and the decline was exacerbated by the Global Financial Crisis (GFC) of 2007-2008, while the contribution of capital stock remained relatively constant during the same period.

Labour contribution to the potential growth has been disappointing since 2000, nevertheless it registered a slight increase following the GFC, and then dropped again as the economy has become more capital intensive. In the period leading to the crisis, labour productivity was in a downward trend, it declined further during the crisis and rebounded in the aftermath of the crisis, and it has been following closely the same pattern as the economic growth rate.

Although most of the EU countries are emerging from the slump caused by the global economic crises, the results have been mixed globally, including those of the productivity of labour. South Africa regards

economic growth as crucial if they are to create employment, fight poverty and deal with the legacy of apartheid, and therefore, labour-led productivity is crucial in this regard.

The period leading to and including the global economic crises is crucial as the country experienced higher growth rates. This research will therefore look at what potential is there for growth in respect to labour productivity, and how the two variables related over the said period. As indicated above, this study is significant as the country experienced a jobless growth for a longer period, and therefore policy interventions may be important to look at what needs to be done.

Chapter Two: Literature Review

2.1. Introduction

The purpose of this section will be to look at what the literature says around the definition of both Labour productivity and economic growth both in the South African context and the global context. We will also explore the measurement of both, and some of the different approaches and challenges that the South African context has with regards to the measurement of labour productivity.

Our survey of the literature will also look at whether is there a relationship between labour productivity and economic growth, and if there is, what is the nature of the relationship and how the one influences the other. We will further look at the various Theories of Economic Growth, and based on their approaches, determine which is best to ensure that labour productivity plays an important role in driving economic growth. We will then conclude with a discussion that summarizes what the literature says.

2.2. Theoretical Issues and Definition of Concepts

2.2.1. What is Labour Productivity?

Labour productivity refers to the labour units used to produce a given output. A country with higher labour productivity tends to experience higher rates of growth and is assumed to be competitive in the global market. Similarly, in the local economy, firms that produce more goods and services using less factor inputs, in this case labour (either in relation to its cost or its quantity), tend to be more competitive in terms of prices as compared to firms whose productive factors cost higher. (McCarthy, 2005)

Simply put, if a firm produces 10 cars in year one using 100 workers, it means that you need 10 workers to produces one car or that your productivity is at 10% (if we are to use total number of workers instead of man-hours). If in year two, the same firm introduces a more efficient production line and other forms of technology such as robotic assembly line, and also reorganizes the workforce to increase labour intensity, and now produces a 1000 cars, this means that the productivity of the firm has increased tenfold. Now we can produce more cars with the same number of labour units, or one worker can now produce 10 cars, meaning an increase in labour productivity.

There are various factors that influences labour productivity. These includes the skills and qualifications of workers, their morale (influenced by their wages, working conditions and attitudes), technological progress, substitution of capital to labour or labour to capital ratio, and how flexible it is to higher or dismiss workers. A single or combination of all these factors can influence labor productivity. For instance, if workers are not satisfied with their wages, through their unions they can go on strike or choose to produce at lower rates in order to get management to meet their demands.

It is therefore important to understand the driving forces behind labour productivity such as the improvement of human capital in the form of health, education and skills, the role of technology and capital accumulation that informs policies that supports economic growth. These policies may include regulations in industries, institutional innovations, government investments programmes in infrastructure and human capital, regulation of the labour market, technology or a combination of all of these (ILO, 2013).

2.2.2. Measurement of Labour Productivity

Total employment vs Total Hours worked

The measurement of labour productivity is the ratio of GDP over one hour of employed labour, or real GDP per worker (Datta, 2011, OECD,

2001). Owyong (2014) notes that because labour statistics are presented in terms of the wage bill paid together with the number of workers and the hours worked, it become easier to measure labour inputs compared to, for instance, capital. We can obtain, for instance, the wage rate by dividing the wage bill with the number of worker of hours worked.

"The number of person-hours is generally a better measure of true labor input than number of workers, since the latter does not reflect changes in the hours worked per worker" (Owyong, 2014).

In some countries, due to pressures in terms of availability of statistical data, the use of output per worker is prevalent (Duarte & Restuccia, 2012). However, measuring labour productivity based on the total workforce employed poses challenges such as double counting as some workers have more than one job, whilst others would work overtime or be absent from work. This will distort the estimates (OECD, 2001, Duarte & Restuccia, 2012).

Wittenberg (2014), using the Statssa Quarterly Labour Force Survey (QLFS), conducted an interesting exercise of measuring labour productivity using the figures of total employment on the one hand, and of total hours worked on the other in the South African labour market. This exercise yielded the same results, leading him to conclude that labour productivity has risen by more than 30% since 2000. According to Duarte and Restuccia (2012), who tracked different countries using the same model, this may not be the case in all instances. In both instances these studies play an important role in understanding labour productivity, particularly for policy makers who have to take these results into consideration

In the case of South Africa, the South African Reserve Bank (SARB) is responsible for the calculation of labour productivity using GDP data from the national accounts and employment figures from Statistics

South Africa's Quarterly Employment Survey (QES). The weakness with using QES is that it provides data from formal employment in the non-agricultural sector only, and is only collected from employers (Mabunda, 2011). This is in contrast to the frequently used (for policy decisions and other labour market related decisions) and relied on Quarterly Labor Force Survey (QLFS) that tracks a larger sample of the population over time and is used for determination of various labour market policy interventions.

A further problem lies with the weight of the input compared to the output, since National Accounts includes all the economic activity of the country when calculating GDP. This distorts the outcomes if we are to use a sample (QES or QLFS) to calculate labour productivity. Although the same methods have been used in Australia, Canada and Mexico, Mabunda (2011) recommends that it may be helpful to set up a labour unit in the National Accounts at Statistics SA so that the input is equal in sample to the output. As indicated before, the generally used measurement is that of total hours worked.

2.2.3. Factors that Drives Labour Productivity

We now turn to look at the factors that drive the increase or decline of the productivity of labour. We will link this discussion with the general principles of the factors and how they have contributed to economic growth in the South African economy.

2.2.3.1. Education and Skills of workers (Human Capital)

When South Africa opened for business in 1994, with massive inflow of foreign capital and technology, large number of workers who were forced from subsistence agriculture economy into the industrialising cities during apartheid, became instantly unskilled as firms mechanized to compete globally. McCarthy (2005) confirms this as South Africa's productivity growth was on the backbone of an increased capital over labour ratio, leading to massive unemployment.

The education system has also impacted negatively on the entrepreneurial urge of the black population as its intention was to provide minimal training that simply created a reproduction of their labour. The main challenge that South Africa's education system faces is the quality of education, and its ability to produce sufficient graduates for the labour market (Bernstein, 2013). It is important to stress that education alone is not going to drive productivity, but the presence of institutions that support workers welfare, proper bankruptcy laws, access to capital and various other factors that supports the initiation and sustenance of the productive process (Chang, 2011).

In addition, South Africa has experienced the loss of skills since 1994 has been detrimental in creating unskilled and semi-skilled work as it has been showed that for every professional employment created, there are three more jobs created as a result (Faulkner et al, 2013). The economy has over the years moved from the labour intensive sectors such as mining, manufacturing and agriculture and now into finance and services as the core of economic activity, which are mainly technological-intensive (Faulkner et al, 2013).

The various democratic reforms at a political level did not rapidly move towards the transformation of the workplace, and therefore some of the racial disparities in wages, rank and general conditions of employment were slow and continues to replicate itself across the labour market (Presidency, MTSF 2014). Poor working conditions and very little prospect of improving skills affects labour productivity, as workers continue to engage in rolling industrial unrests demanding higher wages and better working conditions. For instance, the wage strikes in the platinum sector 2012, one of the longest in the history of South Africa, resulted in the death of 40 workers, and had a huge impact on productivity output that the decline in mining output nearly resulted in a recession in early 2014 (Harvey, 2013 and National Treasury, 2014).

Investment in the education and skilling of workers is one of the critical functions that drive the improvement in productivity of labour. Through this, workers can be accustomed to new forms of organization and easily respond to new technology. The apartheid system excluded the majority of black people from training opportunities, and in cases were this training was offered, its quality was compromised. This was a double edged sword as a lack proper education and under-skilling of black workers meant the abundance of cheap labour that was used to build an economy that was starved of technology due to sanctions, but equally robbed it of a huge generational dividend. (McCarthy, 2005 and Faulkner, et al, 2013).

2.2.3.2. Technological progress

The introduction of new technology is one of the biggest factors in improving labour productivity, and has played a significant role in maintaining economic growth in South Africa post 1994. Haydam (2002) observes the decline in demand for unskilled and semi-skilled labour as a result of the changing global environment and a higher demand for technology as a substitute for labour. As indicated above, prior to 1994, international sanctions have barred access for the country to international investments and technological progress, and thus impeded growth. The advent of democracy led to access to world markets and foreign direct investments, and thus opening up opportunities to take advantage of the technological progress that was available (Roux, 2011).

Using the Solow residual model, or total factor productivity, it has been shown that the relative contribution of technological growth in South Africa has increased over time and has become an important source of output growth during the 2000s compared to capital and labour which have declined. This has been due to significant advances in technological progress (Du Toit, Ingelzi-Lotz & Van Eyden, 2014).

2.2.3.3. Rules and regulations

One of the consistent criticisms of the South African labour market has been the 'rigidity' of labour regulations that were introduced in 1996 and are embedded in legislation and the constitution. The debate regarding labour inflexibility is an extremely contentious matter and has become extremely polarized. Benjamin & Theron (2008) argue that to undo the apartheid legacy it was important to develop a suite of new labour legislation, which was to be the cornerstone of a new labour regulatory regime. Others, such as Haydam (2002), argue that due to the political nature of the trade union movement and its alliance with the ruling party that it uses this influence to further introduce labour inflexibilities. From an economic argument, the higher costs of labour inputs and the constrains associated with replacing unproductive labour, business will opt for capital intensive production in order to increase output. However, Mandel (1962) suggested that no matter the costs associated with labour, it would be illogical for business to replace labour with machines if it does not make profitability, and that the substitution of labour for capitals lies in what is profitable (and practical since some labour processes cannot be simply replaced).

Drawing extensively from the Global Competitiveness Report of the World Economic Forum in 2012/2013, which ranked South Africa 52 out of 144 countries, Nattrass (2014) looks at the labour market sub-index and conclude that South Africa has performed poorly. The Global Competitive Index looked at four measures, that is (i) cooperation in labour-employer relations; (ii) flexibility in wage determination; (iii) pay and productivity and; (iv) hiring and firing practices (see also Bernstein, 2013).

With a focus on the demand side of the South African labour market, Federke (2012) has showed extensively how labour market rigidities have led South Africa to shed more than 5% of its labour force, way out of proportion of the economic downturn. Fedderke (2012) attributes

this to labour market segmentation, participation costs, skills mismatches and a possible high reservation wages. The rapid growth of real wages--which outpaced labour productivity in most sectors--also contributed in the slow recovery of employment and growth post the economic downturn (Klein, 2012).

Due to the highly political nature of the South African workforce, the slow pace of transformation of the workplace and the lack of trust in that space, there are significant number of unionized workers which is a constant concern for investors (Harvey, 2013). The trade union movement played a significant role in reforming the apartheid labour laws that legislated inequality, wage differentials, exploitation and unfair labour practice (Shendy, 2009).

The new Labour Relations Act (1996) is argued by some (van Aardt, 2009; Haydam, 2002; Faulkner, 2013; and Harvey, 2013) as being too rigid and contributing to the absence of labour intensive investments. According to Bhorat & Cheadle (2007), a "more recent analysis of South Africa's labour market rigidity – measured by a combination of employment inflexibility and social protection – indicates therefore an overall level of hiring and firing costs that is low by world and upper middle income country standards. In contrast however, it is clear that in the case of legislative provisions for firing workers and (due to the problems with the measure noted above) less so for hiring provisions, South Africa possesses a particularly high level of rigidity. This is an important value-added to previous research in the area for South Africa, in that it suggests for the first time - at least according to empirical evidence here – where the reported rigidity within the domestic labour market may in fact lie."

It is clear that any form of compromise, or a 'new deal', that would introduce a new labour law regime have to consider factors beyond the economic realm and ensure that the trade unions are taken on board (Bernstein, 2013).

2.2.4. Total Factor Productivity

Total Factor Productivity (TFP) is the portion of output not explained by the amount of inputs used in production. The level of TFP is determined by how efficiently and intensely the inputs are utilised in production, and is usually measured by the Solow Residual. TFP plays a critical role on economic fluctuations, economic growth and cross-country per capita differences (Comin, 2006). If we take our initial example of the production of cars, since there is no mention of an increase in labour or capital units, but there is a significant rise (in tenfold) of productivity, there has to be an explanation of the value of the contribution of technological progress (owing to innovation and Research and Development). This is where TFP comes into place, and has been used widely in the place of the traditional calculations of two-input over the output.

Therefore, the measurement of the main factors driving productivity growth is derived from the standard Cobb-Douglas production function which relates to labour input, capital input and technological progress, that is, the residual which cannot be explained by the quantity and quality of either labour or capital (McCarthy, 2005). This methods take into consideration the fact that capital and labour factors may be influenced by external factors that will change the output, therefore including technological progress gives us a total picture of productivity using the Solow residual, that is, the productivity component that cannot be explained by changes in the quality or quantity of capital or labour (Inglesi-Lotz, Van Eyden, & Toit, 2014).

If we use labour as a single measure of efficiency (taking other factors as constant) would be incomplete because firms can, for instance, boost output per man-hour by investing more in equipping workers with better or more machinery and thus affect its productivity. Thus, 'one of the drawback of labour productivity is that it compares output against only one input. Labour productivity may therefore be raised (or

decline) by simply raising the quantity (or quality) of another input (eg. capital)' (Mohr, 2011). This implies that labour productivity may be reliant on the subjective or objective factors that may or may not be in their control (Mohr, 2011).

Unlike labour and capital intensive productivity, which are partial measures or single input measures of productivity, TFP is a measure of the effect of improvements in the quality of all inputs and in what manner they are used (Datta, 2011). The multifactor productivity helps to disentangle the direct growth contributions of labour, capital, intermediate inputs and technology, thus a superior measure than either labour or capital productivity.

2.3. What is Economic Growth

Economic growth is the increase in the productive capacity of the economy over a longer period, usually annualized, and is expressed as GDP per capita (Mohr, 2011). With the development of technology and statistical capabilities, many countries now even measure the rate of increase in total production on a quarterly basis (Chang, 2014). This increase can be driven by investments in new factories, infrastructure, the working population or labor productivity (through education and training or new technology). Technological progress and development also contributes in economic growth by improving the productivity of capital and labour. In some countries, GDP growth has been through the discovery of new raw materials such as oil (Equatorial Guinea), or the intensity of labour (China). These factors are known to influence economic growth in the long run.

In the short run, the economy can grow as a result of an increase in disposable income of households and firms through interest rates adjustments or wage increases. The volatility of currencies or the prices of commodities (such as oil, gold or platinum as has been the case recently) can also influence economic growth in the short run until such time households and firms adjust their spending patterns to suit the

new conditions (Roux, 2011). In certain cycles, governments are encouraged to either save (during booms) or increase expenditure (in times of bursts) in order to influence economic activity and ensure that there is a stabilization through fiscal policy (Mohr, 2010). Central banks can also use monetary policy to influence prices and therefore influence the confidence of households and firms to either spend or save (Datta, 2011). All of these factors have an influence in the short-run and the long run economic growth.

Economists, such as Chang (2014) and Todaro & Smith (2014), use economic development, which is defined as a process of economic growth that is based on the increase in an economies productive capabilities: its capabilities to organize—and more importantly, transform—its productive activities.

2.3.1. Why countries pursue Economic Growth?

In calculating economic growth, production or income should be measured in real terms (that is, the effects of inflation should be eliminated). The figures used to calculate economic growth should also be adjusted for population growth, and thus be expressed on a per capita basis (Mohr, 2010). Therefore, when we say that the economy is growing we mean that total real production or income is growing faster than the population, which results in real GDP per capita (Fourie, 1997).

The pursuit for sustained economic growth is usually linked to an improvement in the quality of living standards of the population. Therefore, high economic growth is usually associated with higher employment and improved incomes, increased levels of education, health and access to other basic services. This is usually not the case and therefore a closer look at the composition of the output (what is produced) is critical (Fourie, 1997; Mohr, 2010 & Roux, 2011)

Using a country such as Equatorial Guinea, Chang (2014) was able to illustrate that although it has been growing (at 18%) much higher than China (regarded at that time as the fastest growing economy at figures between 7% and 9%), it has been driven by its mineral resource endowment (in oil). Because Equatorial Guinea relied on US companies for the extraction and processing of the oil (resulting in capital flight), it was therefore not employing and developing its productive capacities to drive this growth and therefore had no consequence in the improvement of the living standards of the population. Fourie (1997) also showed that if, for instance, the main driver of economic growth in a country was in military expenditure and production, this will not have the same effect on living standards if, for instance, expenditure was driven by the production of basic consumer goods, housing and medical services. From this we can conclude that the model used to drive economic growth determines what (developmental) outcomes that growth would yield.

2.3.2. Components of Economic Growth

Although economists hold different and sometimes opposing views on how nations should strive towards attaining economic growth, there are common components (or factors of production) that drives economic growth. These are (i) capital accumulation, (ii) population growth that leads to the growth of the labour force and (iii) technological progress (Todaro & Smith, 2014).

Let us look at each in turn.

1. **Capital (accumulation)** refers to all new investments in land, physical equipment, and human resources achieved through improvements of the health, education and skills of the labour force (Todaro & Smith). Mohr (2011), Haydam (2012) and Fourie (2012) however refer to capital as goods that are produced to produce other goods and services, and gives as examples of these machines, tools and buildings. In their

definition, they classify land as a natural resource (and a separate factor/component of production) and include mineral resources, water, arable land, vegetation and natural resources whose supply is fixed. We include natural resources here as part of capital mainly because in the calculations and measurements we use later, they are defined and included as such. Moreover, due to technological progress (which we discuss below), it is possible to manipulate natural resources such as land and mineral resources in abundance as is the case in North Korea where they manufacture synthetic fibre from limestone (Chang, 2014). Investments (and savings) are a critical element in economic growth, as the building of infrastructure such as roads and railways (fixed capital, or gross capital formation) facilitates and unlock other economic activities (Roux, 2011)

2. **Labour** refers to the human mental and physical effort exerted in the production of goods and services with a view of attaining reward in the form of wages (Mohr, 2010). Labour can be defined both in terms of its quality and quantity. Its quantity depends on the size of the population and its willingness and ability to work. Therefore, the growth in population and its dynamics has a consequence on the composition of the labour force, and consequently, on labour productivity (Smith & Todaro, 2014). The quality of labour refers to its skill, knowledge and the health of the workers. This requires investment through education and various other socio-economic functions of the state. All of these factors determine the extent of the productivity of labour, or human capital (Haydam, 2002).
3. **Technological progress** is not usually referred to by traditional economists but is an important factor in the production process and in economic growth, and has been used in growth accounting to explain the productivity components that cannot explain the changes in quality or quantity of capital or labour. Since Adam Smith's 'Wealth of Nation', technology has made a

significant contribution as a source of economic growth and improving productivity of the other factors. It has contributed immensely in reducing the time of producing goods, their quality and the turn-around quantity (Chang, 2014). Todaro & Smith (2014) identifies three forms of technological development or progress, which are (i) neutral technological progress, (ii) capital saving technological progress and (iii) labour-saving technological progress. The first refers to higher outputs with the same combination of labour and capital. The second refers to a higher output with the same quantity of labour, and may refer to technology such as Internet, computers, tractors and ploughs. The third, which is rare and occurs mainly in highly developed economies whose objective is capital accumulation, and thus uses the same quantity of capital input to achieve higher outputs. In countries such as South Africa, where there were long periods of jobless growth, there has been significant technological progress that is capital intensive and has been at the expense of labour, that is, jobless growth (Roux, 2011)

2.4. Classical theories of Economic Growth

Since the 18th century thinkers such as David Ricardo, Adam Smith and Karl Marx up to the current period have theorized extensively about the economy, its growth and how different economic actors influence economic activity. Some of these theories are opposed to each other, whilst others have complemented each other and some have informed the development of others. For instance, Smith and Marx have been known to be on the opposing side of economic systems, with the former having inspired the system of capitalism whilst the latter championed the socialist system (Haydam, 2012).

Adam Smith's popular work, "The Wealth of Nations", focused on the market and placed labour productivity at the centre of economic growth by improving work organization (Chang, 2014). By engineering

the 'division of labour', Smith focused on improving the dexterity of workers; which would lead to saving time and therefore more output; and has resulted in the development of machinery. In this regard, he saw competition as creating the basis for private sector investments guided by the 'invisible hand', and that this would lead to economic growth (Salvadori, 2003).

Karl Marx, however, argued that the rate of growth depends on the general rate of profit and the propensity to accumulate. Marx argued in his voluminous popular work, Capital, and after studying the conditions under which the system is capable of reproducing itself; that the expansion of the economy at an endogenously determined rate is possible. His conclusion was that the aim and compelling motive of capitalists' production is 'the snatching of surplus-value and its capitalization, that is, accumulation' (Salvadori, 2003). This is as opposed to Smith's accumulation in the national interest, and automatic reinvestment into wages, rent and the production cycle.

Informed by this, what are the different theories and models of economic growth? The classical theories of economic development have been dominated by four major and sometimes competing strands of thought: (1) the linear-stages-of-growth model, (2) theories and patterns of structural change, (3) the international-dependence revolution, and (4) the neo-classical, free market counterrevolution (Todoro & Smith, 2014).

Lets us look at each in turn.

2.4.1. The Linear Stages of Growth Models

Immediately after World War II, and with the experience of the Marshall Plan which led to faster economic growth in the period between the two world wars, economists were now faced with the challenge of focusing on poorer nations. The two famous models that emerged from this period are the Rostow's Stages Growth Model

(associated with American economic historian, Walt. W Rostow) and the Harrod–Domar model (Todaro & Smith 2014).

Rostow (1960) viewed the process of development as a sequence of historical steps or stages (the traditional society, the preconditions for take-off, the take-off, the drive to maturity, and the age of mass consumption) in which all countries should proceed. Building on the historical pattern of the then developed countries and from the successes of the Marshall Plan, Rostow (1990) claimed that these models could be repeated in developing and under-developed countries. Rostow's emphases were on increasing the national rate of investments and considered it to be necessary to induce per-capita growth (Todaro & Smith, 2014).

The Harrod–Domar Model suggests that for an economy to grow, it should be able to mobilise national savings and drive the productivity of capital (known as the capital-output ratio). This growth model is dependent of the efficient use of capital in order to generate a higher output, and the inverse applied. This means that every country should therefore mobilise capital to generate investments. The principal strategies of development from the stage approach were commonly used by developing countries in the early post-war years. With a target growth rate, the required saving rate can then be known. If domestic savings were not sufficient, foreign savings would be mobilized.

Critiques of the Harrod-Domar Model insist that the model could not be applied to low income countries as increasing savings was not easy because disposable income was mainly used for consumption. Solow (1994) dismissed this model as an oversimplification of complex factors that contributes into economic growth, including labor productivity and technological progress. Labeling it the 'Harrod-Domar Impulse', Solow (1994) further exposed the limitation of the model in encouraging investments in capital-intensive investments with the hope that labour would migrate from the rural economy into the industrial one as

ridiculous because were it possible, not only would developing countries have applied it long ago, but developed countries would have followed the model repeatedly.

Many developing countries lacked the financial institutions and policies to allow savings by households to be borrowed by firms, experienced gross under-funding of Research and Development (R&D), weaknesses in human capital; and no access to foreign capital are some of the impeding factors for developing economies (Smith & Todaro, 2014). South Africa's Gear policy was premised on this model, which prescribed national savings by privatizing state assets and instituted cuts in social spending but failed to redistribute the income and create employment commensurate to the economic growth (Schneider, 2003). Although labour productivity grew at 1.6% in the period 1994-2008 and 1.5% between 2008-2012 (OECD, 2013), this was at the expense of employment as showed by McCarthy (2005).

2.4.2. Structural Change Theory

This theory postulates that under-developed countries can transform their domestic economies from a traditional subsistence agriculture economy to a more modern, urbanized and industrially diverse manufacturing and services economy (Smith & Todaro and Lin & Bank, 2012).

Proponents of the structural change theory such as Arthur Lewis argues that this can be done by reallocating 'surplus labour' from the rural agriculture into the urbanised industrial economy. This assumed that there is no loss of output in the transformation from rural agriculture to urban industrialization, and that there is full-employment and higher output in the industrializing urban centres (Ranis, 2004). The basic assumption here is that labour transfer and job creation will lead to an increase rate of capital accumulation, and that reinvestment is guaranteed and will be in labour intensive sectors (Smith & Todaro, 2014). This did not take into consideration capital flight and

mechanization, which became predominant, features of late industrialization. It also assumed the availability of employment in urban or modern economies and surplus labour in rural agricultural subsistence and guaranteed and constant real wages. This model encouraged urbanization and thus high levels of urban unemployment and poverty (Smith & Todaro).

This model also presumably led to structural changes in all economic functions, including in production, consumption, international trade, urbanization and population growth (policies and approaches). There are obviously domestic constrains that were there in developing countries that are absent in underdeveloped countries, such as their policies, state capacities and institutions, resource endowment (human and natural), and external constrains such as access to foreign capital, technology and trade. Countries such as China, Brazil, Chile, India, Korea, Malaysia, Mauritius, Singapore; however, developed greatly at the back of this model (Chang, 2003 and Lin & Bank, 2012).

2.4.3. Dependency Theory

The Dependency Theory can be divided into three categories, which are the Neo-Colonial Dependency Model, False Paradigm Model and the Dualistic Development Model. All of them are rooted in Marxist theory of growth and development (Smith & Todaro, 2014). The neo-colonial model asserts that the dominant rich nations have developed at the expense of the poor under-developed and based on historical evolution. There unequal power relations between the developed centre and the under-developed periphery, with major constrains towards self-reliance and independence in pursuing development (Prebisch, 1982). The rich north have asserted their global dominance through influence and capture of the IMF and the World Bank, and that through capitalistic power relations, continues to under-develop the rest through extraction of minerals.

The False Paradigm Model relies on a compradorial class or groups that are co-opted by the north in order to pursue its agenda of dominance by pushing for Western models that focus on (i) measuring capital to output ratio, (ii) pursues and encourages savings and investments ratios at the expense of social spending on education, health and other basic necessities, and (iii) wholesale privatization of state owned enterprises and the deregulation of the market (Wood, 1984). These ideas are pursued through expert advise linked to donor agencies and development assistance agents that offers complex and yet misleading models of growth that have not worked in the under-developed world.

The Dualistic-Development thesis asserts the perpetual co-existence of superior and inferior conditions, rich and poor and also powerful and weak geo-politics that favours the north. This maintains the power relation of the centre and the periphery, dominated by the developed nations over the under-developed ones and maintains a bi-polar world (Smith, 1981). They pursue a stronger role for the state, nationalization and governmentalisation of growth and development.

2.4.4. Neo-Classical Theory (Free Market Fundamentalism)

The neo-classical growth theory, also known as market fundamentalism, is linked to the ascendency of conservative governments in the US, Canada, Britain and West Germany and united by their front of fighting the 'evil' of communism in the Soviet Union during the Cold War (Smith & Todaro, 2014). They favoured the supply-side macro-economic policies, privatization of public corporations and called for free market as opposed to public ownership, state and centralized planning and government regulation (which they strongly believed slows growth and development) using their influence and control of the IMF and the World Bank (known as 'The Washington Consensus) (Stiglitz, 2008), they imposed Structural Adjustment Programmes on the developing and under-developed world arguing that these will lead to competitive free markets. Central to this theory is

minimal state intervention, privatization of State Owned Entreprises, the promotion of free trade and exports, the opening of their markets for foreign investors at unfair trade terms (pushing tariffs down in exchange for development aid) and the elimination of government regulations as a means to stimulate growth and economic efficiency (Smith & Todaro, 2014). They opposed the notion that underdevelopment is externally induced, arguing that it is the internal actions of governments such as corruption and centralized planning and intervention that led to under development and growth stagnation (Canova, 2008).

This approach to economic growth has led to the further under-development of third-world countries as they were trapped in foreign debt, unregulated financial institutions that led to the 2008 global economic crisis (Stiglitz, 2008), curtailing the role of governments in stimulating growth and thus surrendering the provision of basic needs such as education and health to the whims of the markets (Canova, 2008) and essentially pushed developing nations to be dependent on development aid and budgetary support. Because a lot of developing nations had not developed their productive capacity, whether private or public, and did not have the institutions and policies that catapulted the developed nations to the top, their dependence deepened on external intervention and capacity to drive economic growth was robbed from them (Chang, 2001). This had serious implications for labour productivity, as emphasis has been on capital-driven and technology-reliant productivity, pushing developing worlds to replace human capital with machinery in pursuit of profits. There is consensus that the minimalist role of the governments that market fundamentalist imposed on the under-developed South was a recipe for disaster, with proponents of this theory being the one's advocating for state intervention coining phrases such as 'too big to fail' as they motivated for national banks to save financial institutions (Galbraith, 2008; Stiglitz, 2008; Smith & Todaro, 2014 and Chang, 2001).

2.5. Analysis and Conclusion

From the above, it is clear that due to its history of apartheid, South Africa had to take into consideration the mass of unemployed labour that was excluded from economic participation through poor quality of education, health care and entrepreneurial activity. Through decades of dispossession and forced removal from their subsistence agricultural economy to the industrial centres, most South Africans still follow this pattern of urban migration as their access to land, and the ability to till the land, was destabilized by the apartheid form of accumulation which relied on cheap supplies of labour, especially in agriculture and mining (Lipton, 1986).

The unequal wage dispensation, job-reservations and a racialised workplace (which technically remains a feature of the post-apartheid workplace) (Schneider, 2003) could not satisfy all the preconditions of the Structural Change Theory of growth as the growing army of labour remained in reserves, or could not be utilized optimally and efficiently due to their exclusion from education and skills development (McCarthy, 2005).

South Africa's pursuance of neo-liberal policies after 1994, with a mixture of welfare interventions that were led by the newly elected ANC government, further entrenched the apartheid structure of accumulation. By submitting to pressures from the IMF and the World Bank, and through the adoption of Gear, the newly elected ANC government compromised state expenditure on quality education and skills development in favour of reducing the external deficit and allowing for the marketization of these basic services. State corporations which were central to driving growth through labour intensive approaches were privatized or mostly corporatised and pursued positive balance sheets as opposed to investment in infrastructure such as transport, electricity, water, access to land and the integration of communities (Schneider, 2003 and Carmody, 2002).

Given its emergence from apartheid, South Africa was supposed to pursue a labor-intensive economic growth as opposed to capital-intensive growth. This was compromised by continued policy differences within the alliance of the ANC, SACP and COSATU on the one hand (Nattrass, 2001), and an internal and external 'compradorial' push for pursuance of business friendly neo-liberal policies that favoured less state and more profits. For such a policy to be pursued, it has to be both a political and an economic consensus driven by government and agreed to by business and labour (Harvey, 2013 and Nattrass, 2011).

The shift in capital-intensive productivity and the greater drive for technological progress resulted in a reduction in labour through retrenchments as millions of workers were pushed into starvation wages or unemployment. This was enabled by South Africa's access to Foreign Direct Investments and technology after the 1994 democratic elections, and as part of that coupled with a drive for capital investment and savings led to economic growth that shed labour.

Clearly, any consolidated strategy to drive economic growth through labour productivity has to be borne on the reality that South Africa is currently in need of an employment-intensive strategy, and therefore a growth model that takes into consideration the need to increase labour-intensity is apt and yet at the same time ensuring improved labour productivity. Most, if not all of the dominant growth theories and models explored here on their own will not work in the South African context. Therefore a mixture of state-led infrastructure programme, attraction of labor-intensive investments, support for small businesses, the improvement of the quality of education and health are some of the mixture of interventions that has to be introduced.

Chapter Three: Research Methodology

3.1. Introduction

This study adopts a quantitative method suitable in estimating the relationship between labour productivity and the economic growth rate. We first analyse the impact of TFP on the potential growth rate of the South African economy from 2000 to 2016, based on the Cobb-Douglas framework, estimated with a State-Space model. We then use an Ordinary Least Square (OLS) technique to estimate the impact of labour productivity on economic growth rate. This technique entails causality, which moves from an independent variable to a dependent variable. It is robust than mere correlation as it implies a cause-and-effect hypothesis between two or more variables. It is worth mentioning that correlation between two or more economic variables does not necessarily imply causality.

The remainder of the chapter is divided as follows. We first discuss the mathematical representation of the State-Space model used to extract the TFP, and then we discuss the OLS representation of the growth model. Section 3.3 describes the data used, their source, and transformation. It also includes a graphical analysis of the variables included in the growth model. Section 3.4 contains the empirical analysis of components of potential growth rate and the effects of productivity growth on the economic growth rate.

3.2. Mathematical Representation of the Potential Growth and the Economic Growth Rate

This study uses the Cobb-Douglas production function, like Anvari, Ehlers, and Steinbach (2014), to estimate total factor productivity (TFP) for South Africa. The Cobb-Douglas is represented as follows

$$Y_t = A_t L_t^{\alpha} K_t^{1-\alpha} \tag{1}$$

where Y_t is the output, A_t is the TFP, L_t is labour, K_t is the capital stock, and α is the labour share in output. All variables are estimated at their potential level, which is a challenging task on its own. Note that the TFP is estimated as the residual of the Cobb-Douglas model. It is therefore clear from equation (1) that we can derive A_t from Y_t, L_t, and K_t.

We follow closely Borio, Disyatat, and Juselius (2013) and Anvari, Ehlers, and Steinbach (2014) and estimate the potential output based multivariate filter instead of just using the popular Hodrick and Prescott (1997) filter. Assume y_t^r is the natural logarithm of the real gross domestic product (GDP) and y_t the natural logarithm of trend GDP (i.e. Y_t). y_t^r can be expressed as the sum of the trend y_t and the cyclical component of the real GDP as follows

$$y_t^r = y_t + (y_t^r - y_t) \tag{2}$$

where $(y_t^r - y_t)$ is the cyclical component of y_t^r. Assume y_t follows a second-order Markov process such as

$$\Delta y_t = \Delta y_{t-1} + \varepsilon_t \tag{3}$$

where ε_t is normally distributed with zero mean and constant variance ($\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$), and Δ represents the first difference, i.e. $\Delta y_t = y_t - y_{t-1}$. It suggests that the trend, y_t, follows a random walk

process, and can be estimated using a state-space model with unobserved component where equation (3) is the state equation and the measurement equation is

$$y_t^r - y_t = \varepsilon_t^c \tag{4}$$

where ε_t^c follows a normal distribution with zero mean and constant variance ($\varepsilon_t^c \sim N(0, \sigma_{\varepsilon^c}^2)$). It is worth mentioning that the smoothing parameter $\lambda = \sigma_{\varepsilon^c}^2/\sigma_{\varepsilon}^2$ is the noise to signal ratio which determines the relative variability of the estimated potential output. A larger value suggests that potential output follows a linear trend, whereas a small value means that potential output follows closely the actual output. Hodrick and Prescott (1997) set $\lambda = 1600$ for quarterly data.
Borio, Disyatat, and Juselius (2013) and Anvari, Ehlers, and Steinbach (2014) augment equation (4) with other variables, which yield to the following estimation

$$y_t^r - y_t = \gamma' X_t + \varepsilon_t^c \tag{5}$$

where X_t is a vector of other explanatory variables and possibly lagged of the dependent variable, and γ is a vector of coefficients of explanatory variables. In this instance X_t includes the one period lagged of dependent variable, the credit growth, the growth rate of house prices, and the capacity utilisation.

Using natural logarithm in both side of equation (1) yields the following expression

$$y_t = a_t + \alpha l_t + (1 - \alpha) k_t + \epsilon_t \tag{6}$$

where small letters represent respectively natural logarithms of output, labour, and capital. ϵ_t is the stochastic error term which independently, identically, and normally distributed with zero mean and constant

variance ($\epsilon_t \sim N(0, \sigma_\epsilon^2)$). Given that growth tends to be smooth and that South Africa is an open economy, equation (7) is better estimated as follows

$$y_t = \rho y_{t-1} + \alpha_1 l_t + \alpha_2 i_t + \alpha_3 lp_t + \alpha_4 \pi_t + \alpha_5 g_t + \alpha_6 op_t + \epsilon_t \quad (7)$$

where y_t is the annual growth rate of real GDP, l_t is the annual employment rate, i_t is the annual growth rate of the gross capital formation, lp_t is the labour productivity, π_t is the annual headline inflation rate, g_t is the government expenditure to GDP ratio, and op_t is the trade to GDP ratio, expressed as the sum of imports and exports to GDP. The paper uses equation (7) to assess the impact of the productivity growth on the economic growth rate.

We estimate equation (7) using the OLS method. The dependent variable is the economic growth rate. The choice of explanatory variables is informed by economic theory, such the endogenous growth model. According to the theory, economic growth depends largely on labour and investment. We control for monetary policy by including inflation rate, whereas the use of government expenditure to GDP represent fiscal policy. Finally, since South Africa is a small open economy, trade is key driver of economic growth. The lagged dependent variable, y_{t-1}, accounts for the dynamic in the economic growth rate. It means that the economic growth changes smoothly from one period to the other. Hence, we assess the impact of labour productivity on economic growth rate while controlling for all key forces explaining the dynamic in the economic growth.

According to economic theory, we expect α_1 and α_2 to be positive, whereas the sign of α_5 and α_6 is not predetermined in advance. Government expenditure can be growth enhancing or it can also be detrimental to growth, depending on its focus. For example, if the government expenditure is directed toward infrastructure building, it will benefit the economy in the long run. But when the government

expenditure is mainly geared toward government wages, like in South Africa, it is detrimental to long run economic growth. The relationship between inflation and economic growth rate is expected to be negative, which implies α_4 should be negative.

Since equation (7) is estimated using data, the OLS regression is a statistical technique. It means that the estimated coefficients depict the average relationship between each explanatory variable and the dependent variable while assuming other factors are kept constant. Importantly, the variables included do not represent all variables that explain the economic growth rate, but they are the most important factors. Hence, the negligible factors are represented by the stochastic error term, ϵ_t. It implies that ϵ_t is on average zero and it is random. The relationship between explanatory variables and the dependent variables is validated by a statistical test, in this case, the t-statistics. Assume that α_1 is statistically significant at 1% level, it means that we have more evidence that the relationship between labour and economic growth does exist. In this case we are more interested in the sign and the significance of α_3, i.e. the relationship between labour productivity and the economic growth rate.

Finally, equation (7) should comply with some econometric assumption. First, it entails that all variables are stationary, which means that they are integrated of order zero. Second, in order to use the t-statistic, we assume that the error term follows a normal distribution. However, even if this assumption is violated, when using a large sample, we can approach a normal distribution. Third, we assume a weak linear relationship between explanatory variables. A violation of this assumption will render one or more explanatory variables statistically insignificant as it will be impossible to keep some variables constant when assessing the impact of each variable on the dependent variable. Fourth, the OLS entails that the error is not autocorrelated. It means there is no relationship between error terms of two consecutive periods. The presence of autocorrelation implies that the model is

missing one or more important explanatory variables. Finally, the OLS regression entails that the err0r term has a constant variance.

3.3. Data Sources

For the estimation of potential GDP as stipulated in equation (5), we use the real GDP, the capacity utilisation in the manufacturing sector, obtained from Statistics South Africa (StatsSA), the credit extended to the private sector, obtained from the South African Reserve Bank (SARB), and house price growth, obtained from ABSA Bank. For labour productivity and capital stock we use figures obtained from StatsSA from the period 2000Q1 to 2016Q2.

Then the estimated potential output is used in equation (1) to derive the TFP. We use quarterly data from 2000Q1 to 2016Q2. Equation (1) assumes a constant returns-to-scale Cobb-Douglas function and includes capital stock and employment. We use the Solow-residual to estimate the Total Factor Productivity.

To estimate equation (7), we use quarterly data obtained from the SARB and StatssA covering the 2000Q1 to 2016Q2. The selection of the sample size is informed by the adoption of the Inflation Targeting policy as the new monetary policy framework for South Africa. The sample size also represent the period just before and just after the global economic crises which will give us a better picture of labour productivity within that period. As we have showed in the literature, the economic crises hit around 2008, and most countries were 'regarded' as recovering from 2010 onwards. Note that inflation rate and government expenditure to GDP ratio represents monetary policy and fiscal policy, respectively.

It is worth mentioning that all variables are stationary based on the DF-GLS and the KPPS tests. [1]

3.4. Ethical Considerations

We have complied with all the ethical considerations as prescribed by Brink et al (2012) in respect to this research. We affirm that no human participants were involved, and that we relied mainly on secondary data for the conducting of this research. We carried out this research competently, rigorously and methodologically soundly. We have received no financial resources in respect of this research. All those who have made a contribution and offered guidance were acknowledged fairly at the beginning of the research. More importantly, we have ensured that the results are communicated fairly and accurately without interference and bias of the researcher.

3.5. Conclusion

In this section, we have showed how using a quantitative method suitable in estimating relationships between labour and economic growth rate will help us analyse the impact of TFP, labour and capital on potential output. We have showed how, through the Cobb-Douglas production function, we estimate TFP for South Africa. We have discussed the mathematical representation of the State-Space Model used to extract the TFP, and also the OLS representation of the growth model. We have also showed how we received our data, and ensured that it is not compromised. We have also showed, through the application of the data on equation (7), that the relationship between the explanatory variables and the dependent variable is validated. We end the Chapter by discussing ethical issues which the study followed.

[1] See Table A.1 in the appendix.

Chapter Four: Presentation of Results

4.1. Introduction

In this Chapter, we present the results for the study, starting with the descriptive statistics which will include showing the standard deviation and the normal distribution curve of the data. We will show the correlation coefficient. We will also show through graphs the relationship between the dependent variable (economic growth), the independent variable (labour productivity) and the control variables. The results section will also show how each of the factors of production have an impact on the potential output. We will then conclude the chapter with a growth model to show the significance of each of the variable towards economic growth.

4.2. Descriptive Statistics

Table 1 displays the descriptive statistics of the dependent variable, the economic growth rate, and all explanatory variables. From the table, we can see that the economy has an average growth rate of 3.03%. However, this mean hides recent performance of the economy since the GFC. The economy has been struggling and it can hardly perform above 2%. Similarly growth in labour productivity and investment can hardly reach their averages of 2.03% and 5.50% in the post-crisis period. On average employment has been disappointing, with a negative growth of -0.19. It suggests that on average the economy has shed employment more than it has created. It has been a serious challenge for policymakers since the down of democracy.

Table 1: Descriptive statistics

	Growth	Lab prod	Invest	Empl	Inflation	Gov exp	Trade op
Mean	3.03	2.30	5.50	-0.19	5.31	19.41	57.84
Median	3.09	2.13	5.06	-0.31	5.34	19.11	58.18
Maximum	6.07	6.17	16.19	4.44	8.43	20.62	65.13
Minimum	-2.23	-1.05	-13.74	-4.30	2.55	18.08	51.64
Std. Dev.	1.90	1.55	6.53	1.98	1.41	0.88	3.57
Skewness	-0.70	0.46	-0.57	0.23	0.08	-0.02	0.12
Kurtosis	3.42	2.96	3.05	2.75	2.32	1.38	2.07
Jarque-Bera	5.88	2.31	3.58	0.78	1.34	7.20	2.52
Probability	0.05	0.32	0.17	0.68	0.51	0.03	0.28
Sum	200.10	151.88	362.77	-12.57	350.63	1281.02	3817.38
Sum Sq. Dev.	233.61	156.00	2773.66	253.68	129.34	50.29	829.82
Observations	66	66	66	66	66	66	66

Importantly, inflation has been anchored below the upper bound of the official target band, at 5.31%. It suggests monetary policy authority has been successful in maintaining inflation within the set objective. But the average inflation portrays a wrong picture in that before the crisis inflation was outside of the target range for about two years. From Table 1, it is also clear that all of the variables except investment and trade openness, exhibit moderate volatility, with standard deviations below 2. Finally, besides the government expenditure, the variables follow a normal distribution, with the p-values of the Jarque-Bera statistics above the 5% threshold.

4.3. Relationship between Economic Growth and other Variable

From Table 2, it is evident that there is a positive and strong relationship between the economic growth rate and the growth in investment, with the correlation coefficient of about 71%. It is followed by the correlation between economic growth rate and labour productivity and trade openness, with the correlation coefficient of

32% and 27%, respectively. However, employment depicts a low correlation with the economic growth rate, which points to the evidence of job-less growth in South Africa.

Table 2: Correlation coefficients

	Growth	Lab prod	Invest	Empl	Inflation	Gov exp	Trade op
Growth	1						
Lab prod	0.321	1					
Invest	0.706	0.000	1				
Empl	0.059	0.671	-0.173	1			
Inflation	-0.503	0.227	-0.246	0.056	1		
Gov exp	-0.624	-0.538	-0.490	0.008	-0.198	1	
Trade op	0.271	-0.382	0.424	-0.078	-0.467	0.178	1

Inflation and government expenditure portray a negative and relatively strong relationship, with correlation coefficients of -50% and -62%, respectively. The negative relationship between inflation and growth is consistent with economic theory, whereas the negative relationship between government expenditure and growth can be attributed to many factors. For example, if the government expenditure is focused on less productive sectors such as government wages, it is not going to bring about growth. Similarly, the negative relationship emerges when the government uses countercyclical fiscal policy. However, it is worth mentioning that the correlation between variables does not capture lead-lag relationship which prevails in macroeconomics. Specifically, it does not account for dynamic relationship.

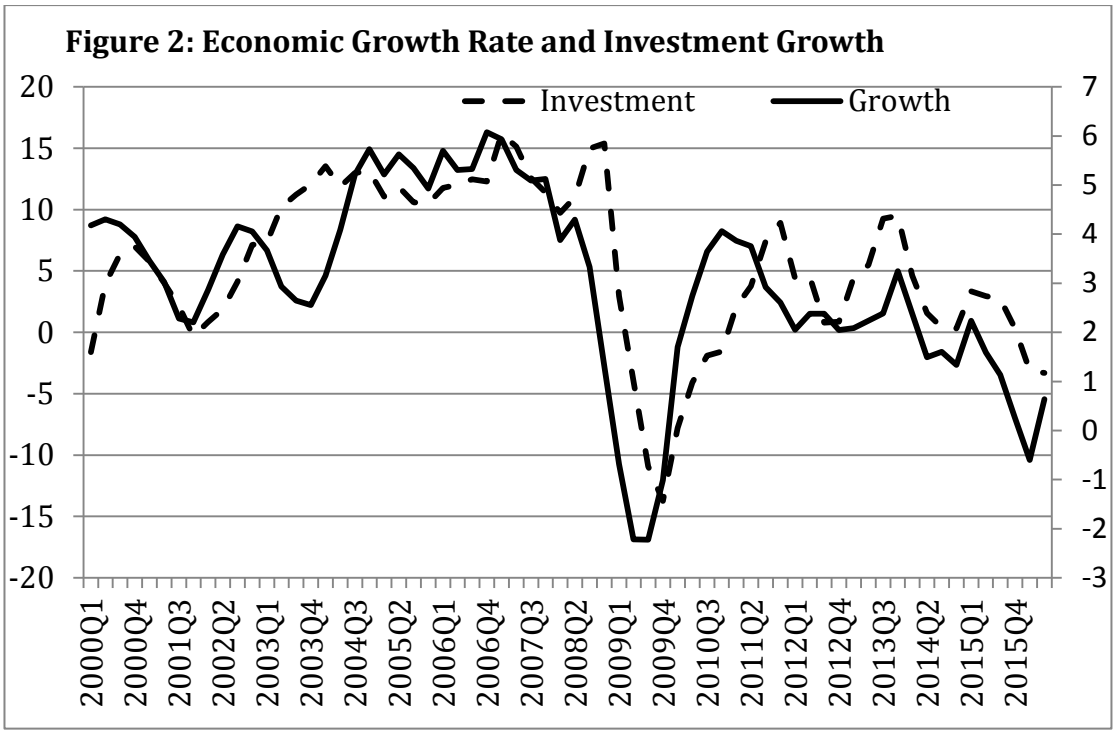
Graphical representations as depicted in figures below address somehow this issue. Interestingly, besides a relatively strong relationship between employment and labour productivity, explanatory variables are not strongly correlated. It suggests that we cannot expect multicollinearity when estimating equation (7).

Figure 1: Economic Growht Rate and Labour Productive Growth



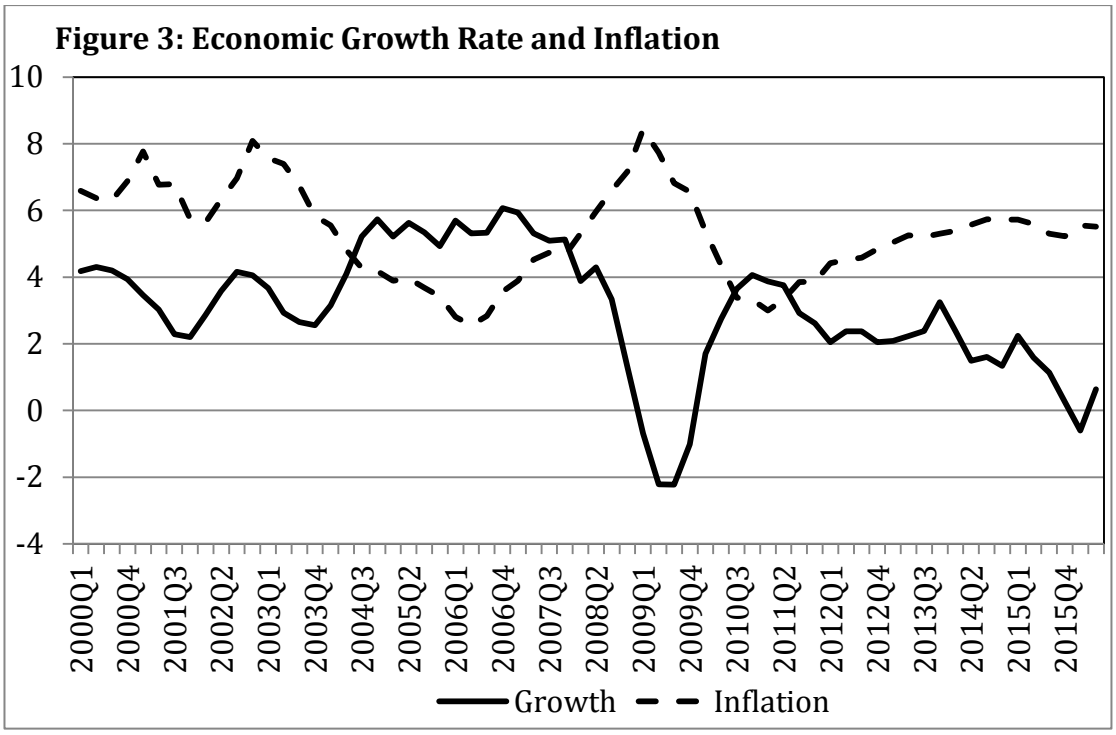
Source: *Calculated from SARB Data www.resbank.gov.za*

Figure 1 depicts the relationship between the economic growth rate and the annual growth in labour productivity. It is clear from the figure that labour productivity mimics closely the pattern in the economic growth rate. It is a lead-lag relationship, with the labour productivity leading the economic growth throughout the sample, expect from 2012 where the two series show a contemporaneous co-movement. From the graphical representation we can infer that the recent decline in the performance of the South African economic can be attributed to the slowdown in labour productivity.



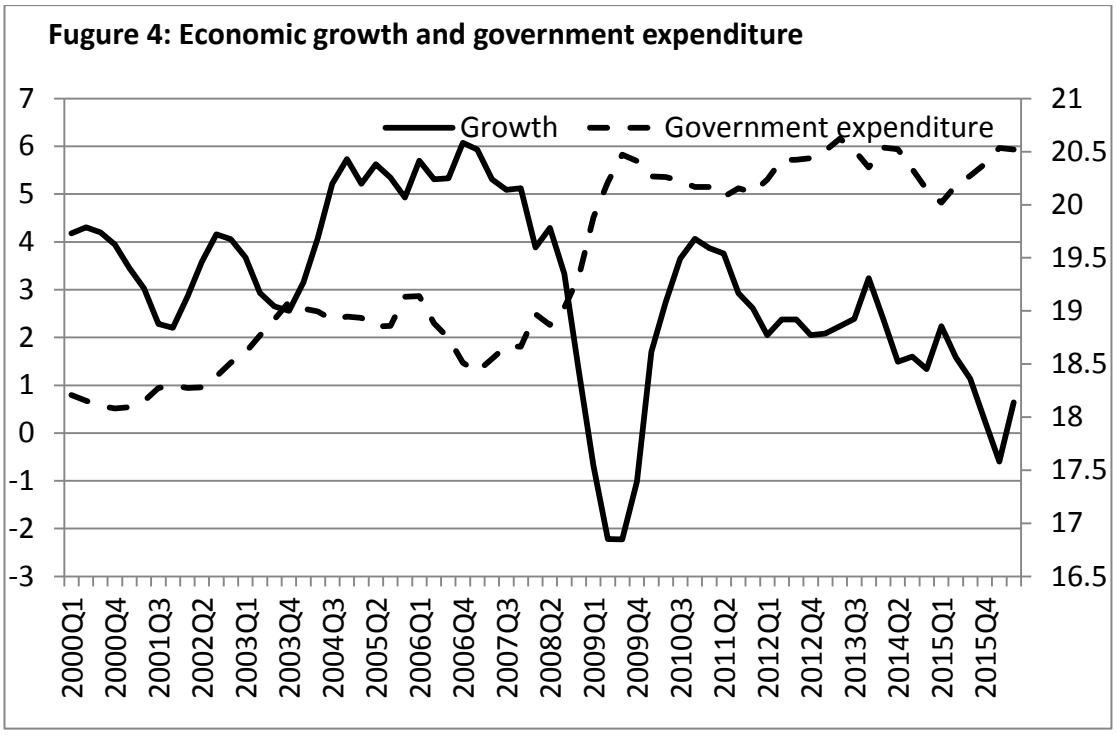
Source: *Calculated from SARB Data www.resbank.gov.za*

Figure 2 shows the economic growth rate together with the annual growth in investment. Interestingly, the two series show a strong co-movement from the beginning of the sample until the end. We can infer that investment is growth enhancing. Note that investment tends to lag the economic growth from 2008 to 2012. It means that the GFC affected the economic activity first and then the impact was translated to slow down of investment because of lack of demand. The contemporaneous relationship re-emerges again from 2013 until the end of the sample. Unlike the productivity, investment was the main driver of the economic performance during the high-growth period of 2003-2007. Interestingly, it also contributes somewhat to the slowdown of the economy in the aftermath of the GFC.



Source: *Calculated from SARB Data www.resbank.gov.za*

Figure 3 depicts the relationship between the economic growth rate and the annual inflation rate. It is evident from the representation that the two variables are negatively correlated. Periods of low economic growth from 2000 to 2003 were mirrored by high inflation rate. Conversely period of low inflation, such as 2003 to 2007, the economy witnessed its better performance ever, with the average growth rate of 5%. Then the crisis pushed the economy into recession and at the same time high oil and food prices put high pressure of prices, with inflation reaching the peak of 8% before a sharp drop after the GFC. Most recently, the economy has been struggling to return to its pre-crisis performance, while inflation remains relatively high at around 6%.

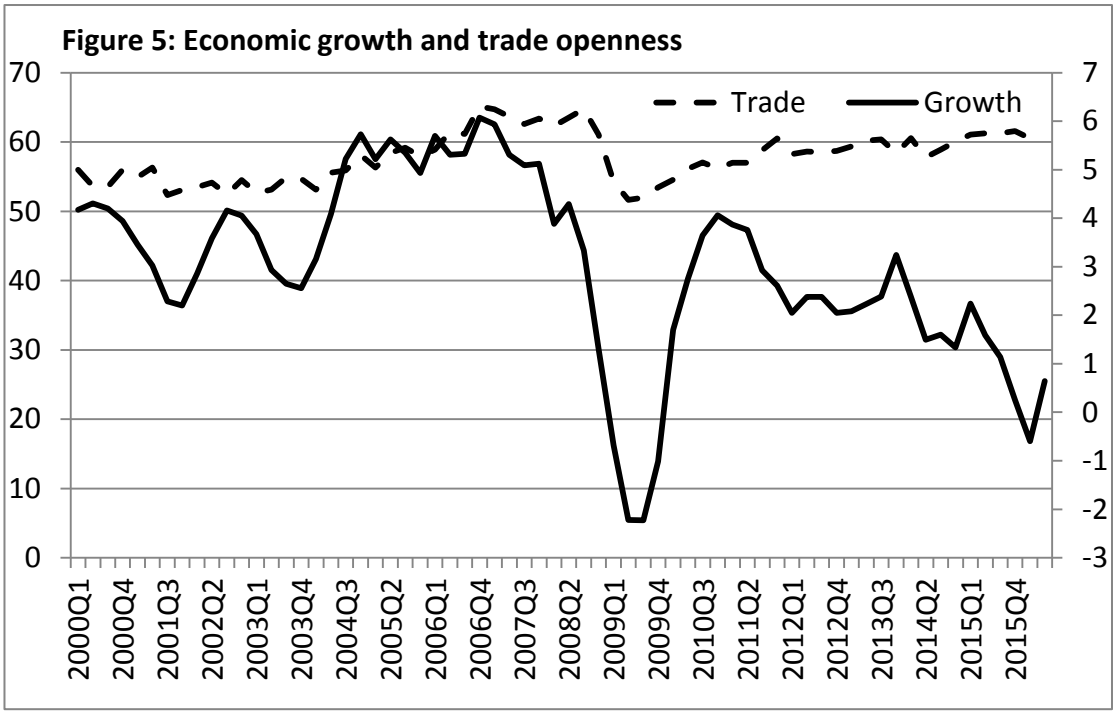


Source: *Calculated from SARB Data www.resbank.gov.za*

The negative relationship between the economic growth rate and government expenditure to GDP ratio is clear in Figure 4. It seems an increase in expenditure to GDP ratio occurs when the economy is weak and vice-versa. For example, the sharp decline in the economic growth rate following the recent GFC is mirrored with a significant increase in the government expenditure. It is consistent with countercyclical fiscal policy followed by the government to address negative effects of the crisis.

Figure 5 shows the relationship between the economic growth rate and the trade to GDP ratio. There is little evidence of a clear relationship between the two variables. From the beginning of the sample, a rise in trade is followed by a better performance of the economy, especially the period before the GFC. Similarly, the variables were heavily affected by the GFC, but the decline in the economic growth rate was more than that of trade to GDP. However, the two series move in the opposite direction from 2011 onward. The rise in the ratio is mainly attributed

to the decline in GDP than the rise in rate. Global trade has not yet recovered to the pre-crisis level.

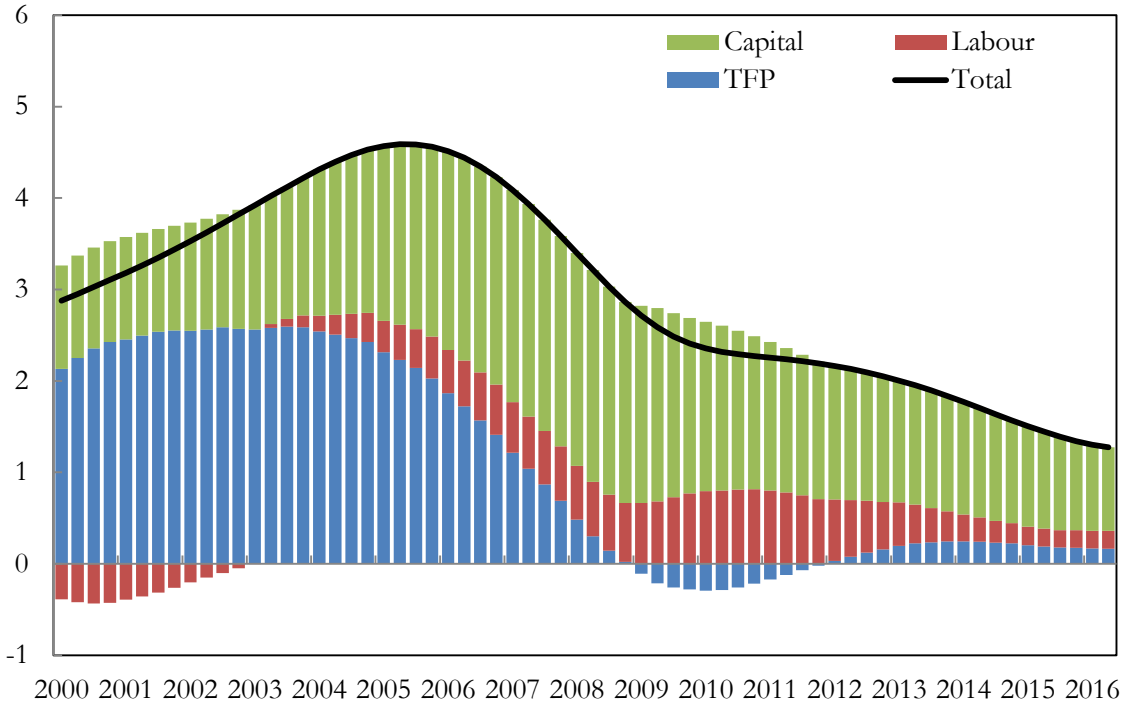


Source

4.4. Relationship between Potential Output and all other Factors

Figure 6 depicts the potential growth rate together with its components, namely, total factor productivity, labour, and capital stock. The figures in the appendix display these variables separately. The results from Figure 6 shows a constant decline in potential output growth from 2005, after reaching the maximum of 4.6 per cent. The decline is mainly attributed to a sharp drop in the TFP from 2003. The TFP was negative following the Global Financial Crisis (GFC) of 2007-2008, and then increased slightly from 2011 until the end of the sample. However, the TFP is still very small compared to the level attained from 2000 to 2003. Interesting there is a little change regarding the contribution of capital, which appears to be relatively constant throughout the sample, with a slight decline from 2014 onward. Note that the contribution of labour changes over time.

Figure 6: Potential output, TFP, Capital and Labour



The low level of potential growth from 2000 to 2003 was mainly due to the negative contribution of labour. From 2003, labour contribution has been positive, but small. However, its contribution has declined substantially. It seems the South African economy has moved from labour intensive to more capital intensive.

4.5. Results of the Regression Model

Table 3 depicts results obtained from estimating equation (7). It is clear from the results that labour productivity does have a significant effect on the economic growth rate in South Africa. Regression (1) indicates that labour productivity alone explains 32% of variation in the growth rate after controlling for dynamic in the growth rate. However, it is only significant at 10% level. Regression (2) depicts a high explanatory power, 62% of variation in the economic growth rate is explained by all these explanatory variables.

Most of these variables portray signs that are consistent with economic theory. For example, investment, employment, and labour productivity are growth enhancing, while inflation and government expenditure can be detrimental to growth. But, the impact of trade is somewhat puzzling. It can be explained by the reliance on imports far above exports. This is consistent with the structure of the South African economy, which is exemplified by a large and persistent trade balance deficit.

Table 3: Growth Model

	(1)	(2)
y_{t-1}	0.48***	-0.11
l_t		0.03**
i_{t-5}		0.09***
lp_t	0.34*	0.45**
π_t		-1.41***
g_t		-0.87***
op_t		-0.16**
Adj R^2	0.32	0.62

Note: we use Robust Standard errors
*, **, *** denote significant at 10%, 5%, and 1%

It is clear that labour productivity affects economic growth significantly. A percentage increase in the labour productivity increases growth by 0.45%. The impact is even higher that the effects of investment and employment. The results suggest that the South African economy will benefit a great deal from a very productive labour force. Thus, policies which enhance the productivity of the labour force are warranted. In addition, policymakers should strive to create an environment which is conducive to boosting productivity, such as investment in quality of primary and tertiary education. Moreover flexibility of the labour and product markets is prone to support economic growth.

4.6. Conclusion

Using raw data from the South African Reserve Bank, we determined the descriptive statistics of each of the variables which showed that the economy grew by an average of 3,03% within the sample parameter. The main challenge in the same period is employment. We should indicate that the average, the mean and the median would be misleading if considered in determining the relationship as there is an inverse relationship on some of the variables before and after the global financial crises.

We also showed that there is a positive and strong relationship between investment and economic growth, followed by labour. Using the correlation coefficients, we showed the relationship between all the variables and the dependent variable. We then used the data to illustrate through graphs the relationship between the independent and the control variable towards economic growth. We indicated that this illustration is consistent with economic theory.

This Chapter shows the relationship between TFP, Labour, Capital and Potential Output. From Figure 6, we concluded that both labour and TFP have been dragging potential growth downwards, whilst capital has been consistent, showing that South Africa's economy is more capital intensive than labour intensive.

The Chapter ends with regression model, estimated using equation (7). From the table, it is clear that labour productivity has a significant impact on economic growth in South Africa at 1% and 5% yielding 32% and 62% of variation in the growth rate respectively after controlling for dynamic.

Chapter Five: Analysis of Results

5.1. Introduction

In this section, we will provide the an analysis to the research questions that we posed in the introduction and see if the findings do help in responding to those questions as a way of beginning to wrap-up the report. We will further link the discussions, the research question with some of the issues that we canvassed in the literature review, and seek to affirm or negate some of the conclusions that were made by the literature based on the results and the findings.

5.2. Analysis of the Research Questions

Hypothesis 1: There is a relationship between Labour Productivity and Economic Growth in South Africa between 2000 and 2016.

Table 3: Growth Model

	(1)	(2)
y_{t-1}	0.48***	-0.11
l_t		0.03**
i_{t-5}		0.09***
lp_t	0.34*	0.45**
π_t		-1.41***
g_t		-0.87***
op_t		-0.16**
Adj R^2	0.32	0.62

Note: we use Robust Standard errors
*, **, *** denote significant at 10%, 5%, and 1%

We have shown through the results that there is a positive and strong relationship between labour productivity and economic growth in

South Africa between 2000 and 2016. Through Figure 6, the trend analysis has indicated that a decline in labour productivity results in a decline in the growth potential, and likewise, an increase in labour productivity results in an increase in the growth potential.

This is further supported by the regression model (Table 3) which shows that labour productivity does have a significant effect on the economic growth. Regression (1) indicated that labour productivity alone explains 32% of variation in the growth rate after controlling for dynamic in the growth rate whilst Regression (2) depicts a high explanatory power, 62% of variation in the economic growth rate is explained by all these explanatory variables.

Hypothesis 2: All economic factors of production have an impact on the growth of the economy.

The results from Figure 6 showed a constant decline in potential output growth from 2005, after reaching the maximum of 4.6 per cent. The decline is mainly attributed to a sharp drop in the TFP from 2003. The TFP was negative following the Global Financial Crisis (GFC) of 2007-2008, and then increased slightly from 2011 until the end of the sample. There is a little change regarding the contribution of capital, which appears to be relatively constant throughout the sample, with a slight decline from 2014 onward.

The contribution of labour is low at the beginning of 2000, but rises towards 2003 pushing GDP potential higher, and then again decline just after 2005 and becomes drastic as the GFC hits. So, whether negative or positive, all the three factors of production have an impact on the growth of the economy, confirming the precepts of economic theory.

5.3. Issues Raised in the Literature Review

Some of the findings that were raised in the previous sections are testament to the issues that were unearthed as we surveyed the

literature on the subject matter. Below, we reiterate some of the issues that were canvassed in Chapter Two which we believe are relevant to the findings, whilst others may have been refuted by the literature. We explore some of these below.

In the period between 2000 and 2016 there was higher capital to labour ratio, which was the result of higher unemployment, less demand for unskilled and semi-skilled labour and a shift towards capital and technology as a drive for growth (McCarthy: 2005). This point was also emphasized by Faulkner et al (2013) were they illustrated the movement from labour intensive to capital intensive production resulting in low levels of employment. This was as a result of the changing global environment and a shift towards the demand for technology, resulting in 'jobless growth' as observed by Haydman (2002). Nattrass (2014), in reference to the Global Competitiveness Report of the World Economic Forum, also came to the conclusion that South Africa's Labour Market performed poorly and has been in the decline. However, as noted by Mandel (1962) labour substitution by technology or capital, or a combination of the two, is primarily the result of profitability overriding all the other factors

Wittenberg (2014) observation that Labour Productivity has risen by more than 30% may be true only in the period between 2000 and 2008, however, in the period towards and after the crises, labour productivity has been on the decline as shown in Figure 1. Du Toit et al (2014) proves our findings that there was a rise in TFP from 2000, which clearly drove potential GDP. The observation by Fedderke (2012) that South Africa shed more jobs (close to 5%) way out of the proportion of the global economic crises is indicative of the special measures that needs to be take if the country is to deal with its growth and employment slump. Some of these interventions are dealt with in the next section, but this observation explains why, although some of the countries have shown sigs of speedy recovery, South Africa has been lagging.

As Comin (2006) found, technological progress, or TFP, has played a significant role in economic fluctuations, economic growth and cross-country per capita differences. Although we did not conduct the cross-country tests, if we compare this to the findings above by Fedderke (2012), we can deduce that this is the case in relation to South Africa in comparison to other economies of the same scale. As further indicated in the findings, the rise in TFP was important in raising the lelves of Labour productivity and capital productivity (Inglesi-Lotz: 2014, Chang: 2014).

Currency volatility and the prices of commodities (such as oil, gold or platinum) have a great influence in economic growth in the short run (Roux: 2011). These played an important role in economic growth in South Africa in the period before the global economic crises.

Finally, as Chang (2014) and Fourie (1997) emphasized, the economic growth model pursued by a country determines the use of the factors of production that will be highly intensive, and in the case of South Africa, a (unintended) move towards capital intensive growth (influenced by high commodity prices, dependence on imports and the extraction of raw mineral resources) led to minimal use of labour, resulting in high unemployment.

5.4. Conclusion

The regression model and Figure 6 which showed the growth potential led us to accept our hypotheses that there is a relationship between laboir productivity and economic growth on the one hand, and that all other factors of production have an impact, negative or positive, on economic growth. Most of the issues that were raised in the literature reviews as part of economic theory were consistent with the findings and results of the regression model and our statistics.

Chapter 6: Conclusion and Recommendations

6.1. Conclusion

It is clear from the results that labour productivity closely mimics the pattern of growth in the economy as shown in figure 1, with labour productivity leading the economic growth throughout the sample. It is also clear that the recent slowdown in economic growth is as a result of the decline in the productivity of labour.

There is a co-movement throughout the sample between investment and economic growth as we showed in Figure 2, suggesting that investment is growth enhancing. Investment began to lag from 2008 until 2012, mainly due to the global financial crises and lack of demand. From 2013 onwards, the contemporaneous relationship reemerges until the end of the sample. However, this has not translated into positive growth in the economy largely due to the decline in contribution of Total Factor Productivity and Labour. Investment has consistently been the driver of economic growth in the earlier high-growth period of 2003-2007.

There is negative correlation between inflation and economic growth, which means that in periods of low economic growth from 2000 to 2003, there was high inflation as opposed to 2003 until 2007 were there were higher growth rates averaging 5% whilst inflation was lower. As we illustrated in Figure 3, the recent lower growth rates also reflects higher rates of inflation, which currently stands at 6%.

There is a constant decline in potential output growth from 2005, this after reaching a high of 4,6% in that year. A sharp decline of total factor productivity (TFP) and labour explains this decline in potential output

of growth. TFP has not recovered since a sharp decline in 2005, and was adversely affected throughout and have not recovered since then.

The South African economy, as we depicted through Figure 4, has seemingly moved from being labour intensive into being capital intensive, with constant and higher contribution of capital in the potential output, whilst labour has declined in the same period. This is not good given the high levels of unemployment, growing inequalities and poverty in South Africa. It is also not positive for the growth of the economy, and therefore, as we illustrated in Table 1, there is a need to increased labour and its productivity to growth the economy.

Through regression models, we show that labour alone explains 32% of variation in the growth rate after controlling for dynamic in the growth rate, although labour is only significant at 10%. Labour, therefore, like investment and and employment, are growth enhancing as compared to inflation and government spending that's more geared towards wages. Labour productivity affects economic growth significantly, with a percentage increase in labour productivity yielding growth rates of 0.45%. A productive labour force is therefore crucial for the attainment of economic growth.

6.2. Recommendations

All of the above are indicative of the need for urgent policy interventions that will improve the quality of labour, increase labour intensity and ensure that the economy grows. This therefore calls for the following to be done:

- As we have shown that towards 2008, labour productivity was in the decline and even became worse during the global economic crises, it is important for the economy to be driven more towards increasing labour participation, as this will contribute

towards growth. Sectors such as agriculture, manufacturing and mining should be supported as opposed to the technology and capital intensive sectors such as finance and services;

- The South African government should fix the education system, improve on its quality and ensure that it is geared towards providing quality labour regime;
- The role of Sector Education and Training Authorities (SETA's) in providing on the job training workers is going to be critical;
- Because the economy is export-oriented (mainly raw materials) and import-dependent (mainly finished luxury goods, agricultural products and machinery), and thus capital intensive, it was easy for factories to dispense of labour in the middle of the economic crises. Investment in local manufacturing and beneficiation of raw material will go a long way in yielding employment;
- The role of total factor productivity (TFP) in pushing the economy to achieve its potential remain critical, and therefore, measures to increase TFP should be put in place;
- There is a need for a 'new deal' between government, business and labour that will ensure that it protects existing workers' rights and benefits whilst guaranteeing entry for a new and younger labour force. This will deal with the demand for flexibility at an entry level whilst addressing the concerns of workers. Although various interventions pursued by the state were not canvassed in the report, including the employment tax incentive, and their failures or successes, it is critical to ensure that the introduction of such programmes follow a comprehensive consultation and engagement by all parties;
- Government should increase its investment in Research & Development, especially aimed at beneficiating raw minerals, as the economy was more vulnerable with the burst in commodity prices, which were a major driver of growth pre-economic

crises. This will also reduce the depencence in import of finished goods such as machinery, and result in abour intensity;

- Government spending as percentage of GDP should also focus on investment in infrastructure that will facilitate manufacturing, agriculture and mining as opposed to the increase in wages. This had become inevitable given the decline in investment by the private sector in labour-absorbing industries during the crises, however, this is unsustainable on the national fiscus and is not contributing towards growth;
- The country should also put in place measures to sort out the impending water crises, which will have serious implications as was witnessed with the electricity crises. Although the crises was partly due to drought, it was also as a result of the lack of infrastructure that will ensure sustainable supply of water to industry; and,
- The newly established Ministry for small business should focus on the implementation of the country's vision (as articulated in the National Development Plan) of supporting this sector as a major employment creation sector.

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Appendix

Table A.1: Stationarity Tests

	DF-GLS	KPSS
Growth	-3.01***	0.46
Lab prod	-4.27***	0.08
Invest	-2.52**	0.29
Empl	-5.03***	0.04
Inflation	-2.65***	0.17
Gov exp	-4.61***	0.07
Trade op	-1.91*	0.37

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

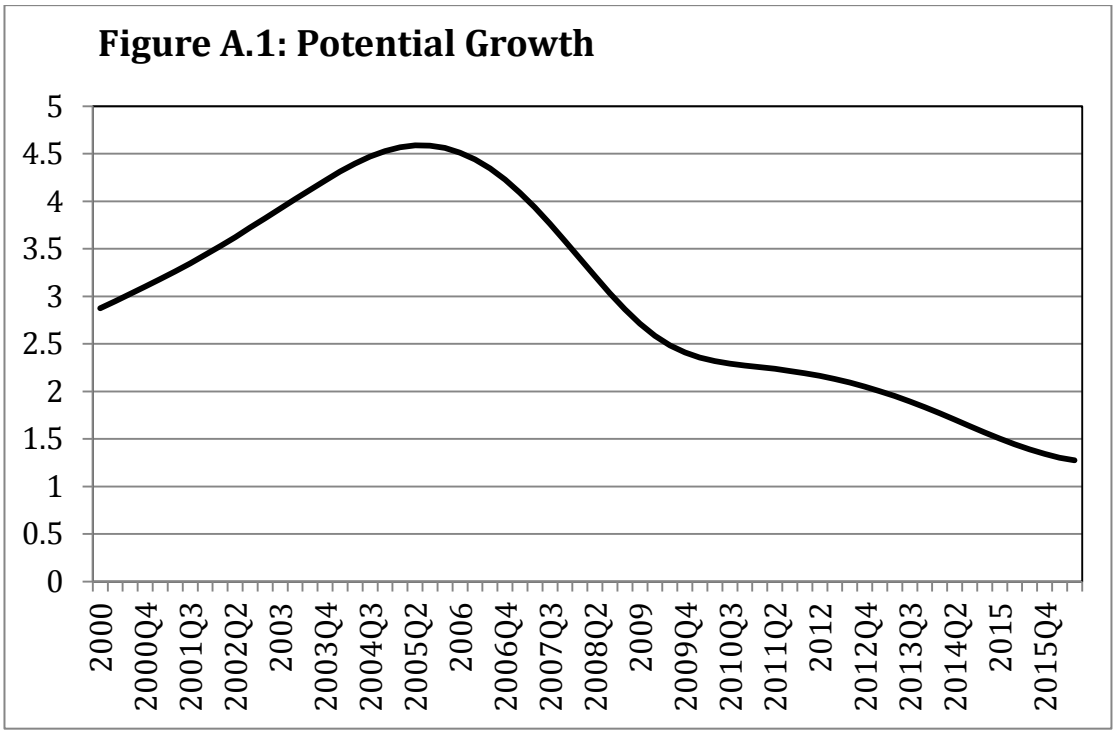


Figure A.2: Total Factor Productivity

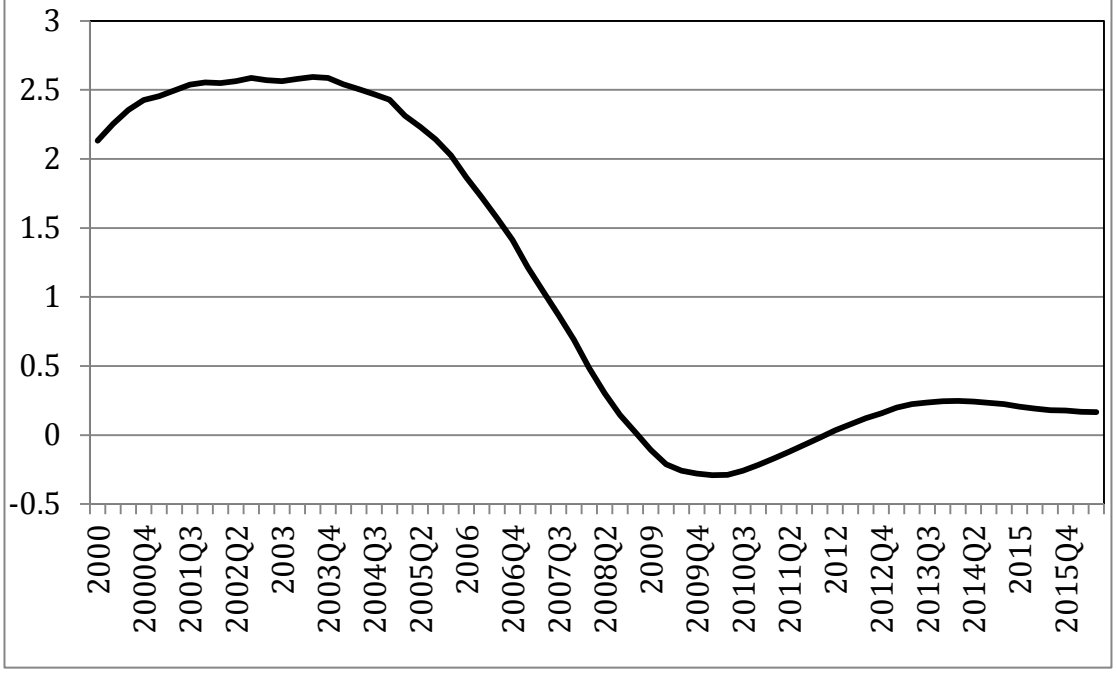


Figure A.3: Labour

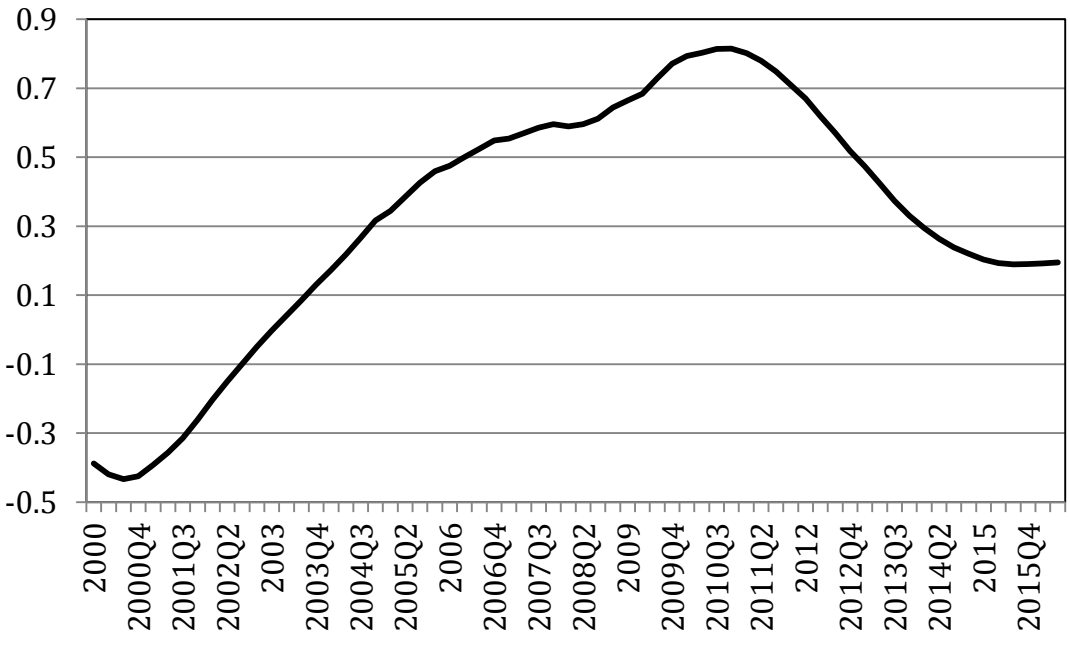


Figure A.4: Capital

