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DRIVING ECONOMIC GROWTH"

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CHAPTER 1: INTRODUCTION

This study seeks to analyze whether State Owned Enterprises (SOEs) significantly drive growth at an industrial and provincial level in South Africa. The argument is that SOE expenditure on infrastructure generates consumption and investment demand which in turn drives growth. This growth can be at an industrial, aggregate and provincial level. This study will also provide an understanding of which industries will benefit from each SOE that we consider, and to also have a spatial understanding of the growth benefits that these entities yield in the context of the South African economy.

This study is taking place at a time where the developmental role of SOEs in the South African economy is being debated as they have been largely criticized as result of poor performance of some of the largest SOEs such as Eskom, Denel, SAA to mention a few. This has led to a number of perspectives on whether these entities should still be in the hands of the State or rather be privatized.

This research contributes to literature by focusing on the extent to which SOEs significantly drive growth in the South African economy and the debate around whether we should still have ailing State owned entities that have failed to meet their objectives rather than privatizing them in order to get better results in terms of their performance. Given that SOEs have been significant economic players and continue to deliver vital services in key economic sectors such as finance, utilities, natural resource and transportation networks for example, the study will also assist us to understand which respective SOE infrastructure expenditure drives growth for different industries and which provinces' growth benefits significantly from the infrastructure expenditure programmes of those SOEs.

For the purpose of this paper, the study will be based on the expenditure of four SOEs in the South African economy namely: Denel, Eskom, Rand Water and Transnet. These SOEs are selected on the basis of their importance as enablers of economic development and the key role they play in the infrastructure development.

In the effort to examine the extent to which these SOEs play a key role in driving growth, the study will focus on each of the respective SOE infrastructure expenditure which consists of; power generation, plant and equipment, rails, ports, pipelines for example. This approach will assist in understanding the role played by SOEs in driving growth through their infrastructure expenditure and gross value addition in the South African economy.

In this regard, this paper is made up of five sections. Following the introduction, which addresses the research problem, the research question and a discussion on the contribution of the study. The subsequent section will be a literature review which will cover a number of areas of the topic which are; defining State Owned Entities and Economic growth; the conceptual and legislative framework on SOEs to offer a different perspective on how they are defined and the regulations that govern them. This section will also include a brief discussion on the evolution of State-Owned Entities in the South African economy focusing on the four mentioned entities; this will be followed by an in-depth discussion of the role and the importance of SOEs.

In addition, the chapter will also discuss some of the problems/challenges that SOEs face which have often led to poor performance of State-Owned Entities globally, and therefore failing to meet their targets. This will also include a discussion on how countries such as Malaysia, China, and Sweden to name a few for example managed to deal with such problems and therefore presents us with a case of successful State-run enterprises which have led to high economic growth rates. Moreover, the paper will also discuss the importance of infrastructural development in line with SOE expenditure on infrastructure.

Chapter 3 of the paper will outline the methodology that will be implemented in the study and lays out the design and technique applied. With this background, chapter 4 of the study will consist of the data collected and data analysis to be used in the model and provide an in-depth discussion of the regression analysis and findings. Chapter 5, of the paper presents a conclusion of the study illustrating that in some of the provinces and sectors of the economy, these SOEs play a significant role in driving growth through infrastructure expenditure and gross value added.

1.1. Research Problem

There is a debate as to whether SOEs are relevant in growing the South African economy. However, the debate misses an avenue that quantifies the relationship between SOE expenditure and the extent to which that drives growth at an industry or sectoral and provincial levels, respectively.

1.2. Research Questions

In the attempt to add value to the literature and studies on SOEs, the paper will build on existing definitions, qualitative information and data on SOEs to develop a more comprehensive quantitative picture of their significance in South Africa and today's world economy that would inform the current policy debate. The principal two questions that will be answered are:

- Does SOE expenditure significantly drive industrial or sectoral growth?
- Does SOE expenditure determine growth at a provincial level?

1.3. Motivation for the study

It is important to study the role of SOEs in South Africa as since the year 1994 they have been an essential component of the economy as they were regarded as an economic strategy that would be used in order to foster economic growth, generate employment, reduce poverty and increase the fiscal space to deal with problems of inequality. The transformation of state assets into state owned were also seen as key players to address issues of market failure and deliver key infrastructure services such as transport, water and energy more effectively in order to allow the economy to grow while ensuring equity through access and quality social services to all citizens. In line with the international trends and following the success of state-owned entities in countries such as Norway, Malaysia etc., having state ownership of key sectors of the economy rather than privatization is often viewed as a better strategy to take advantage of private-sector efficiencies while maintaining public accountability.

The motivation of the study is based on the growing debates around the efficiency of State-Owned Entities in the case of South Africa where these entities have failed to meet their core objectives of growing the economy.

This has largely been as a result of the mismanagement of funds, corruption and cronyism within the SOEs which consequently led to the constant financial bailout by the government through treasury backed guarantees on loans or cash injections in order to keep these entities afloat. This has sparked the debate around whether state ownership of these entities is still a viable option rather than privatizing them as a result of their poor performance.

Based on the South African government website (2019), there are about 131 State-owned entities in South Africa. The discussion in this report is based on a choice of four SOEs i.e. Denel, Eskom, Rand Water and Transnet as they play a key role in the development of the economy in key areas such as transportation networks, bulk infrastructure, energy etc.

These entities play a key role in the attempt to deliver developmental objectives of the economy as they are the commanding heights of the economy. Eskom for example is the country's main electricity producer, supplying over 95 percent of the electricity consumed. On the other hand, more than 50% of South Africa's GDP is generated in Rand Water as area of supply (Rand Water, 2014). Denel on the other hand plays a key role in our national security and is the military technology conglomerate.

In terms of their contribution to in the employment, the table below illustrates how many people are employed by some of these entities.

Company Name	Segment	Number of employees
Denel	Defense	3 438
Eskom	Energy	45 982
Transnet	Transport/	56 718
South African Airways	Airline	5 256
SA Express	Airline	711
Safcol	Forestry	2 396

Alexkor	Mining	331
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1.4. Contribution and significance of the study

The research contributes to the literature on SOEs by addressing a gap that exists in relation to the significance of the relationship between SOE expenditure and industrial and spatial growth. The research further contributes by controlling for SOE expenditure in GDP, this solves the problem of double counting of explanatory variables that leads to multicollinearity, the co-movement of explanatory variables. The study will extend on the existing body of literature and studies in the context of South Africa.

This research provides results that are useful for policy considerations, since policy makers will have an understanding of the extent to which respective SOE infrastructure expenditure drives growth for different industries. In addition, it also provides an opportunity for policy makers to understand which provinces' growth rate benefit significantly from infrastructure expenditure by the SOEs by taking the growth rate of Gross Value Addition per province.

The study is significant in a sense that it will have policy implication in how SOEs will be positioned in different sectors of the economy for them to allow SOEs to deliver on their developmental mandate.

CHAPTER 2: LITERATURE REVIEW

This section of the study will provide a discussion with the use of available literature on the role and the rationale of State-Owned Entities in the world economy. The section will be comprised of subsections which will firstly define the key terms in the study such as; Economic growth and State-Owned Entities. The ensuing parts of the section will address topics on the legislative framework of SOEs, the evolution of State-Owned Entities in South Africa, the role and importance of State-Owned Entities. In addition, the study will further look at some of the key challenges that these SOEs face which have led to inefficiencies within these firms. On the other hand, the study will also examine some of the key factors that played a role in the success of SOEs in countries such as China, Malaysia, and Botswana etc. Lastly, the study will also discuss the importance of infrastructure spending in bringing higher growth rates and improved living standards.

2.1. Conceptual approach Economic Growth and Development

Haller (2012, p: 66), defines economic growth “as is the process of increasing the sizes of national economies, the macro-economic indications, especially the GDP per capita, in an ascendant but not necessarily linear direction, with positive effects on the economic-social sector, while development shows us how growth impacts on the society by increasing the standard of life”. He further asserts that, “Economic growth is obtained by an efficient use of the available resources and by increasing the capacity of production of a country. It facilitates the redistribution of incomes between population and society. The cumulative effects, the small differences of the increase rates, become big for periods of one decade or more. It is easier to redistribute the income in a dynamic, growing society, than in a static one” (Haller, 2012, p: 67).

2.2. Conceptual and Legislative Framework of State-Owned Entities

Defining the concept State Owned Entities takes numerous definitions which are applied across countries based on the various forms of State ownership.

In this regard, Kowalski, P. *et al.* (2013) assert that governments have the ability to either hold equity in enterprises at various levels incorporated in accordance with normal corporate laws, or permit laws that are enabled to create a statutory corporation governed by a status outlining its objectives and formal requirements.

Garner (1970) defines State-owned Enterprises as a legally independent entity that functions along commercial lines but is owned in whole or in part by a government. These enterprises are often used as measures taken by the state to gain ownership and control of key industries within an economy to drive economic growth.

According to the European Union (2016: 6), SOEs can be defined as “all non-financial corporations, quasi-corporations and non-profit institutions, recognized as independent legal entities that are market producers and are subject to control by government units”. In addition, these entities include companies where the public authorities are the majority shareholders; where they are fully owned by public authorities; where public authorities retain a minority share but have special statutory powers; companies where public authorities have a minority share and no special powers (EU, 2016).

Moreover, in extreme cases, the state may only own a small share of the entity and a private firm enjoys relative managerial and organizational independence; on the other side of the spectrum, companies may be fully owned by the state and do business in accordance with the directives outlined by the state from their line Minister (EU, 2016). These enterprises engage in a wide range of commercial activities such as telecommunication industry, the banking sector, the manufacturing industry, the mining industry, airlines etc.

Robinett (2006) on the other hand maintains that State-owned enterprises are also referred to as public sector enterprises, government-linked companies, government corporations and parastatals which are diverse in nature ranging from internationally competitive listed companies, large-scale public service providers, wholly owned manufacturing and financial firms, to small and medium enterprises.

The governance structures, regulatory and ownership arrangements of SOEs differ across different sectors in an economy and in different countries. In this regard, the literature on SOEs illustrate that there is a wide range of legal forms of SOEs depending on factors such as; the conditions in the SOEs were formed, the positioning of the entity in the public administration hierarchy, the mandates of the entities, whether the entity is listed on the stock exchange or not and the status of the SOE if it is in the process of being privatized and variations such; as full, majority or minority ownership by the government (OECD, 2005).

The fundamental principle underlying the use of regulatory and legislative frameworks as the governing structures is to make the broad policy directions of the state and the “rules of the game” clear for everyone (OECD, 2014). The underlying objectives of state ownership are found in SOE laws and regulations that define the legal structure of SOEs found in many countries is their administration, control, and regulation; and the role of governing bodies such as boards (OECD, 2014).

In this regard, the legal and regulatory framework of the SOEs in SA fall within the ambit of the Companies Act and their operations are subjected to the dictates of the Public Finance Management Act (PFMA) legislation which intends to secure accountability and sound management of expenditure, assets, and management of the revenue and liabilities of the respective SOEs (Kanyane & Sausi, 2015). As a result, the functioning of State-owned entities requires a clearly defined legal and regulatory framework that is important for communicating key expectations to SOE boards, management, shareholders and all other stakeholders including the general public.

Additionally, the main objective of the PFMA in ensuring that public sector institutions are well run and meet their stated objectives is to regulate financial management, ensure secure accountability and sound management of the revenue, expenditure, assets and liabilities of these enterprises are managed efficiently and effectively (Kanyane & Sausi, 2015).

A number of strategies have in many countries implemented to ensure that the governance structures of SOEs are effective in bringing about success amongst SOEs. In the attempt to achieve the success there is no one-size-fits-all approach that is applicable to all countries and contexts, thus the framework should set clear boundaries and define the relationship between the government as shareholder and SOE boards and management, separate legitimate government control and oversight for ensuring SOE accountability from the managerial autonomy necessary in commercial decision making (OECD, 2014).

2.3. Brief history of State-Owned Entities in South Africa

State Owned Enterprises have a long history as instruments that are used to play a key role in South Africa's socio-economic advancement. South Africa has over 700 SOEs which are involved in a wide range of business activities from government entities to commercially run entities and some of which extend across the country's borders (Fourie, 2014). The state-owned infrastructure utilities were established in the first half of the century as part of state projects that were intended to diversify the economy (Ritchken, 2014). In the latter part of the 20th century, economic development was attributed to exports of bulk, process resources such as coal, iron ore, aluminum and manganese (OECD, 2015). This was after resource processing entities were established to diversify the country's economic participation to lift the dependence on mining houses (OECD, 2015).

According to Fourie (2014), the underlying motivation for the establishment of some of the SOEs was to provide the state with the instruments to improve import-substitution, build a diversified industrial economy, and generate revenue (Fourie, 2014).

However, Fourie (2014) further asserts that by the 1980s the National Party-led government changed the policy strategy on SOEs in order to focus more on economic development through stringent export policies.

In the context of the study, the following table outlines a brief background of the four State Owned Enterprises to be analyzed:

Denel: The enterprise was incorporated as a private company in 1992 in terms of the South African Companies Act (1973), with the South African government as its sole shareholder (National Treasury, 2018). It operates in the military aerospace and landward defence environment, and provides strategic defence equipment. Denel supplies the South African National Defence Force with strategic and sovereign capabilities (National Treasury, 2018). It is structured into three main groups: Aerospace, Ordnance, and Commercial and Information Technology (Fourie, 2014).

Eskom was first established in 1923 and in 2002 was converted to fully state-owned entity that was the country's primary electricity supplier (Fourie, 2014). Its mandate was to generate, transmit and distribute electricity in South Africa. Eskom, a SOE wholly owned by the government, is the country's main electricity producer, supplying over 95 percent of the electricity consumed. Fossil fuel-fired stations generate 90 percent of the supply; nuclear power stations generate 7 percent; while hydro stations generate only 1 percent. A very small amount of electricity is imported (DPE 2000: 131-132). Fourie (2010) Eskom is the largest producer of electricity in South Africa (approximately 95%) and Africa (approximately 45%) (Eskom 2011(a):13). Electricity generation forms the core function of Eskom, but the company is also active in all elements of the electricity supply chain, which includes the transmission and distribution thereof to industrial, mining, commercial and residential consumers (Fourie, 2014).

Rand Water Rand Water is a public utility corporation that supplies a current daily average of more than 2 800 million litres of water to meet the needs of more than 12 million people centered in the Gauteng metropolitan area. More than 50% of South Africa's GDP is generated in Rand Water as area of supply (Rand Water, 2014).

The rand water was officially established in 1903 by the Rand Water Board Incorporation Ordinance No. 32 of May 1903 to supply water to the entire Johannesburg area (Rand Water, 2003). The Rand Water board consisted of members of the Johannesburg Town Council, The Chamber of Mines, and other existing local authorities in the Witwatersrand (Rand Water, 2003). It was only in 1905 that Rand Water commenced with full operations and by 1906, the annual daily consumption of water supplied by Rand Water was about 11 Ml/d and it has been growing ever since (Rand Water, 2003).

Transnet: Transnet has a long history which dates back to the late 1850s, when it was proposed for the harbours in the Cape and Natal as railway transport (Sturesson et al., 2015). The entity was established as a limited company on 1 April 1990 referred to as Transnet SOC Ltd which formed around the core five complementary divisions comprised of freight rail, rail engineering, the national ports authority, port terminals and pipelines supported by various interrelated projects that reinforce the group as a whole (Transnet 2012).

Source: National Treasury (2018); Transnet (2012); Rand Water (2003), (2014).

2.4. The Role and Importance of State-Owned Entities

The existence of SOEs in a number of countries have in principle enabled governments to influence its economic policy direction to benefit other industries and pursue national goals, economic efficiency, deal with their political, social and economic challenges and ensured that key sectors of the economy are under state ownership for the well-being of the nation. In this regard, SOEs have been established as government mechanisms to encourage economic development, industrialization, improve labour relations in strategic economic sectors, generate public funds for the fiscus, increase service delivery, and limit private and foreign control of the domestic economy (Thabane & Snyman- Van Deventer, 2018).

These entities have become vital to the development of a number of key strategic industries such as the transport sector, access to water and sanitation, energy, telecommunications and the manufacturing sector for example and cited as critical mechanisms to assist governments to achieve economic growth and service delivery (Fourie, 2014).

In a nutshell, State ownership or control of the key sectors of the economy essentially has three main purposes i.e. allocative, distributive and stabilization functions (Black et al, 2003). The allocative function in this regard, refers to measures taken by the state to correct any distortions that might arise as a result of non-competitive markets. Secondly, the distributive function may arise as a consequent of the distributional failures of the competitive market explained above (Mondli and Robb, 2013).

Lastly, the stabilization function mainly deals with macroeconomic policies put in place to ensure that the economy functions efficiently through high economic growth rates, achieving full employment, ensuring price stability and a sound balance of payments (Mondli & Robb, 2013). As a result, governments have often opted to be service providers of basic goods and services through direct control industries where conditions are such that it would be most efficient if there is natural monopoly whereby there is only one supplier or competition is imperfect (EU, 2016).

In this context, “a natural monopoly exists in industries where economies of scale are so high that only one firm can cost-effectively serve the market and it doesn’t make economic sense to duplicate core infrastructure” (Mondli & Robb, 2013, p.3). Examples of natural monopoly include, railway infrastructure, electricity transmission, water and sanitation etc. The provision of basic goods and services will support equality, regional development and other economic and social goals (Forfas, 2000). The provision of these services through SOEs in sectors where there is opportunity for natural monopoly provides a clear rationale on the role that SOEs play in growing the economy.

Governments have often opted to directly intervene in the economies for equity through the provision of a minimum level of access to services which are considered as essential and basic goods (EU, 2016). This is for example the case for SOEs providing subsidized or non-profit services. The provision of public goods and services through SOEs can be viewed as an effective way to fulfill a number of social and economic objectives.

Fourie (2001) maintains that the intervention through SOEs play a key role in providing the immediate need for infrastructure and basic services to be provided at the lowest cost and highest quality, with access being extended to historically disadvantaged groups in the community. This forms part of the role and the rationale for the establishment of SOEs to be set up and controlled by government to prevent the abuse of natural monopolies whereby private ownership of the key industries in the economy will result in high monopoly profits for that particular firm by charging high prices as a result of having only supplier.

In some cases, the regulation of private monopoly firms has been advocated to be an alternative to the ownership and control of key industries of the economy in order to achieve sustainable development and driving growth. In this context, Robinett (2006) further affirms that, ownership and residual control rights would be deemed unnecessary in cases where the state can achieve its goals through regulation (including appropriate taxes and subsidies).

However, the role of government especially in the ownership for natural monopolies or oligopolies in the “commanding heights” of the economy would allow for greater economies of scale, more efficient pricing, and higher levels of investment and innovation (Robinett, 2006). In addition, regulation of private monopoly firms may in certain situations prove to be inefficient and thus fail to meet the state’s policy goals.

For example, if the scope and quality of the SOE’s output or service delivery is hard to verify, and hence, contract on or regulate explicitly, then in theory, it might be best for the state to retain residual control rights to ensure adequate delivery (Robinett, 2006).

Moreover, since the primary motive for private firms is profit maximization, the regulation of private monopoly firms would be ineffective in providing reliable constant supply of basic goods and services in situations whereby it would be most difficult for private firms to finance high-yielding but risky pioneer projects.

Taking into account the provision of electricity for example, the regulated private monopoly firms in key sectors of the economy would be required to provide constant and reliable supply of electricity which cannot be guaranteed as a result of high costs. Thus, the government could attempt to ensure this constant and reliable supply of electricity by retaining direct control of electricity production and distribution (Robinett, 2006). In addition, governments have established SOEs to seize market failures and provide critical goods falling in the basic needs category in cases whereby the private sector investors may not be willing or are incapable of financing projects that may have high returns in the long run but carry high risks in the short term and which are costly to roll out (Forfas, 2000).

In this regard, capital markets where key sectors of the economy are privately owned often have an inherent bias towards short-term gains and tend not to support risky, large-scale projects with long gestation periods (Forfas, 2000). Therefore, as a result of capital market failures, the State has under these circumstances funded the establishment of state-owned companies in order to address these capital market failures (Forfas, 2000).

When key industries of the economy are under private ownership, consumers can be charged inefficiently high prices for basic goods and services. As a result, since SOEs are not driven by profit maximization and are in favor of maximizing social welfare, the monopoly SOE can adjust prices and output to approximate the competitive equilibrium (Shirley and Walsh, 2000). In this regard, SOEs play a key role in the attempt to overcome market failures due to factors such as, lack of information, lags in adjustment, incomplete markets and non-competitive markets arising from natural monopolies and prevent the abuse of such natural monopoly while being superior to regulatory alternatives (Forfas, 2000, p.21).

This also accounts for the problem of externalities whereby the action of a firm or individual has a cost or benefit for others which it fails to take into account in its production or consumption decision (Black et al, 2003). For example, “when nascent industries have externalities that cannot be incorporated in pricing strategies, or when information is asymmetric, or capital or insurance markets imperfect, private investors can be reluctant to invest. When these industries have potentially important spillovers within or across sectors, the state might decide to invest instead” (Kowalski, et al. 2013, p. 12).

The existence of SOEs has ensured that key sectors of the economy that have the ability to become monopolies are under state ownership for the benefit of the economy as a whole since the state engages in business activities for the growth of the economy and better the living standards of the general population rather than profit maximization. State owned entities play role in the protection of the general public particularly those living in poverty or remote areas from profit seeking firms which would exclude these individuals from economic participation by charging relatively high prices on these goods and services (EU, 2016).

Christiansen (2013) on the other hand maintains that, SOEs play a significant role in establishing the country's infrastructure in large infrastructural developments which is fundamental to economic growth as the expansion of infrastructure is essential to ensure sustainable rates of economic growth as it encourages the promotion of industrial development and increase the economy's productive capacity.

Nunnenkamp (1986) argues that the expectation of the existence and role of public enterprises is that they will improve the supply of goods falling into the basic needs' category at socially acceptable prices and subsequently make infrastructure accessible to the general population. According to Fourie (2014), state ownership of key sectors of the economy has led to government investment in infrastructure which can contribute effectively to opportunities for infrastructure equipment suppliers, increased investment by users of that infrastructure and to benefits supporting peripheral economic initiatives and developmental opportunities, such as the increased use of railway infrastructure, as opposed to road transport networks for example.

Lawson (1994) asserts that, the basis for establishing State Owned Enterprises is motivated by the political, social and economic reasons around the issues of the need for economic planning, redistribution of power, income and wealth, natural monopoly and the advantages for stabilization policy of direct industrial intervention. The establishment of State-Owned Entities in many countries is driven by aspirations to drive socioeconomic development and generate revenues through state ownership of key industries of the economy.

State intervention in the key sectors of the economy was meant to ensure that profits from these industries are secured by the government and encourage the exploitation of economies of scale rather than being accumulated by the private sector (Forfas, 2000). Megginson and Netter, 2001 further maintain that one of the major roles that SOEs operating in commercial activities of the economy play is to generate revenues for the state to improve its operations and respond to the needs of the people.

Shirley & Walsh (2000, p. 16) indicates that in some cases SOEs are responsible for the “facilitation of industrialization through central planning, the development of productive forces, the acceleration of technology transfer, increased employment, reduced inequality through redistribution of wealth and provision of equal opportunity, regional development, and increase national security or autonomy”.

Shirley & Nellis (1991) further assert that SOEs have instrumental in ensuring the development of the economy through nourishing sectors of special interest for the economy and in particular to preserve employment; introducing new and emerging industries by channeling capital into SOEs which are, or can become, large enough to achieve economies of scale in sectors where the start-up costs are otherwise significant.

Ake (1981) maintains that in some of the previously colonized countries, SOEs were viewed as critical components in the struggle for economic independence and was necessary to encourage the development of enterprises controlled by nationals which could compete with and, if possible, displace those controlled by foreign capital (Ake, 1981). Primarily, SOEs further play a key role in ensuring that procurement initiatives fulfill the developmental objectives aimed at the promotion of industrial investment and governance practices as a strategy relating to targeted investments in key industries of the economy in order to minimize dependence on the export of raw resources (Fourie, 2014).

In this context, Nindi 1996, the creation of public enterprises particularly in the “commanding heights” of the economy were intended to provide substantial social benefits by creating sustainable economic and social benefits that would facilitate economic development and have the means to contribute to an improvement in the standard of living of the population. Moreover, Nunnenkamp (1986) asserts that SOEs also play a key role as the main source of employment in a sense that they also have the capacity in the upgrading of unskilled labour and contribute to a better supply of managerial skills, thereby reducing the widespread lack of human capital.

On the other hand, Balbuena (2014, p.6) argues that “whilst the State’s enterprises should not play a role as “employer-of-last instance” whereby the government employs all of the jobless people who are ready, willing and able to work in a public sector project at a basic wage, they can play an important role in upgrading labour skills and raising social standards through appropriate policies of corporate responsibility”.

Additionally, Ramamurti (1987), argues that SOEs may be expected to create employment, assist in developing sectors of the economy that make slow progress, make unprofitable products in uneconomic plants, develop national technological capabilities, hold down prices, or earn foreign exchange-even if to some extent pursuing these goals negatively impacts the financial performance of the country in order to pursue social objectives.

Lewin in Ake (1981) argues that governments have used state ownership of enterprises as a means to save declining industries and foster high risk and/ or high technology industries, combat inflation, defend against foreign owned enterprises, reduce unemployment, and accumulate foreign currency. It is essential to note that the role and functions of public enterprises is assessed in terms their original developmental roles and their contribution towards supporting sustainable economic growth through the provision of high quality and cost competitive infrastructure which are mainly based on a country’s’ goals as discussed in the study. The table below outlines the key role that SOEs have played in many countries.

Examples of the role of SOEs in the Economy in different countries

Globally, in 2006 SOEs accounted for 20 percent of investment and 5 percent of employment (Robinett 2006). According to a 2009 OECD survey, 25 OECD countries had a total of some 2,050 SOEs valued at US\$1.2 trillion. These SOEs accounted for 15 percent of gross domestic product (GDP), as measured by the valuation of SOE sectors relative to GDP, and, in countries still undergoing the transition to a more market-based economy, for 20–30 percent of GDP (OECD, 2011).

In China, the central government is responsible for 17,000 SOEs, the number of SOEs under local governments exceed 150,000. The 1,200 listed SOEs produce 18 percent of GDP, and their total market capitalization is around 40 percent of GDP (Robinett, 2006, p: 10).

In India, there are 240 Public Sector Enterprises outside the financial sector. These enterprises produce 95 percent of India’s coal, 66 percent of its refined oil, 83 percent of its natural gas, 32 percent of its finished steel, 35 percent of its aluminum, and 27 percent of its nitrogenous fertilizer.

Indian Railways alone employs 1.6 million people, making it the world's largest commercial employer. In less developed countries, SOEs produced about 15 percent of regional GDP in Africa, 8 percent in Asia, and 6 percent in Latin America in 2006 (Robinett 2006).

Sources: Robinett (2006). "Held by the Visible Hand". OECD (2011).

2.5. Some of the key challenges that SOEs face, what are the problems?

The study by the OECD (2015) on "*OECD Guidelines on Corporate Governance of State-Owned Enterprises*" provides a number of challenges that SOEs face globally (from developed countries to developing and the least developed countries) which are mostly common in the operations and management of these entities.

SOEs have been central in ensuring high growth rates of economies in a number of countries, however, Khan (2008, p: 3) mentions a number of factors that have proved detrimental to the well-being of the economy and exposed serious "government failures" include; "rising corruption, management inefficiencies, overstaffing (without due regard to their economic viability, many governments treated PEs as easy conduits for job creation and a convenient vehicle for patronage distribution), rising current account deficits and the limits of PEs as major players in economic development".

On the one hand, performance of SOEs may be compromised as a result of politically motivated ownership interference and suffer from unwarranted hands-on individuals which may lead to unclear lines of responsibility, a lack of accountability and efficiency losses in the corporate operations (OECD, 2015). On the other hand, distant or totally passive ownership by the public authorities due to lack of any oversight can lead to weakened incentives of SOEs and affect staff performance in the best interest of the entity which would in turn raise the likelihood of self-serving behavior by corporate insiders (OECD, 2015).

In addition, as a result of the protection warranted to senior management from the possibility of takeover and that of bankruptcy which are deemed to be vital for overseeing how managers perform also affects the performance of SOEs (OECD, 2015).

This form of protection as a result can at times promote lackluster performance by senior managers as there is some guarantee that the entity will not go bankrupt due to the state guarantees available to bailout the waning SOE (OECD, 2015). Robinett (2006) maintains that the likelihood of potential takeovers and proxy contests can as a result, reduce the incentives of board members and managers to maximize the value of the company to operate to its fullest capacity. In addition, the lack of bankruptcy since SOEs are often bailed out when they are in dire financial situation can introduce a soft budget constraint, which reduces pressure to contain costs (Robinett, 2006).

Furthermore, in cases where SOEs have multiple and often competing goals whereby the entity is mandated to carry out commercial activities in order to yield returns for the government and on the other hand, fulfill a public policy goal relating to the developmental objectives outside their core mandate of the entity, also leads to poor performance of the SOEs (OECD, 2015). The enforcement of commercial laws and regulations at the level of the state can cause Intra-governmental friction resulting from regulators bringing enforcement actions against entities controlled by the government which as a result creates unique challenges amongst SOEs (OECD, 2015).

It is imperative to concede that many of the problems/complexities faced by SOEs proved to be detrimental to the success of achieving sustainable economic growth as key role players in driving growth and ensuring quality provision of infrastructure and basic goods and services amongst other things. This section further expands on the challenges outlined which mainly stem from the problems in the structures, operations and processes for the direction and control of these entities.

According to the World Bank (1991), most of the SOEs in a number of countries are largely affected by issues of mismanagement of the firms which often lead to inefficiency in the use of capital for productive outcomes, which in turn compromises the performance of these firms and the government's ability to carry out its functions through SOEs efficiently.

In this regard, Hones (1982) cited in Nindi (1996, p. 21) asserts that, “some of the problems that affect the performance of public entities are inherent in the ownership of these SOEs while others stem mainly from managerial weakness and lack of flexibility”. According to Fourie (2014), the structural and operational problems within SOEs have led to irregular and unequal patterns of growth, inconsistent service delivery and infrastructure development.

The contributing factor to such occurrences can be attributed to the conception that SOEs are agents that absorb government funds as they may be able to secure additional financial assistance even in cases where the investments made by the state to support these SOEs do not deliver adequate returns and even in cases where the operational performance is poor (Forfas, 2000).

The protection of SOEs against the probability of bankruptcy, reduces incentives for board members to contain costs and improve performance through competition (Kim & Ali, 2017). This safety net becomes detrimental to the growth of the economy as income generated by the state from taxes are used to bailout these SOEs and as a result compromising service delivery.

In South Africa for example, there has been growing skepticism about the ability of some of the major SOEs such as Eskom to achieve optimal economic results and has been considered to be having harmful effects on the economy as a whole as the entity had to receive financial assistance from the state on several occasions.

Eskom for example, has for a number of years been in financial distress with about more than 400 billion in debt which is unable to service from its revenue as it is unable to sell enough power to cover its interest payments and operating costs (Bloomberg, 2019). Some of the reasons being cited as a result of this dilemma is the issue of irregular expenditure, a legacy of years of mismanagement of the entity, the looting of funds of the entity by senior management, over-staffing, cost overruns on new plants and overvaluation (Bloomberg, 2019).

This has also been the case with other State-Owned Entities such as the SAA which has debt of around R12, 7 billion and hasn't made any profits since the year 2011 (Bloomberg, 2019). The crisis at the cash strapped Denel is also as a result of corruption and poor management of the entity which resulted in huge losses. Loss-making and ineffective financial SOEs weaken the financial system as a whole, and, by lending mainly to unprofitable SOEs, they can create contingent liabilities that become a source of fiscal risk (World Bank, 2014). In many countries, the provision of financial relief in the form of loans to the underperforming SOEs bring high financial and economic costs and often remain a fiscal burden and a source of fiscal risk that creates contingent liabilities that become a source of fiscal risk to the economy as a whole (World Bank, 2014).

Secondly, another factor that impedes efficiency in the SOEs is the issue of political interference whereby board members and the appointments of senior management in these entities is largely selected on the basis of political considerations (e.g. members from the ruling party are likely to occupy these positions) which can produce weak and conflicted boards rather than appointments based on professional competence (Kim & Ali, 2017).

This can as result, at worst exploit SOEs for personal and partisan benefits while compromising short-term efficiency and long-term efficacy of the SOEs (Robinett, 2006). In addition, "Board-level committee structures are nascent, and board expertise in important areas such as audit and risk management remain weak in many SOEs" (World Bank, 2014, p: 15).

In their study on "*Corporate Governance, Political Interference, and Corporate Performance of China's Listed Companies*" Chang and Wong (2002) offer evidence that brings together the robust body of theoretical and empirical aspects of the corporate performance implications of political interference which supports the notion that political interference in State owned companies' decision-making negatively affects their performance.

The notion that political interference affects the performance of SOEs raises more important issues such as whether executive appointments as well as board members based on political consideration promote expressly political agendas, and whether boards are able to operate without undue political interference once appointed (Corrigan, 2014). Thus, Corrigan (2014) maintains that ubiquitous politicization of SOEs puts some of the central tenets of good corporate governance at risk of being ineffective and looked over.

Nellis (1994) further argues that having competitive markets, autonomous and profit maximizing managers are some of the conditions that need to be in place in order to promote efficient SOE operations however these are often neglected by politicians from the ruling party to drive political goals. In addition, this is further supported by Stiglitz (1993) who argues that politicians cannot reliably commit to encouraging competition as a result of their aspirations to drive political goals with the use of these SOEs.

These arguments are supported by several studies that they have undertaken based on the abuse and political use of SOEs (Shirley and Walsh, 2000). On the other hand, issues of multiple actors in SOEs such as line ministries, the ministry of finance, and a number of other government bodies affect the performance of the entities as the state usually exercises its ownership responsibilities through these multiple actors (World Bank, 2014).

Although the establishment of multiple governance layers may contribute to the success of SOEs, research conducted by the World Bank (2014) shows that conflict may arise between state ownership functions and its policymaking and regulatory functions which may, in turn, leave the institution vulnerable to being used to achieve short-term political gains detrimental to SOE efficiency (World Bank, 2014). Additionally, the influence of political interference on SOEs can open opportunities for corruption and create a system of patronage (World Bank, 2014).

In this regard, according to Shleifer & Vishny (1994) this type of influence becomes possible largely because SOEs at times become inefficient entities as a result of the pressures that the politicians exert on them. A system of patronage and weak corporate governance often make SOEs susceptible to corruption which consequently leads to the distortion of public spending reduce the inputs such as investments in infrastructure and qualification of human resources which are that are necessary to stimulate economic growth (Lopes, et al., 2018).

These impediments will inhibit the stimulation of the economy through the provision of economic infrastructure as the State's assets that could be used more productively elsewhere in the economy may be tied up as a result of the looting of government resources (World Bank, 2014). In essence, "the inefficient provision of critical inputs and services can increase costs for local businesses and divert scarce public sector resources and taxpayers' money away from social sectors that directly benefit the poor" (World Bank, 2014, p. 20).

Most if not many of the challenges can also be attributed to the lack of a clear set of goals and a performance monitoring system to ensure accountability, transparency and responsibility for performance, particularly of the board and the chief executive officer (World Bank, 2014). Wong (2004) on the other hand highlights additional issues of governance which arise as a result of SOEs pursuing multiple and often potentially conflicting objectives whereby these entities are mandated to carry out economic activities via ensuring constant revenue for the SOEs and on the other hand fulfilling a public policy role whereby costs are kept at production prices in order to ensure affordability of the basic goods and services for the general public.

As noted by Wong (2004), entities that are under state ownership are by law required to be as profitable as their non-state-owned counterparts in order to ensure that senior management is kept on their "toes" to promote efficiency of SOEs and be socially responsible.

In the context South Africa's major challenges with regards to the SOEs, problems faced by these major SOEs are as a result of the lack of strict adherence and appreciation of the important tenets of corporative governance regulations and guidelines by the board members (Thabane & Snyman-Van Deventer, 2018).

In addition, other problems arise as result of issues around the role of government as a single or dominant shareholder in a sense that this has often at times led to substantial political interference in the operations of these SOEs (Thabane & Snyman-Van Deventer, 2018). This is further compounded by lack of integrity amongst senior management.

2.6. How have governments in different countries dealt with these challenges through a number of SOE reforms?

In view of the above, SOEs still remain significant to growing economies in a number of countries despite the number of challenges outlined. In this regard, both developed and developing countries where key sectors of the economy are still under State ownership have taken measures to ensure that the SOEs yield the aspired rewards in order to grow their respective economies.

In some of the countries where the governance and operational structures have been effectively improved, these initiatives have assisted in enhancing the competitiveness of SOEs and the economies as a whole; provided critical infrastructure and other services in a reduce the fiscal burden and fiscal risk of SOEs while improving their access to external sources of finance through the capital markets; and strengthen transparency and accountability (World Bank, 2014).

In essence, good corporate governance which is key to the success of SOEs is characterized by: strong oversight and monitoring by shareholders, this requires the development of specific and transparent mandates to ensure that SOEs have clear objectives and targets which can at all times be reported on and monitored over time (Forfas, 2000).

In many cases, the legislative factors which oversee SOEs do not give a sufficiently clear mandate to these bodies regarding their broad objectives and goals (Forfas, 2000). In this regard, to address the issue of political interference and the appointment of senior managers and the board under political considerations, the selection of such positions must be done through a strict professional recruitment based on the candidates' technical, financial and corporate governance skills where conflict of interest should be resisted (World Bank, 2014).

One of the other contributing factors to the success of SOEs is due to that the appointments of executive personnel are on the basis of merit assessments determined by their technical expertise (Wong, 2009). This was the strategy implemented to deal with the issues of appointments made on political considerations. The senior staff of these SOEs work on a three-year term and can only be dismissed as result of incompetence (Wong, 2009).

Another example is that of the New Zealand whereby the appointment of the boards and senior managers of SOEs is done through a specialized unit (Crown Company Monitoring Advisory Unit) which uses a clearly defined criteria and a screening process that is based on technical skills required for the advertised position ensuring that the candidate's skills match the needs of a specific SOE board based on merit assessments (Wong, 2009). Additionally, other strategic interventions that contributed to the success of SOEs in New Zealand include, the commitment by the government to regularly monitor the operations and performance of the SOEs through the setting up of "transparent and detailed mechanism for cost declaration to prevent mismanagement of funds and by instituting penalties to discourage underperformance" (Christiansen, 2013, p: 15).

In addition, the perception that SOEs are hierarchical and bureaucratic have often discouraged meritorious individuals as a result of appointments of individuals in senior positions being based on political considerations rather than technical expertise and merit assessment along with (Kim & Ali, 2017).

Thus, SOEs should ensure that competition for senior positions is of high-quality standards and is complemented by a performance-based competitive salary and benefits packages which are designed such that meritorious individuals with technical expertise to run the SOE are drawn to these positions (Kim & Ali, 2017).

The study on corporative governance by the World Bank group has also credited the measures put in place to safeguard the SOEs against political interference and the independence granted to the appointees of the SOEs in senior positions in their commercial decision making of the functioning of the SOEs (World Bank, 2014). In addition, Kim and Ali (2017, p: 4) argue that, “the governments should explicitly delineate realistic, time-bound, and quantifiable outcomes to better guide and evaluate SOE performance. This includes drafting a clear scorecard that evaluates progress on not only the financial viability and strengths of SOEs but also social objectives such as job creation, public service, welfare provision, and other social benefits”. The success of SOEs heavily relies on good governance as it is at the core to the running and success of SOEs.

For example, the success story of SOEs in countries such China, Malaysia and Indonesia has also been attributed to the implementation of effective performance monitoring systems, the balance between a state’s ownership mandate (appointing boards and providing oversight) and improving SOE competitiveness simultaneously as the ownership function was exercised through a centralized ownership unit that operated independently and in compliance with its publicly disclosed ownership policy (World bank, 2014).

On the other hand, the case of the Botswana Power Industry which has historically performed well in the sub-Saharan African context and can also be described as one of the success stories of an African SOE that has followed a path of strict adherence to and enforcement of corporate governance principles which led to its Success (Mbo, 2017). For example, between the year 2000 and 2013 access to electricity by the rural population improved significantly from about 22% to about 55% (BPC, 2013 cited in Mbo, 2017).

This as a result led to an improvement in the growth of the economy and contributed to a growth of electricity consumption per capita to 1,406 kWh per annum by 2008, being amongst the top 20 in Africa (Mbo, 2017). In addition, the utility corporation showed progress in improving profitability of the firm as it reached revenues amounting to 36 million US Dollar by the year 2005 with the revenue growth averaging 12% and 7.4 for the Gross Domestic Product from the year 2000 to 2005 (Mbo, 2017). Moreover, another factor that played an instrumental role in the success of these SOEs is the development of the Human and capital resources (Mbo, 2017).

As a result, the development of human capacity was thus given top priority as a fully-fledged training institute was established in-house which offered training initiatives focusing on executive development; graduate trainee programmes; staff exchange programmes and a range of industry specific courses to a certification level (Mbo, 2017). Such initiatives boosted worker morale which is key to the success of a firm.

The success of the Malaysian Government Linked Companies provides an example as one of the success stories where SOEs have been effective in driving the economic growth when the State implemented a Transformation Programme with key focus on the restructuring of SOEs which put realistic and performance-based objectives in place in line with international benchmarks (Kim & Ali, 2017).

As part of the reform to drive growth through the use of SOEs, the program put in place a number of strategies such as the introduction of key performance indicators (KPIs), as well as performance-based contracts and compensation, along with a change in the composition of GLC boards and senior management (Kim & Ali, 2017). In addition, specialized units within the program were established in order to determine and tackle the root causes of poor performance of the SOEs, improved the operational, legal and regulatory framework in order to be in line with the specific SOE objectives and infused newer management from the private and public sector into SOEs (Kim & Ali, 2017).

With the implementation of a number of clear mandates and sophisticated indicators in ensuring that performance is of high quality, these reforms were put in place as top priority in the operations of the SOEs and ensuring that senior management perform to the best interest of the entities (Kim & Ali, 2017). Therefore, the transformation of the operational structures in the Government Linked Companies yielded positive outcomes such as a performance-based culture in the best interest of the entity, better use of State's capital and resources, and an improved management of the SOEs (Kim & Ali, 2017).

Secondly, the market capitalization of the entities had tripled and grew by 11% annually between the year 2004 and 2014 which boosted the returns on equity of the Malaysian Government Linked Companies equal to the ones outlined by the listed companies in the financial markets and (Kim & Ali, 2017).

Driven by the success of the Government Linked Companies transformation programme, the government had constructed New Economic Models which led to the expansion of the entity's operations globally (Kim & Ali, 2017). This as a result, grew the operations of the government linked companies to 42 countries globally and had about 20 of their largest SOEs revenue operating globally tripling from \$7 billion to \$22 billion by 2014 from the year 2004 (Kim & Ali, 2017).

The efficient operational and performance of SOEs is a lengthy and complex process that requires quite an extensive implementation of a number of policy frameworks founded on the basis of high levels of commitment, transparency, accountability, persistence and flexibility on the part of management and public authorities to make a success of SOEs.

2.7. The importance of Economic infrastructural investment/expenditure of SOEs on economic growth

The infrastructural development plays a significant role and is one of key determinants of the economic growth in both the economic and social development in any economy. For the purpose of this study, it is important to provide an overview of the role that infrastructure spending by SOEs plays in driving growth.

Gramlich (1994) defines infrastructure spending as consumption expenditure by the state or private sector which can be divided into two categories namely economic and social. The economic consists of power generation, water supply and sanitation facilities and transport, whilst the social consists of educational and health care facilities to mention a few (Gramlich, 1994).

In addition, infrastructure spending can also be referred to as direct inputs used in the production process or regarded as capital goods (Gramlich, 1994). As infrastructure could otherwise be placed under the broader heading of physical capital, this approach assumes that infrastructure may be related to growth in a manner different to other forms of physical capital (Gramlich, 1994). Theory holds that an increase in the stock of infrastructure would increase the output of the economy as a whole, directly inducing economic growth.

Infrastructural development has a number of benefits to a country's growth as it plays a significant role in the creation of the production facilities, enhances the economic activities, reduces the transaction and trade costs, decreases production costs and improve the market competitiveness (Fedderke & Garlick, 2008). For example, a reliable power generation infrastructure plays a central role in the production process of goods and services and thus inefficient or unreliable supply of power generation proves to be more expensive or almost impossible in these processes and thus negatively affects the growth of the economy (Gramlich, 1994). On the other hand, the expansion and efficient provision of infrastructure by SOEs may lower costs in the production process of goods and services (Gramlich, 1994).

Additionally, Fedderke & Garlick, (2008) asserts that, inadequate provision of infrastructure inhibits the growth of firms and may raise a number of costs for firms as these firms may as a result need to develop contingency plans against infrastructure failure or even build infrastructure themselves to ensure that production is operational.

In this regard, firms may for example may seek alternative ways to do business and thus potentially incur massive costs for both inputs and finished goods as a result of inadequate infrastructure. Taking into account the concept of human capital formation for example, “infrastructure, in the form of schools, roads used to access schools and electricity provided to schools, is likely to be an important factor in the human capital production function” (Fedderke & Garlick, 2008).

More generally, infrastructure becomes a major determinant of various inputs in the factors of production of any economy and as a result, the efficient provision of infrastructure in the form of power generation, transport facilities, telecommunications, water and sanitation improve growth rates. Thus, the accumulation of other factors of production may improve growth rates of the economy indirectly as a result of a boost in the accumulation of capital goods or improve growth rates via boosting the productivity of these factors of production (Fedderke & Garlick, 2008).

Before examining how expenditure of SOEs on infrastructure contributes to economic growth, it is essential to define the term economic infrastructure. Thus, from an economic standpoint, infrastructure can be defined as a capital good in the sense that its origins lie in investment expenditure and is characterized by its long duration, technical indivisibility and a high capital output ratio (Torrise, 2009). Economic infrastructure is part of the capital stock used to facilitate economic production, or as production inputs for example, electricity, roads, and ports (Mnyaka, 2014).

In the case of SA, the financing of infrastructure development is largely carried out by a number of SOEs predominantly Eskom and Transnet for example (IDC, 2017). This goes to the problem of trying to justify the existence of SOEs from the standpoint of countries that seek to achieve high growth rates. In the 2011/12 financial year alone, SOEs reportedly spent a total of R514.4 billion on infrastructure (Treasury, 2017). This was mostly in the energy, transport and logistic realms. This infrastructure has contributed to the country’s economic development in various ways.

For example, according to the National Treasury (2017), Transnet invested in new locomotives and rail infrastructure that has raised the general freight business capacity by 26.4 million tons, the export line by 9 million tons and the export iron ore line by 7.2 million tons. Eskom on the other hand, has increased generating capacity by 1 893 MW as new units came online. This played a crucial role in its mandate to lowering the cost of doing business in South Africa, facilitating economic development and ensuring security of supply through providing appropriate port, rail and pipeline infrastructure in a cost effective and efficient manner (DBSA, 2012).

Conclusion

In summing up, this chapter has conceptualized the concept of State-owned entities in great detail and noted that these entities have their pro's and con's whereby in some instances where state owned entities have failed to meet their objectives have been largely critiqued and brought about the concept of privatization as an alternative. On the other hand, in instances where they have been successful the transformation of state assets into SOEs has been seen as an effective strategy to promote more effective and efficient service delivery. In addition, the literature also provided us with an in-depth discussion on the role and importance of State-owned entities and illustrated that these entities play a significant role in developing new industries, providing infrastructure thereby insuring economic growth.

The section further discusses how these entities are governed in terms of the legal and legislative framework to illustrate how these entities are operated in line with the PMFA.

CHAPTER 3: METHODOLOGY

There is a plethora of research that has been conducted on the role of firms in the economy. These look at the contribution of private firms on a spectrum of economic determinants and lastly on economic growth. Very little of this research is dedicated to the assessment of states owned companies and their individual effect on the economy as well as the direct effect that they have on various economic activities in the economy. This section of the paper will present some of the research methodologies which have been applied in the studies relating to the subject of State-Owned Entities from different perspectives.

In the context of this study, economic growth will be measured from the production approach using gross value addition of the entity. Thus, the branch of economics usually describes growth in relation to the production function for goods and services, “where aggregate economic output is a function of a collection of production inputs or factors of production” (Fedderke & Garlick, 2008, p.23).

This paper basis its analysis on data obtained across four SOEs in South Africa and covers a period from 1996 to 2018. The impact of these SOEs is then measured across thirteen different industries. The model used for the analysis was developed from various existing models. Each model is discussed below, followed by the description of the model that will be used for this paper.

Firstly, Chen & Feng (2000) use a cross-sectional analysis of six Chinese provinces to evaluate the effect of the presence of state-owned companies to the economic growth of the respective provinces. The cross-sectional study uses the averaged time series of the variables in order to evaluate each cross-section.

The model used by the authors is as follows:

$$g_i = \alpha + \beta_1 GDP_i + \beta_2 EDU_i + \beta_3 FERT_i + \beta_4 SOE_1 + \beta_5 INFLATE_i + \beta_6 TRADE_i + \varepsilon_i \dots (1)$$

For which the i subscript represents the provinces. g , GDP, EDU, FERT, INFLATE and TRADE denote the growth in real income per capital; the initial level of development; the level of human capital; the crude birth rate at the beginning of the study; the level of inflation and the level of trade respectively.

SOE is a dichotomous categorical variable that illustrates the presence of SOE's in the province, this is a focal point of the study and is subsequently removed from the fixed effects of the cross-section. The above model is then assessed using Ordinary Least Squares (OLS) estimation and the empirical results illustrate that the presence of SOE's in the provinces reduce the economic growth of the respective provinces and economy at large. Pointing to the managerial and market challenges experienced by the firms as being a core reasons for this (Chen & Feng, 2000).

This methodology can be adjusted to be able to look at the national and sectorial contribution of the state-owned enterprises. One alternative would be including time indices on the variables and use a panel data methodology such as to improve estimates as well as the inclusion of the intertemporal behavior of the variables.

Chen & Feng (2000) removed these dynamics by using averages of the respective time series. This was done to look at the long run trends of the series however the averaging can remove the dynamics of the data series (Cheng & Feng, 2000). The paper also gives a qualitative understanding of the role of SOE on the provinces but not the quantitative stance that is required for understanding the value created or contributed to the economies.

Consistent with the above, Li (1997) uses a panel data approach to evaluate the effect of SOE reforms on the output generated by multiple Chinese sectors of the economy. Taking a microeconomic approach to the estimation, LI (1997) uses an augmented production function for the analysis of 272 state-owned enterprises. This analysis is conducted using an analysis of the firm's marginal productivity as well as the Total Factor Productivity (TFP) of the state-owned industries in each industry.

The analysis controls for the central planned nature of the Chinese market by adjusting the total productivity growth in the firms. The Cobb-Douglas production function used has the following specification:

$$Q_{nt} = F_n(L_{nt}, K_{nt}, M_{nt} R_{nt}) A_{nt} \dots \dots \dots (2)$$

The subscripts n, t denote the firm and time indices respectively. Q is described as the value of output created by the firm using the Production process F . The inputs into this production process are Labour (L), Capital (K), intermediate inputs (M) and the institutional environment (R). The production process is augmented to the available level of technology (A) at time t . By taking the value of production of the goods in each sector, Li (1997) evaluates the contribution of the firms by means of a nonlinear three-step least squares and a nonlinear seemingly unrelated estimation methodology.

The reform in institutional environment shows that the firms were able to increase TFP in the sectors, pointing to the procyclical nature of SOE performance on sectorial economic growth within the Chinese context (Li, 1997). This methodology speaks to the objective of measuring, quantitatively, the effect of state-owned enterprises' effect on the South African (RSA) economy however the methodology is explicit to a microeconomic analysis and is not applicable to the RSA economy as it looks at a central planned economy where as South Africa is a mixed economy.

This report will employ some elements of qualitative and quantitative method to address the key questions that will assist in understanding the extent to which SOEs drive development. In addition, the report will use an econometric equation IS relation used by Olivier Blanchard (2013).

This methodology is used in order to generate an in-depth analysis on the impact of SOEs looking at the specific SOE expenditures to understand whether or not they drive economic growth. The analysis will allow for the determination of the statistical significance between South African economic growth and the SOE expenditures such as to understand the developmental value that the state-owned enterprises offer to the economy.

Our methodology is derived from the work of Blanchard (2013) based on the IS curve relation model outlined in macroeconomics. The methodology is outlined in the equation below:

$$Y = C + I + G + X - M \dots \dots \dots (3)$$

Whereby Output (Y) is determined by consumption (C), Investment (I), Government Spending (G), Exports (X) and Imports (M). In this regard, an increase in consumption, investment, government spending will lead to an increase in output (Y) therefore an increase in a country's growth rates and vice versa. In addition, if the value of exports is higher than that of imports then there will be an increase in output. Conversely, should the value of imports be higher than that of exports then there will be a decrease in output (Y) growth rates.

Such a relation allows the analysis of the economy as a whole as well as the value of output on an industry or sectorial level based on macroeconomic variables. The IS equation in the case of our study illustrates the sectoral growth rates with the inclusion of SOE expenditure. The equation that will be used in this research for the purpose of illustrating if the existence of SOEs leads to higher growth rates and how SOEs affect each industry. In this case, the equation becomes:

$$Y_I = \alpha + \beta_1 GDP_t + \beta_2 BOP_t + \beta_3 REAL\ RATE_{t00} + \beta_4 SOE_t + \beta_5 INFR_t + \varepsilon_t \dots \dots \dots (4)$$

(Y) Variable represents Industry Level Output; (GDP) represents the South African Gross Domestic Product; BOP represents the external economic and investment position of the country; (R) denotes Interest Rates which are negatively related to Y_I as a result of an increase in the real interest rate can in stifle investments due to high cost of borrowing on the investments through the SOEs; (SOE) denotes State Owned Entities expenditure; (ε_t) denotes stochastic Error term of the model which incorporates the random shocks that may affect the deterministic mean. This study encompasses the economic parameters that are viewed as important components to economic growth, drawing heavily on major findings in the study of economic growth.

The parameter of SOE expenditure in this case determines growth (Y) which they are positively related. In this regard, an efficient well run SOE will lead to higher growth rates through job creation, investment in infrastructure resulting from the existence of SOEs.

All data was obtained from specific SOEs Annual reports, Quantec, StatsSA and the South African Reserve Bank. The basic argument is that Output at an industry level is determined by the growth rate of our GDP. Thus, when our GDP increases, we expect industrial output to increase because this increase in GDP will drive demand that will drive the production of output in (sector I) thus $\delta_0 > 0$. When SOE expenditure increases, part of the procurement will be picked up by different industries meaning they will produce for the demand that is driven by SOEs, $\delta_1 > 0$.

Interest rate determines output negatively at the sectoral level, an increase in interest rate means that the cost of producing this output using debt increases, thus $\delta_2 < 0$. GDP (foreign demand), when foreign income increases and they are importing from an industry in the SA economy, the demand for goods and services produced by that particular industry are going to increase, thus $\delta_3 > 0$. The error term encompasses all the other variables that affect growth such as income distribution, political stability etc.

To be consistent with the literature, the paper takes the analysis from a production side approach and uses the value added by the economic activities as our measure of output. The model was further modified to include more refined economic variables in the form of the Balance of Payments (BOP). The economic value of the SOE was measured by the company's value added which is equivalent to the company's total factor income or value of sales. The investments of the firm can be described as the change in the firms change in fixed capital or the firm's infrastructure spending, which is a variable of interest. The price level, interest rate and the income of the economy was included with the inclusion of Real interest rates and Real Gross Domestic Product (GDP).

These are adjusted for consumer prices inflation and will be considered in the firm's production choices based on cost and market implications. In principle, the value added by the firm is centered on the value of output that is created with explicit consideration of the inputs. A Leontif system approach is used in the analysis of the firm in order to compute the value added by its production process.

Koopman et al (2008) uses such a system to look at the value addition process for Chinese exports. A VAR estimation technique is used for the dynamic analysis that also consists of the foreign value addition. Using the following system:

$$F(A, Y) = X \dots\dots\dots (5)$$

$$G(B, Y^*) = M \dots\dots\dots (6)$$

For which A is the Leontif system of domestic factor inputs and output and Y is the real Gross Domestic Product and X is the Gross Value of Exports. B is the foreign input-output matrix and Y^* is the real GDP of the foreign economies with M being the value of domestic imports. This system is then used to look at the dynamics of the value addition process.

For the purposes of the analysis, we only require a static analysis on factor productivity of a firm and the value added to domestic Gross Value Added (GVA). Subsequently the Model is refined to incorporate these needs.

The Leontif matrix is assumed to be embedded in the sales or turnover of the firm, as it is the value of outputs using the required labour and capital inputs. Real GDP is still used. Instead of measuring the contribution to exports, our adjustment will look at the contribution to GVA. To further enhance the model, we look at the effect of real interest rates on the GVA. This is because, firstly it implicitly incorporated the effect of price changes of Value Addition.

Secondly, it helps gives insight into the manner in which firms allocate resources based on the real value of the cost of capital. Subsequently the following equation will be estimated:

$$\begin{aligned} & \text{Gross Value Added}_t = I(\text{Turnover}, \text{Real GDP}, \text{Real Interest Rate}) \\ & \text{Gross Value Added}_t = \alpha + \beta \text{Turnover}_t + \delta Y_t + \lambda r_t + \varepsilon_t \dots \dots \dots (7) \end{aligned}$$

The following equation will be estimated using Ordinary Least Squares, to measure the contribution of the firm towards the economy's GVA. The analysis will also look at the intra-sector linkages that exist because of direct and indirect influences by the firm. The relation is defined as:

$$\begin{aligned} & \text{Sector VA}_t = H(\text{Turnover}, \text{Real GDP}, \text{Real Interest Rate}) \\ & \text{Sector VA}_t = \rho + \phi \text{Turnover}_t + \varphi Y_t + \theta r_t + \mu_t \dots \dots \dots (8) \end{aligned}$$

The relations (7) and (8) will be estimated to measure the effect of SOE value addition on the economy as well as its various sectors.

Provincial methodology: “In a cross-country setting, numerous theoretical and empirical studies find that growth is determined by human capital, fertility, trade, government consumption, the rule of law, political stability, income distribution, inflation and the terms of trade” (Cheng & Feng, 1997).

We adopt the following basic multivariate statistical model to investigate the impact on economic growth across provinces:

$$g_t^{(i)} = \alpha + \beta_1 \text{GDP}_t + \beta_2 \text{BOP}_t + \beta_3 \text{REAL RATE}_{t00} + \beta_4 \text{SOE}_t + \beta_5 \text{INFR}_t + \varepsilon_t \dots \dots \dots (9)$$

In the equation above, the index i represents the i -th province whilst the subscript t refers to time (year), g denotes the growth rate in real provincial income, β_1 is the GDP parameter that is expected to be positive given that an increase in GDP leads to an increase in the demand of goods and services from province i , β_2 is the Balance of Payment parameter, Real Rate β_3 denotes real interest rates which are negatively related to $g_t^{(i)}$ as a result of an increase in the real interest rate can in stifle investments due to high cost of borrowing on the investments through the SOEs. The parameter β_4 represents SOE value added (represented by firm Turnover) such that an increase in the value-added leads to an increase in the growth rate of Gross Value Addition in province i . INFRASTRUCTURE spending β_5 indicates spending on infrastructure by SOEs which leads to an increase in $g_t^{(i)}$ as a result of increased spending in bulk infrastructure (Chen & Feng, 1999).

Eq. (4) will provide an analysis of SOE infrastructure expenditure on growth at an industry level and Eq. (9) will provide an analysis based on the role of SOE expenditure in driving growth at a provincial level. This will enable us to understand which industries benefit from each SOE that we consider, and to also have a spatial understanding to the growth benefits within the South African economy and why it is important to understand the impact of SOE expenditure from a spatial perspective, reasoning should be in line with knowing which part of the country will be most affected when intervening or changing expenditure patterns for SOEs.

CHAPTER 4: DATA ANALYSIS AND FINDINGS OF THE STUDY

This section of the study will provide the findings of the research in line with the research problem with the use the economic models discussed in the methodology section and illustrate the relationship between SOE expenditure and the extent to which that drives growth at an industry or sectoral and provincial levels, respectively. The economic and statistical analysis will further be used in the findings to address the research questions of the report i.e. to illustrate whether Does SOE expenditure significantly drive industrial or sectoral growth? And if SOE expenditure determine growth at a provincial level?

In this regard, this study will use a sectorial level data sourced from the South African Reserve Bank for the following variables: the gross value added that will be used to compute sectorial growth rates, Gross Domestic product of the South African economy, consumer price index to compute inflation and the trade balance that captures the trade surplus or deficit. We will source SOE expenditure from the annual statements of SOEs as indicated previously in the methodology section.

The Gross Value-Added data series is obtained from the South African National Accounts on the OECD database; the Consumer Price Index and Real Gross Domestic Product series were attained on the Global Financial Data database. The SOE turnover data is obtained on the iRESS Expert database. The variables (except the real interest rate which is already in percentages) are all transformed into growth rates by means of a logarithmic transformation then differencing. The times series will be annual from 1995 – 2017.

4.1. DIAGNOSTIC CHECKS

The data series' were initially used to check for stationarity using the method proposed by Dickey & Fuller (1979), for which the null hypothesis is that the time series has a unit root. From the data series that were assessed, only Gross Value Added is found to have a unit root whilst all other series' are said to be stationary at their growth rates.

Secondly, the series' are checked for model specification using the correlogram. The respective results illustrate that the series exhibit an autoregressive process of order 1 [AR(1)]. Subsequently indicating the inclusion of a lagged dependent variable in the models. The key concern with the analysis was the existence of multicollinearity between regressors and respective regressands. Tables of correlation are computed and presented in the appendix of the paper. Excessive collinearity is defined as correlation that is or almost linear whereby the correlation between variables is above 0.8. The correlation tables illustrate that correlations of this nature only exist between Real Gross Domestic Product and several provinces in the spatial analysis.

4.2. National and Sectoral Results

The estimation results in this analysis are conducted under a least squares estimation and the standard errors in the analysis are corrected using the method from Newey & West (1987). This procedure corrects the standard error for heteroscedasticity and serial correlation of a lag of 1.

4.2.1. DENEL SOC Ltd.

This section will look at the autoregressive regressions used to estimate the equations (7) and (8) found in the methodology section above. Tables 1 – 4 below illustrate the results for Denel SOC Ltd.; Eskom SOC Ltd.; Rand Water SOC Ltd. and Transnet SOC Ltd. respectively from the year 1995 to 2017. The tables consist of the analysis of the Gross Value Added by each firm in the South African economy and an analysis based on sector to sector.

In this regard, Table 1 illustrates the results for Denel SOC Ltd. and assist in giving a comprehensive view of the relationship between the enterprises' financial performance and infrastructure spending on the South African economy. Column 1 of table 1 illustrates that the firm's turnover (value added) is statistically significant in the value added in the economy. Taking into account the economic effect of the entity on the performance of the economy at large, at the 10% confidence level, a 1% rise in the value created by Denel will lead to a 0.05% rise in domestic gross value added.

The model used in column 1 has a significantly high R^2 value of 0.737 showing that the model fits the data well. In addition, this model is jointly significant having an F-statistic that is statistically significant at the 1% level. Infrastructure spending on the other hand, is not statistically significant, inferring that spending by the firm in a certain period does not influence the gross value added by the entity in that period.

The model also illustrates that there exists a negative inertial effect, such that a rise in this period's value added will lead to a fall of 0.48% in the following period. This describes the cyclical nature of the data series.

The economic value created by Denel is also found to be statistically significant in sectors such as; the Energy and Manufacturing; Agriculture, Public Administration; Information, Communication & Telecommunications and Other Services. These results are illustrated in column 2, 3, 4, 11, 12 and 13 respectively. Prior expectation of the effect of infrastructure spending on the economy is that this spending would contribute positively to these sectors particularly in the communication and telecommunication due to its investment infrastructure programmes in the enhancement of engineering skills and modification of its technological capacity. This is evident in five of the six sectors.

Infrastructure spending in the value creation process of the energy industries as presented in column 3 of the table is found to be statistically insignificant. The Durbin Watson statistic for the above industries are all significantly close to 2, with the exception of the construction and financial intermediary's sectors, pointing to the absence of a model specification problem.

Table 1: Value Added Analysis for Denel SOC Ltd.

	(1) Gross Value Added	(2) Agriculture	(3) Industry Energy	(4) Industry Manufacturing	(5) Construction	(6) Retail	(7) Real Estate
Constant	-0.034570 (0.008397)***	-0.061112 (0.018227)***	-0.013150 -0.011678	-0.008323 (0.008885)	-0.04162 (0.038558)	-0.003141 (0.003998)	0.000975 (0.014033)
Lagged VA	-0.483832 (0.139924)***	0.110281 (0.119752)	0.392677 (0.102624)***	0.110644 (0.192518)	0.701598 (0.202230)***	-0.114173 (0.193745)	0.084745 (0.194867)
Turnover	0.059889 (0.033968)*	0.278149 (0.125318)**	0.234548 (0.030841)***	0.096097 (0.024228)***	0.226676 (0.153595)	-0.051089 (0.136835)	0.071106 (0.105971)
Real Interest Rate	0.063815 (0.140222)	-1.344394 (0.277703)***	-0.351387 (0.071131)***	-0.599275 (0.151458)***	0.055482 (0.561202)	0.227364 (0.436191)	0.236306 (0.215593)
Real GDP Growth	0.957096 (0.263834)***	2.957407 (1.098243)**	0.616752 (0.221756)**	0.91896 (0.140412)***	2.24987 (0.991724)**	1.430663 (0.338572)***	0.592964 (0.580869)
Lagged Real Interest rate	0.106000 (0.158690)	1.172167 (0.455179)**	0.627557 (0.110914)***	0.831588 (0.159175)***	-0.162043 (0.653520)	-0.010388 (0.533829)	0.232881 (0.194051)
Balance of Payments	0.002850 (0.028985)	0.184815 (0.048594)***	-0.068653 (0.022036)***	-0.016728 (0.024584)	-0.143601 (0.115943)	-0.056047 (0.026968)*	-0.009066 (0.037036)
Infrastructure Spending	-0.027000 (0.008529)***	0.106223 (0.025883)***	-0.038810 (0.009543)***	-0.009979 (0.011798)	-0.017434 (0.040591)	-0.009382 (0.026965)	-0.014527 (0.019025)
Observations	22	22	22	22	22	22	22
R-Squared	0.737584	0.709095	0.798192	0.76817	0.623413	0.698073	0.421667
Adj R-squared	0.615123	0.539401	0.68047	0.632936	0.403738	0.521949	0.132501
F-stat	6.023018	4.178661	6.780342	5.680308	2.837882	3.963532	1.458218
Prob (F Stat)	0.001772	0.014815	0.002098	0.004459	0.05415	0.017949	0.259133
Durbin-Watson D	1.716971	2.058921	2.245209	1.983934	2.73471	2.190403	2.19041
	p<1% *** , p<5% ** , p<10% *						

	(8) Financial and Insurance	(9) Financial Intermediaries	(10) Distributive Trade	(11) Public Admin	(12) ICT	(13) Other Services
Constant	0.000851 (0.021230)	-0.030664 (0.020021)	0.001286 (0.016103)	-0.028857 (0.009975)***	-0.00361 (0.021669)	-0.022797 (0.00871)***
Lagged GGVA	0.027249 (0.140757)	-0.718246 (0.093217)***	-0.082479 (0.138865)	-0.188389 (0.114948)	0.180009 (0.135555)	-0.467766 (0.14917)***
Turnover	-0.056772 (0.045785)	0.021923 (0.044144)	0.018253 (0.061196)	0.08466 (0.03795)**	-0.112129 (0.09806)	0.060168 (0.036021)
Real Interest Rate	0.412411 (0.280124)	0.126255 (0.492871)	0.082004 (0.250146)	0.226847 (0.171931)	0.40275 (0.517756)	0.264429 (0.227203)
Real GDP Growth	1.514012 (0.709237)*	1.065673 (0.327258)***	1.324267 (0.360688)***	1.080834 (0.301494)***	1.184911 (0.264466)***	0.846118 (0.319584)**
Lagged Real Interest rate	-0.048162 (0.307473)	-0.125103 (0.372221)	0.100107 (0.342815)	-0.230387 (0.115841)*	-0.272819 (0.54767)	-0.249878 (0.187494)
Balance of Payments	-0.022414 (0.045342)	0.005358 (0.056178)	-0.012371 (0.029695)	0.06464 (0.023322)**	-0.068147 (0.048798)	0.069057 (0.017845)***
Infrastructure Spending	-0.023394 (0.031460)	-0.049437 (0.021527)**	-0.023336 (0.018238)	0.002739 (0.003933)	0.010696 (0.010526)	-0.015219 (0.004461)***
Observations	22	22	22	22	22	22
R-Squared	0.639576	0.629618	0.617125	0.623043	0.623043	0.594264
Adj R-squared	0.459363	0.413562	0.43845	0.434565	0.434565	0.357584
F-stat	3.549013	2.914141	3.453893	3.305645	3.305645	2.510837
Prob (F Stat)	0.020866	0.049959	0.020862	0.027101	0.027101	0.077274
Durbin-Watson D	2.133048	1.47922	1.748609	1.871461	1.871461	1.920267

p<1% ***, p<5% **, p<10% *

4.2.2. ESKOM SOC Ltd.

Table 2 illustrates the estimation results for ESKOM SOC Ltd which is by capitalization, South Africa's largest State-owned enterprise. The initial expectation of the results is the fact that the value creation process and infrastructure spending of the firm plays a significant role in the economy. This assumption is founded on the basis that Eskom is the country's main electricity producer, supplying over 95 percent of the electricity consumed in the country.

The results presented in table 2 are incredibly alarming as the value creation by the entity does not significantly contribute to the economy when considering its sheer size and operational reach. This could be attributed to a time series that is short, coupled with a model that is inclusive of 8 estimation parameters and inclusion of lagged variables in the estimation technique. The listed factors can affect the accuracy of the parameter estimates. Although biased there are some interesting inferences that can be made from the results in table 2.

The results presented in table 2 show that the firms' turnover is not statistically significant in the value creation process in the South African economy as shown in column 1. The parameter estimate infers that a 1% rise in ESKOM turnover will reduce the growth of gross value added by 0.03%.

The economy's gross value added has, embedded in it, an inertial effect as previously seen in the case of Denel above. At the 1% confidence level, a fall in the previous gross value added will realize a 0.28% rise in the gross value added in the current period. The ESKOM turnover is statistically significant at the 5% level for the agricultural, energy and construction industries of the economy which implies that a percentage point increase in turnover leads to a 0.12%, 0.04% and 0.22% fall in the respective industries.

The infrastructure spending term is found to be statistically significant, at the 10% level, for the overall growth of gross value added as well as for Construction and the Real Estate sectors of the economy. A 1% increase in infrastructure spending by ESKOM would lead to a 0.17% and 0.11% increase in the value added in these sectors and a fall in the growth in gross value added by 0.06%.

The positive relationship between infrastructure spending by Eskom and value addition by the different sectors can be attributed to the fact the Eskom has injected huge sums of money in the building of the Medupi and Kusile power stations. The significance of financials and insurance would articulate themselves in the new debt raised for these power stations and the vast amount of insurance coverage for the multi-billion rand infrastructure build.

Majority of the R^2 values for the respective models are low with only models on aggregate value added (column 1) and Manufacturing (column 4) having a value larger than 0.7. Subsequently the tests of joint significance point to a few models not being significant at the 5% level of significance.

Table 2: Value Added Analysis for Eskom SOC Ltd.

	(1) Gross Value Added	(2) Agriculture	(3) Industry Energy	(4) Industry Manufacturing	(5) Construction	(6) Retail	(7) Real Estate
Constant	-0.024741 (0.004323)***	0.015707 (0.017538)	0.002036 (0.009817)	-0.001864 (0.011128)	-0.019013 (0.023614)	-0.006686 (0.005738)	0.003874 (0.007929)
Lagged GGVA	-0.372674 (0.080649)***	-0.087451 (0.332012)	0.155711 (0.116238)	-0.149824 (0.316005)	0.428202 (0.154477)**	-0.199256 (0.152282)	-0.575292 (0.494858)
Turnover	-0.030026 (0.053683)	-0.415322 (0.090062)***	-0.162206 (0.049963)***	-0.024026 (0.032459)	-0.223668 (0.088125)**	0.001768 (0.030652)	0.012865 (0.079402)
Real Interest Rate	-0.168479 (0.056455)**	-0.971607 (0.328209)***	-0.554161 (0.197541)**	-0.542747 (0.061755)***	0.090034 (0.587459)	0.162201 (0.640426)	0.592693 (0.343496)
Real GDP Growth	1.174593 (0.203305)***	1.520497 (1.067755)	0.655783 (0.390790)	0.704638 (0.265325)**	1.523139 (0.519158)**	1.513353 (0.273382)***	0.328858 (0.231420)
Lagged Real Interest rate	0.159804 (0.068850)**	0.258588 (0.285920)	0.641684 (0.280243)**	0.780980 (0.230532)***	-0.229879 (0.473706)	0.149644 (0.699592)	0.326480 (0.102463)***
Balance of Payments	0.035768 (0.005922)***	0.147377 (0.041932)***	-0.007426 (0.018408)	-0.010468 (0.011719)	-0.091719 (0.084534)	-0.056386 (0.038143)	0.007251 (0.028118)
Infrastructure Spending	-0.061594 (0.014275)***	0.124915 (0.093199)	-0.008060 (0.028551)	0.053899 (0.033342)	0.167038 (0.089111)*	0.010759 (0.023459)	0.118586 (0.045500)**
Observations	22	22	22	22	22	22	22
R-Squared	0.708771	0.442244	0.500995	0.744890	0.674311	0.670102	0.523968
Adj R-squared	0.572865	0.116887	0.209909	0.596075	0.484326	0.477662	0.285952
F-stat	5.215135	1.359257	1.721123	5.005497	3.549285	3.482127	2.201399
Prob (F Stat)	0.003562	0.305323	0.194956	0.007439	0.026405	0.02817	0.098969
Durbin-Watson D	1.911561	1.919318	2.176845	1.709951	2.468943	2.126006	2.492611

p<1% ***, p<5% **, p<10% *

	(8) Financial and Insurance	(9) Financial Intermediaries	(10) Distributive Trade	(11) Public Admin	(12) ICT	(13) Other Services
Constant	-0.004395 (0.014680)	-0.035580 (0.020890)	-0.001197 (0.006982)	-0.020088 (0.011762)	-0.004803 (0.019921)	-0.020604 (0.013014)
Lagged GGVA	-0.198050 (0.162932)	-0.743647 (0.088877)	-0.258924 (0.149307)	-0.245599 (0.310487)	0.066523 (0.212975)	-0.345735 (0.247798)
Turnover	-0.092629 (0.071160)	0.037810 (0.077695)	0.089055 (0.102989)	-0.035374 (0.109600)	-0.068386 (0.057792)	0.001056 (0.099202)
Real Interest Rate	0.330980 (0.199442)	-0.236349 (0.293151)	0.032491 (0.224856)	0.197515 (0.145805)	0.345764 (0.5099610)	0.189245 (0.222079)
Real GDP Growth	1.559252 (0.822368)*	1.536116 (0.829480)*	1.465203 (0.367736)***	1.009184 (0.319559)***	1.360880 (0.385672)***	0.908356 (0.319441)**
Lagged Real Interest rate	0.319119 (0.259656)	0.180678 (0.347339)	0.191896 (0.294559)	-0.312328 (0.128016)**	-0.102933 (0.452991)	-0.241689 (0.144995)
Balance of Payments	-0.020086 (0.033599)	0.040193 (0.035051)	-0.000878 (0.012387)	0.077832 (0.035722)**	-0.096085 (0.055184)	0.075189 (0.016740)**
Infrastructure Spending	0.078687 (0.062411)	-0.093085 (0.091508)	-0.000466 (0.037864)	-0.010143 (0.033427)	0.005674 (0.042992)	-0.027192 (0.024554)
Observations	22	22	22	22	22	22
R-Squared	0.662344	0.58542	0.577998	0.506474	0.562993	0.530553
Adj R-squared	0.493517	0.343581	0.381064	0.25971	0.359056	0.256709
F-stat	3.923195	2.420706	2.934983	2.052468	2.760624	1.937430
Prob (F Stat)	0.014182	0.08548	0.037949	0.119466	0.046811	0.149987
Durbin-Watson D	2.247106	2.135803	1.832714	1.81539	2.165061	1.654187

p<1% ***, p<5% **, p<10% *

4.2.3. Rand Water SOC Ltd.

Table 3 illustrates the results from the estimation of the effect by gross value addition of Rand Water SOC Ltd. The results show that the entity has an impact on the value created in the South African economy. Looking at column 1 of table 3, we observe that the revenue of Rand Water is statistically significant at the 10% level. Subsequently inferring that a 1% increase in Rand Water turnover will lead to a 0.14% rise in the growth in domestic value added.

The infrastructure expenditure of the firm on the other hand does not yield a statistically significant outcome. This implies that the effect on gross value added would be biased. However, the estimation parameter has a negative signage. The negative relation is not consistent with expectations that an increase in infrastructure spending would lead to a higher growth rate of gross value added.

In addition, the model presented in column 1 as a R^2 value of 0.66, with an F-statistic result that supports a jointly significant model. A concern lies in the fact the Durbin-Watson D statistic is relatively low at 1.57, pointing to the presence of a positive autocorrelation or model specification error. Furthermore, table 3 also illustrates that the value created by the firm is statistically significant in a few sectors of the economy namely; Real Estate and Financial and Insurance.

These results indicate that, given the nature of business that Rand Water conducts, its value creation process would directly affect the Real Estate sector more than Financial and Insurance given the amount of water used by households and businesses. In this regard, a 1% rise in Rand Water turnover can realize the 0.12% growth in the sector. Rand Water's infrastructure spending has an impact on the Retail, Distributive Trade, Public Administration and Information, Computer and Telecommunication sectors.

As a result, the expenditures on fixed capital contributes to the value added in the respective sectors with a positive contribution found in public administration whilst negative contributions are in the other sectors.

The initial expectation of the results was that infrastructure spending would have a larger impact in industries such as; agriculture and manufacturing. Taking into account that the operation of the firm was initially established to service the Greater Witwatersrand region, now the City of Johannesburg. Subsequently sectors least predominant in the area would not realize the effect of the operational value of the firm.

Table 3: Value Added Analysis for Rand Water SOC Ltd.

	(1) Gross Value Added	(2) Agriculture	(3) Industry Energy	(4) Industry Manufacturing	(5) Construction	(6) Retail	(7) Real Estate
Constant	-0.043009 (0.013323)***	-0.00425 (0.076954)	-0.022409 (0.027669)	-0.009521 -0.015675	-0.035351 (0.032524)	-0.005451 (0.012824)	-0.016219 (0.013052)
Lagged GGVA	-0.392289 (0.134834)**	0.137069 (0.342252)	0.12443 (0.251603)	0.040912 -0.199019	0.597502 (0.1463)***	0.008836 (0.174575)	-0.060652 (0.354364)
Turnover	0.140565 (0.06877)*	-0.243754 (0.33113)	0.023503 (0.106701)	-0.001492 -0.086469	-0.037943 (0.213518)	0.029225 (0.072845)	0.123046 (0.047302)**
Real Interest Rate	-0.163112 (0.080656)*	-0.336817 (0.435282)	-0.441504 (0.192802)**	-0.637849 (0.075579)***	0.064421 (0.778125)	0.0757 (0.364956)	0.150031 (0.250813)
Real GDP Growth	1.280041 (0.386628)***	1.831429 (1.61413)	0.829962 (0.392952)*	0.975135 (0.348559)**	2.16144 (0.849647)**	1.591923 (0.233066)***	0.758553 (0.372429)*
Lagged Real Interest rate	0.133434 (0.177076)	-0.023095 (0.641929)	0.631329 (0.441818)	0.801335 (0.072811)***	-0.298068 (0.683602)	0.029842 (0.35989)	0.379781 (0.083515)***
Balance of Payments	0.062025 (0.018199)***	0.047613 (0.097631)	-0.010924 (0.0754)	-0.004454 -0.024751	-0.123977 (0.196582)	-0.022676 (0.018871)	0.027451 (0.037131)
Infrastructure Spending	-0.014066 (0.020283)	0.017223 (0.102092)	0.002064 (0.042012)	0.00164 -0.017699	0.007385 (0.072039)	-0.041406 (0.009065)***	0.061501 (0.037487)
Observations	22	22	22	22	22	22	22
R-Squared	0.664447	0.286608	0.462179	0.743676	0.564759	0.753636	0.517775
Adj R-squared	0.496671	-0.167368	0.119929	0.580561	0.287787	0.596859	0.258115
F-stat	3.960315	0.631328	1.350414	4.559213	2.039050	4.807055	1.994052
Prob (F Stat)	0.013662	0.722144	0.314745	0.012857	0.139903	0.010616	0.134061
Durbin-Watson D	1.574676	1.790738	1.603203	1.619155	2.300589	1.910272	1.598839
p<1% ***, p<5% **, p<10% *							

	(8) Financial and Insurance	(9) Financial Intermediaries	(10) Distributive Trade	(11) Public Admin	(12) ICT	(13) Other Services
Constant	-0.020794 (0.017503)	-0.069209 (0.033075)*	0.001899 (0.017063)	-0.022211 (0.009228)**	-0.012124 (0.013611)	-0.025978 (0.009503)**
Lagged GGVA	-0.006562 (0.158772)	-0.657263 (0.132312)***	-0.083526 (0.123155)	-0.451637 (0.301153)	0.226914 (0.227451)	-0.406553 (0.554451)
Turnover	0.201074 (0.099344)*	0.303713 (0.219098)	-0.004524 (0.092267)	-0.08204 (0.1141)	0.093294 (0.087985)	-0.013568 (0.132756)
Real Interest Rate	0.096871 (0.248028)	-0.315892 (0.19588)	-0.064218 (0.176246)	0.306877 (0.181322)	0.271028 (0.422081)	0.246055 (0.274247)
Real GDP Growth	2.054471 (0.463193)***	1.667454 (0.696057)**	1.484139 (0.40067)***	0.88215 (0.259045)***	1.490065 (0.399564)***	0.82529 (0.529691)
Lagged Real Interest rate	0.199556 (0.226339)	0.254934 (0.158798)	0.166903 (0.257946)	-0.285412 (0.182684)	-0.21705 (0.440088)	-0.210083 (0.272825)
Balance of Payments	0.025333 (0.029587)	0.094186 (0.055914)	0.017889 (0.022458)	0.072339 (0.017195)***	-0.061429 (0.031753)*	0.074126 (0.045698)
Infrastructure Spending	-0.021153 (0.03053)	0.012779 (0.030806)	-0.02351 (0.013148)*	0.019405 (0.009351)*	-0.052144 (0.016586)***	0.00605 (0.013567)
Observations	22	22	22	22	22	22
R-Squared	0.675131	0.592697	0.583025	0.556816	0.637974	0.495319
Adj R-squared	0.500201	0.333504	0.374538	0.335225	0.456961	0.174159
F-stat	3.859443	2.286704	2.796454	2.512803	3.524464	1.542281
Prob (F Stat)	0.017196	0.106165	0.048150	0.067440	0.021415	0.249865
Durbin-Watson D	2.420808	2.040289	1.385526	1.912944	2.222837	1.788184
p<1% ***, p<5% **,p<10%*						

4.2.4. Transnet SOC Ltd.

Table 4 depicts the estimation results based on the effect of Transnet SOC Ltd. value created on the South African economy and its individual economic sectors.

Column 1 of table 4 portrays the analysis of the South African economy using the growth of gross value added. The results illustrate that the turnover of the enterprise is statistically significant at the 1% level, to the value created in the national economy.

With all else equal, one can deduce that a 1% rise in turnover, can lead to a 0.07% rise in the gross value added in the South African economy. The infrastructure expenditure of the SOE is found to be statistically significant in contributing to the national gross value addition. The results indicate that the increase in fixed capital expenditures will not be favourable for the South African economy as it reduces the growth of value added in the economy by 0.03% for each 1% rise in expenditures.

Additionally, the model demonstrates a statistical joint significance and a R^2 value that is 0.79. This value is high and illustrates a great fit for the model and that the variations experienced by the dependent variable are adequately explained in the model presented. Although jointly significant, the Durbin-Watson D statistic is slightly lower than 2 and this raises the issue of the role of model misspecification in the analysis. The matter of serial correlation has been compensated through the use of the Newey-West methodology discussed above.

The sectorial analysis of the state-owned enterprise in columns 2 to 13 illustrate that the turnover of the entity will statistically affect industries such as; energy, manufacturing, construction; public administration, Information, communication and Telecommunications, other services as well as financial intermediaries.

In this regard, a percentage point increase in annual returns leads to a rise in sector value added by 0.15 percentage points in the energy sector as found in column 3 and by 0.05 percentage points in the manufacturing sector in column 4 respectively.

A similar effect is expected in the construction industry; however, the effect is 0.13 percentage points with a 1 percentage point rise. Moreover, infrastructure spending of the enterprise is found to be statistically significant for the Agricultural, Retail as well as the Distributive Trade sectors, with the respective estimators being significant at the 5% level of confidence. Overall the models are well structured with relatively satisfactory R^2 values and the models demonstrating joint significance with the exception of Agriculture; Real Estate and Financial Intermediaries.

Table 4: Value Added Analysis for Transnet SOC Ltd.

	(1) Gross Value Added	(2) Agriculture	(3) Industry Energy	(4) Industry Manufacturing	(5) Construction	(6) Retail	(7) Real Estate
Constant	-0.034822 (0.007106)***	-0.068020 (0.023949)**	-0.030412 (0.027652)	-0.015475 (0.010249)	-0.059811 (0.034052)	0.007585 (0.007805)	-0.007719 (0.015310)
Lagged GGVA	-0.555228 (0.188178)**	0.110690 (0.301060)	0.220507 (0.128753)	0.071366 (0.190960)	0.709711 (0.150269)***	-0.047250 (0.155058)	-0.059130 (0.295085)
Turnover	0.074654 (0.010268)***	0.045348 (0.045279)	0.150633 (0.016526)***	0.051439 (0.017397)**	0.138772 (0.073677)*	-0.045850 (0.026289)	0.089697 (0.063803)
Real Interest Rate	0.064816 (0.061416)	-1.395417 (0.345223)***	-0.473809 (0.140061)***	-0.679700 (0.100857)***	-0.054953 (1.143588)	0.405134 (0.282549)	-0.044251 (0.239966)
Real GDP Growth	1.320758 (0.192107)***	2.229427 (0.952956)**	1.275656 (0.273906)***	1.149660 (0.222688)***	2.709287 (0.530599)***	1.397211 (0.257736)***	0.923160 (0.771295)
Lagged Real Interest rate	-0.053865 (0.065066)	1.229313 (0.462599)**	0.548323 (0.295450)*	0.818202 (0.124998)***	-0.231235 (1.229508)	-0.260274 (0.338920)	0.474823 (0.252154)*
Balance of Payments	0.045128 (0.009438)***	0.076201 (0.071413)	-0.004559 (0.035406)	0.001072 (0.019594)	-0.113865 (0.202998)	-0.038168 (0.020655)*	0.031263 (0.023063)
Infrastructure Spending	-0.027655 (0.004414)***	0.122861 (0.027761)***	-0.006836 (0.019013)	0.002137 (0.006329)	0.007918 (0.058047)	-0.037720 (0.007273)***	0.024590 (0.021529)
Observations	22	22	22	22	22	22	22
R-Squared	0.796795	0.550682	0.709791	0.773516	0.597499	0.813240	0.524127
Adj R-squared	0.695193	0.264752	0.525113	0.629390	0.341362	0.694392	0.267888
F-stat	7.842297	1.925933	3.843394	5.366945	2.332734	6.842716	2.045461
Prob (F Stat)	0.000594	0.159191	0.023217	0.007040	0.100964	0.002696	0.125820
Durbin-Watson D	1.830993	1.775581	1.535910	1.540934	2.391925	1.758283	1.824379

p<1% ***, p<5% **, p<10% *

	(8) Financial and Insurance	(9) Financial Intermediaries	(10) Distributive Trade	(11) Public Admin	(12) ICT	(13) Other Services
Constant	-0.011655 (0.014057)	-0.062667 (0.028007)**	0.004892 (0.012178)	-0.030199 (0.014396)*	-0.000795 (0.012425)	-0.025043 (0.01099)**
Lagged GGVA	-0.078617 (0.176187)	-0.736139 (0.114835)***	-0.074399 (0.124222)	-0.464573 (0.121954)***	0.185119 (0.154771)	-0.647303 (0.14396)***
Turnover	-0.019125 (0.033489)	0.129975 (0.049790)**	0.014581 (0.024927)	0.087159 (0.025183)***	-0.111109 (0.05118)**	0.075129 (0.020039)***
Real Interest Rate	0.119465 (0.291897)	-0.295401 (0.195920)	0.211294 (0.243228)	0.211189 (0.179635)	0.599278 (0.420315)	0.328884 (0.295349)
Real GDP Growth	1.677300 (0.573360)	1.719973 (0.769595)**	1.532853 (0.584119)**	1.314418 (0.444689)**	0.989906 (0.334919)**	1.192193 (0.311559)***
Lagged Real Interest rate	0.438918 (0.256317)	0.365464 (0.187455)*	-0.124318 (0.548670)	-0.348584 (0.136311)**	-0.321354 (0.423512)	-0.435291 (0.180241)**
Balance of Payments	-0.014275 (0.029166)	0.055153 (0.020742)**	0.013569 (0.019058)	0.098683 (0.017979)***	-0.102368 (0.043353)**	0.100639 (0.021233)***
Infrastructure Spending	0.021212 (0.023089)	0.014055 (0.012559)	-0.038580 (0.013170)**	-0.006024 (0.007464)	-0.020852 (0.013995)	-0.023929 (0.011899)
Observations	22	22	22	22	22	22
R-Squared	0.622555	0.582131	0.715806	0.642558	0.638651	0.732195
Adj R-squared	0.419315	0.316215	0.573709	0.463837	0.457977	0.561773
F-stat	3.063156	2.189152	5.037452	3.595313	3.534817	4.296377
Prob (F Stat)	0.038812	0.118221	0.004973	0.019872	0.021182	0.015865
Durbin-Watson stat	2.006635	1.672129	1.286465	1.997559	1.591393	1.629380

p<1% ***, p<5% **, p<10% *

4.2.5. Robustness Checks

The following subsection of the analysis will look at the robustness of the results. Due to the small sample properties of the analysis, a panel regression method is used to enhance the findings of the previous time series estimations. The panel is comprised of the 4 State-Owned Companies for the period between 1995 – 2017, subsequently the panel is long in nature. As a result, the results from a fixed or random effect will be the same (Gujarrati & Porter, 2009, pg. 606).

The panel regression will use a least squares estimation methodology where by the cross-sectional effects are said to be fixed across time. The standard errors of the estimates are corrected by the method proposed by (White, 1980). The results are illustrated in the table below

The results presented in table 5 are consistent with the results found in the previous analysis section in that at a national level, the value added by the state-owned enterprises is statistically significant to the value added in the economy such that a 1% rise in SOE turnover will grow nation GVA by 0.02%. The sample data however is unable to illustrate that the infrastructure spending of the SOE's is statistically significant to the national value added. The turnover of the SOE's is a significant determinant of various sectors such as Industry (Energy & Manufacturing), Real Estate, Financial Intermediaries and Public administration.

Table 5: Panel Regression Results for the State-Owned Enterprises

	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction
Constant	0.021058 (0.005780)***	-0.002993 (0.009858)	0.011117 (0.003338)***	0.005055 (0.005128)	-0.001696 (0.006836)
Lagged VA	0.487265 (0.065837)***	0.307429 (0.101046)***	0.286521 (0.063981)***	0.372054 (0.094787)***	0.597921 (0.131648)***
Turnover	0.019135 (0.010560)*	0.020829 (0.032845)	0.023692 (0.009553)**	0.049049 (0.014193)***	0.026334 (0.024797)
Real Interest Rate	-0.375288 (0.066032)***	-0.385179 (0.113238)***	-0.369239 (0.035982)***	-0.304435 (0.045278)***	-0.162418 (0.078195)**
Real GDP Growth	0.820479 (0.092349)***	0.936432 (0.275973)***	0.264452 (0.069979)***	0.230732 (0.106434)**	0.824084 (0.210401)***
Lagged Real Interest rate	0.400323 (0.041565)***	0.234874 (0.144735)	0.446470 (0.034536)***	0.353840 (0.045930)***	-0.017219 (0.076632)
Balance of Payments	0.017113 (0.005569)***	0.044045 (0.017201)**	0.000545 (0.004524)	-0.012042 (0.006743)*	-0.057740 (0.022392)**
Infrastructure Spending	0.002598 (0.004050)	0.039960 (0.011645)***	0.003209 (0.003758)	-0.002732 (0.004586)	0.008333 (0.006756)
No. of Observations	84	76	76	76	88
R-Squared	0.796220	0.353986	0.683438	0.465085	0.534154
Adj R-squared	0.768305	0.254599	0.634737	0.382791	0.473655
F-stat	28.52295	3.561701	14.03313	5.651473	8.829075
Prob (F Stat)	0.000000	0.000838	0.000000	0.000005	0.000000
Durbin-Watson D	1.915094	1.580016	1.932401	1.842190	2.336800

p<1% ***, p<5% **, p<10% *

	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT
Constant	0.023608 (0.004367)***	-0.014198 (0.004408)***	0.031946 (0.003767)***	-0.007633 (0.002132)***	0.025568 (0.004783)***
Lagged VA	0.058985 (0.096318)	-0.616636 (0.104438)***	-0.106445 (0.076299)	-0.049158 (0.084691)	0.128670 (0.125323)
Turnover	-0.000356 (0.011607)	0.022339 (0.013519)*	0.013289 (0.009041)	0.012828 (0.007689)*	-0.028766 (0.014769)*
Real Interest Rate	0.037928 (0.094423)	-0.219887 (0.069077)***	-0.047705 (0.038593)	-0.144877 (0.03050)***	0.083923 (0.061452)
Real GDP Growth	0.463298 (0.122914)**	0.440113 (0.128542)***	0.375197 (0.072973)***	0.321909 (0.062048)***	0.304045 (0.106668)***
Lagged Real Interest rate	0.172781 (0.090049)	0.146565 (0.067528)***	0.124469 (0.051874)**	0.036891 (0.032118)	0.021750 (0.067740)
Balance of Payments	-4.70E-05 (0.008563)	0.014057 (0.007545)***	0.006660 (0.004544)	0.021119 (0.006183)***	-0.039414 (0.006558)***
Infrastructure Spending	0.006180 (0.005129)	0.001144 (0.005216)	-0.003369 (0.003961)	0.006733 (0.002427)***	0.004447 (0.004813)
No. of Observations	84	72	88	84	88
R-Squared	0.442870	0.493222	0.426046	0.440580	0.512164
Adj R-squared	0.366550	0.410144	0.351506	0.389054	0.448809
F-stat	5.802856	5.936831	5.715700	8.550710	8.083998
Prob (F Stat)	0.000002	0.000003	0.000002	0.000000	0.000000
Durbin-Watson D	2.276020	2.240502	1.782749	1.408826	2.336911

p<1% ***, p<5% **, p<10% *

4.2.6. What are the quantitative implications of the regression analysis?

The following subsection of the results discusses the economic contribution of the respective state-owned enterprises. The analysis makes use of the regression output, more especially the regression coefficient for the firm's turnover and infrastructure spending. Statistically speaking, the regression coefficients are the expected mean of the process over the time period. The log-normal growth rates will then be multiplied by the respective value added to measure the effect of the SOE in Millions of Rands, adjusted for the consumer price inflation with base year 2010.

Table 6 below illustrates the effect of Denel infrastructure spending on value addition in millions of Rands. The analysis provides a quantitative perspective of the SOE's effect on the economy. In this regard, Denel's infrastructure spending is found to negatively affect national gross value added with a figure of R32.12 billion found in 1995 and grew to about R77.12 billion as of 2017.

However, it needs to be mentioned that within the same period, the effect of the turnover by the entity is almost double that of infrastructure spending effect with R71.24 billion in 1994 to R171.06 billion as of 2017 as shown in table 7. The general net effect can be seen to be positive by Denel. Additionally, Denel has a segment of its business units within the technologies sector which as a result has benefited positively from the infrastructure spending by the entity in the ICT sector as illustrated in table 7. However, the contribution in the sector is negative for turnover by the entity. The infrastructure expenditure of the firm can be seen to improve value added more especially within the components of Research and Development (R&D). The R&D can enhance the capacity and value added in the sector of technologies.

Table 6: Average Real effect of Denel's Infrastructure Spending across sectors in millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	-32119.3	4883.088	-14772.3	-2534.99	9294.431	-2644.95	-967.452	-2709.61	-9018.41	-3999.64	540.6263	1182.161	-1021.24
1996	-33745.2	5586.56	-15162.6	-2539.46	9679.836	-2781.88	-1033	-2847.45	-9532.71	-4125.62	596.1993	1280.531	-1071.97
1997	-34405.8	5452.301	-15044.8	-2553.31	10023.99	-2805.88	-1078.08	-3121.93	-10266.2	-4101.83	612.8897	1318.79	-1118.31
1998	-34665.9	5160.324	-14958.4	-2511.4	9438.824	-2824.11	-1138.35	-3220.66	-10679.9	-4064.85	620.8865	1356.532	-1159.33
1999	-36084.1	5049.152	-15137.1	-2498.97	9099.517	-3010.16	-1175.13	-3661.18	-11736	-4385.29	629.6731	1421.774	-1244.06
2000	-38873.3	5025.72	-16673.1	-2754.76	9013.019	-3356.59	-1235.68	-3858.18	-12358.3	-4951.62	643.2941	1557.128	-1379.19
2001	-40697.8	5645.129	-18083.7	-2897.36	9056.757	-3432.1	-1306.3	-4165.86	-13249	-4977.48	652.6276	1631.353	-1428.06
2002	-43303.8	6312.277	-19589.7	-3100.78	8703.886	-3541.53	-1417.42	-4836.18	-15043.6	-5184.3	661.8541	1661.324	-1516.27
2003	-44533.1	5867.238	-18909	-3123.33	9175.896	-3816.85	-1475.7	-5207.59	-16026.8	-5441.03	684.5656	1857.533	-1618.75
2004	-49429.2	5957.678	-20341	-3401.17	11058.83	-4327.94	-1642.86	-5959.02	-18183.7	-6148.08	751.1138	2116.139	-1779.59
2005	-53422	5603.485	-21589.8	-3581.56	12979.34	-4644.3	-1815.36	-6719.81	-20378.4	-6537.7	802.8688	2298.235	-1923.87
2006	-57835.6	5941.709	-22552.1	-3511.39	14522.41	-5238.33	-1834.29	-7657.6	-22424.6	-7061.74	843.5191	2735.253	-2081.33
2007	-62513.9	7276.526	-24621.6	-3714.35	18275.88	-5415.88	-2070.66	-8706.48	-25445.5	-7422.28	890.9186	2772.42	-2163.68
2008	-64411.3	8032.262	-26299.5	-3806.12	23519.27	-5435.93	-2090.58	-8299.57	-24653.4	-7749.88	946.648	2645.121	-2105.19
2009	-63981.3	7521.588	-24657.4	-3547.95	22586.94	-5282.71	-2194.43	-8221.47	-24841.8	-7714.01	1017.041	2486.885	-2163.72
2010	-67361.2	6968.782	-25407.1	-3579.46	21636.84	-5629.94	-2253.27	-8618.75	-25881.6	-8647.86	1108.328	2454.721	-2260.95
2011	-70044.6	6989.838	-25624.2	-3446.4	22412.46	-5937.31	-2258.37	-8974.19	-26600.1	-8987.75	1170.478	2620.952	-2375.89
2012	-71322.1	6753.64	-25139.8	-3426.75	23237.63	-6201.35	-2256.57	-9127.8	-26984.4	-9205.54	1197.013	2784.134	-2415.83
2013	-73191.8	6716.633	-25552.3	-3489.45	24822.36	-6302.9	-2243.68	-9233.22	-27074	-9408.35	1246.688	2974.932	-2406.69
2014	-73971.1	7052.265	-25800.5	-3669.87	25441.76	-6358.51	-2257.6	-9266.37	-27744.3	-9431.98	1285.71	3015.998	-2397.62
2015	-75148	6874.227	-25427.2	-3725.15	25918.42	-	-2300.5	-9501.92	-	-9712.84	1318.09	3046.059	-2478.67
2016	-75459.3	7248.643	-25876.6	-3764.14	25199.29	-	-2274.73	-9476.93	-	-9717.16	1351.082	2961.735	-2442.4
2017	-77120	7739.866	-26378.7	-3768.91	25345.25	-	-	-	-	-10014.8	1386.735	3013.425	-2522.85

Table 7: Average Real effect of Denel's Turnover across sectors in Millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	71244.25	12786.55	89276.23	24411.79	9294.431	-14402.9	4735.434	-6575.61	3999.242	3128.446	16710.27	-12392.9	4037.452
1996	74850.55	14628.62	91635.05	24454.77	9679.836	-15148.5	5056.289	-6910.13	4227.312	3226.989	18427.98	-13424.1	4238.01
1997	76315.86	14277.06	90923.37	24588.18	10023.99	-15279.2	5276.909	-7576.24	4552.558	3208.38	18943.86	-13825.2	4421.208
1998	76892.81	13512.51	90400.79	24184.58	9438.824	-15378.5	5571.941	-7815.83	4736.047	3179.455	19191.04	-14220.9	4583.385
1999	80038.48	13221.4	91481.17	24064.89	9099.517	-16391.6	5751.985	-8884.88	5204.385	3430.093	19462.62	-14904.8	4918.371
2000	86225.29	13160.04	100763.7	26528.13	9013.019	-18278	6048.33	-9362.93	5480.35	3873.067	19883.64	-16323.8	5452.596
2001	90272.23	14781.99	109288.9	27901.32	9056.757	-18689.2	6394.029	-10109.6	5875.298	3893.294	20172.12	-17101.9	5645.809
2002	96052.64	16528.94	118390.2	29860.32	8703.886	-19285.1	6937.892	-11736.3	6671.14	4055.065	20457.31	-17416.1	5994.553
2003	98779.27	15363.59	114276.3	30077.41	9175.896	-20784.4	7223.192	-12637.7	7107.155	4255.873	21159.3	-19473	6399.711
2004	109639.5	15600.41	122931	32753	11058.83	-23567.5	8041.403	-14461.2	8063.602	4808.916	23216.24	-22184	7035.568
2005	118496	14672.94	130478	34490.18	12979.34	-25290.2	8885.714	-16307.5	9036.855	5113.668	24815.94	-24093	7605.968
2006	128285.8	15558.59	136293.5	33814.37	14522.41	-28524.9	8978.384	-18583.3	9944.269	5523.565	26072.41	-28674.4	8228.508
2007	138662.8	19053.86	148800.7	35768.86	18275.88	-29491.8	10135.36	-21128.7	11283.89	5805.574	27537.48	-29064	8554.055
2008	142871.3	21032.79	158940.6	36652.69	23519.27	-29601	10232.86	-20141.2	10932.64	6061.816	29260.03	-27729.5	8322.842
2009	141917.7	19695.57	149016.7	34166.44	22586.94	-28766.6	10741.2	-19951.7	11016.17	6033.759	31435.82	-26070.7	8554.219
2010	149414.7	18248.02	153547.9	34469.93	21636.84	-30657.4	11029.17	-20915.8	11477.26	6764.203	34257.42	-25733.5	8938.63
2011	155366.6	18303.16	154859.7	33188.58	22412.46	-32331.2	11054.16	-21778.3	11795.9	7030.058	36178.41	-27476.1	9393.038
2012	158200.4	17684.67	151932	32999.35	23237.63	-33769	11045.35	-22151.1	11966.34	7200.412	36998.59	-29186.8	9550.927
2013	162347.5	17587.76	154425.2	33603.18	24822.36	-34322	10982.23	-22407	12006.06	7359.04	38534.01	-31187	9514.783
2014	164076.1	18466.63	155925.1	35340.54	25441.76	-34624.8	11050.37	-22487.4	12303.3	7377.526	39740.13	-31617.5	9478.954
2015	166686.6	18000.43	153669.3	35872.94	25918.42	-	11260.37	-23059	-	7597.21	40740.98	-31932.6	9799.356
2016	167377.1	18980.85	156384.9	36248.34	25199.29	-	11134.24	-22998.4	-	7600.592	41760.7	-31048.6	9655.969
2017	171060.8	20267.13	159419.5	36294.28	25345.25	-	-	-	-	7833.435	42862.71	-31590.5	9974.045

Table 8 below illustrates the gross value added in the respective sector by ESKOM SOC Ltd investment spending. The table takes the average effect of investment spending using the regression outputs illustrated in table 3.

The table illustrates that the value added by Eskom as presented looks at the average movement in the Value added by the entity in the respective sectors over the period analyzed. The results show that infrastructure spending raises production and value in the economy in sectors such as; Agriculture, Manufacturing, ICT, Construction, Real estate and Financial & Insurance.

Manufacturing and Agriculture have been cited as important sectors of development identified by the National Development Plan (National Planning Commission, 2012). Subsequently the efficient management and operation of the State-owned Entity is pivotal to realizing the goals cited in the South African Policy document.

Table 9 illustrates the value added by the enterprises' operational revenue (or operational value added). In this regard, the growth rate of turnover has an effect on the value added on the economy as a result of an increase in the value added realized by Retail, financial intermediaries, Real Estate and Distributive Trade sectors. These shows that the operational value added by the firm is significant in creating value for the various sectors of the economy.

The other sectors such as the energy industry and industry manufacturing illustrate a negative contribution to value added by the entity. The study measures the economic growth from the production perspective which finds that Eskom will be prejudiced with respect to value added. This is due to the fact that electricity is a fundamental input in the production process subsequently an increase in Eskom turnover is attributable to increases in the cost of electricity for firms.

This implies that firms will incur higher variable costs to operate and in times would need to back track on capacity in order to mitigate the increased cost of electricity. The overall effect is that the value added because of capacity constraints will decline.

Furthermore, Retail and Distributive trades for example, are some of the sectors that do not heavily rely on the use electricity in their production process, thus these sectors are that affected by the turnover of Eskom which would result from increasing the electricity costs. However, manufacturing industries on the other hand, heavily rely on the use of electricity in the production process of their goods and services and are thus largely affected by Eskom turnover. For example, if the increase in the turnover of Eskom is a result of an increase in the cost of electricity, these sectors suffer the most as a result of their rising input costs. The tables below illustrate that the enterprise plays a significant role in the development of the South African economy through its infrastructure spending particularly in sectors such as; industry energy, construction and manufacturing for example.

Stripping away this role for the economy can be detrimental as Table 8 illustrates that, on average, Eskom has added over R 6 Billion in value to construction and a further R 20 Billion in additional value for Manufacturing as of 2017. At the time of writing, the South African government has decided to dismantle the SOE into three business units and an adverse effect of this would be the severing of key operational synergies. These will affect the Value added to the economy.

Table 8: Average Real effect of Eskom Infrastructure Spending across sectors in millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	-73272.52	5742.36	-3067.89	13692.12	2210.03	3033.15	7897.45	9113.92	-16980.77	-79.87	-2002.03	627.11	-1824.66
1996	-76981.50	6569.62	-3148.94	13716.22	2301.67	3190.17	8432.55	9577.56	-17949.16	-82.39	-2207.83	679.29	-1915.30
1997	-78488.52	6411.74	-3124.49	13791.05	2383.50	3217.70	8800.49	10500.80	-19330.15	-81.91	-2269.64	699.59	-1998.10
1998	-79081.89	6068.38	-3106.53	13564.68	2244.36	3238.60	9292.52	10832.88	-20109.24	-81.17	-2299.25	719.61	-2071.39
1999	-82317.13	5937.65	-3143.66	13497.54	2163.68	3451.96	9592.79	12314.60	-22097.81	-87.57	-2331.79	754.22	-2222.78
2000	-88680.06	5910.09	-3462.64	14879.13	2143.11	3849.23	10087.01	12977.18	-23269.55	-98.88	-2382.23	826.02	-2464.22
2001	-92842.22	6638.50	-3755.60	15649.32	2153.51	3935.83	10663.55	14012.11	-24946.50	-99.40	-2416.79	865.40	-2551.54
2002	-98787.19	7423.05	-4068.36	16748.09	2069.61	4061.32	11570.57	16266.75	-28325.64	-103.53	-2450.96	881.30	-2709.15
2003	-101591.45	6899.69	-3926.99	16869.86	2181.84	4377.05	12046.37	17516.02	-30176.96	-108.65	-2535.07	985.38	-2892.25
2004	-112760.83	7006.05	-4224.40	18370.54	2629.57	4963.16	13410.93	20043.49	-34238.03	-122.77	-2781.51	1122.57	-3179.62
2005	-121869.46	6589.53	-4483.74	19344.89	3086.23	5325.95	14819.02	22602.46	-38370.46	-130.55	-2973.16	1219.16	-3437.40
2006	-131937.97	6987.27	-4683.59	18965.84	3453.14	6007.16	14973.57	25756.77	-42223.34	-141.02	-3123.70	1450.99	-3718.75
2007	-142610.48	8556.97	-5113.38	20062.08	4345.64	6210.78	16903.10	29284.72	-47911.39	-148.22	-3299.23	1470.71	-3865.87
2008	-146938.78	9445.69	-5461.83	20557.80	5592.41	6233.76	17065.70	27916.06	-46419.98	-154.76	-3505.60	1403.18	-3761.38
2009	-145957.98	8845.16	-5120.80	19163.32	5370.72	6058.06	17913.49	27653.37	-46774.63	-154.04	-3766.28	1319.24	-3865.95
2010	-153668.43	8195.07	-5276.51	19333.54	5144.81	6456.25	18393.73	28989.63	-48732.42	-172.69	-4104.33	1302.18	-4039.68
2011	-159789.78	8219.84	-5321.59	18614.85	5329.23	6808.73	18435.42	30185.17	-50085.38	-179.48	-4334.49	1390.36	-4245.04
2012	-162704.29	7942.07	-5220.99	18508.72	5525.44	7111.53	18420.73	30701.87	-50809.03	-183.83	-4432.75	1476.92	-4316.39
2013	-166969.42	7898.56	-5306.66	18847.39	5902.26	7227.97	18315.46	31056.45	-50977.72	-187.88	-4616.71	1578.14	-4300.06
2014	-168747.22	8293.25	-5358.20	19821.84	6049.54	7291.75	18429.09	31167.95	-52239.79	-188.35	-4761.21	1599.92	-4283.87
2015	-171432.10	8083.88	-5280.69	20120.46	6162.88	-	18779.31	31960.24	-	-193.96	-4881.12	1615.87	-4428.67
2016	-172142.21	8524.18	-5374.01	20331.01	5991.89	-	18568.97	31876.16	-	-194.04	-5003.29	1571.14	-4363.87
2017	-175930.79	9101.85	-5478.29	20356.78	6026.59	-	-	-	-	-199.99	-5135.32	1598.56	-4507.62

Table 9: Average Real effect of Eskom Turnover across sectors in Millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	-35719.07658	-19092.41643	-61740.62309	-6103.392587	-9171.093269	498.4293588	856.7682224	-10728.74846	6897.383671	15263.44925	-6982.151716	-7558.272638	70.86073904
1996	-37527.13644	-21842.92754	-63371.91317	-6114.139074	-9551.384534	524.2335271	914.8195823	-11274.53759	7290.730251	15744.23196	-7699.873289	-8187.211147	74.38070439
1997	-38261.7837	-21317.98659	-62879.73189	-6147.493325	-9890.96793	528.7563864	954.7356411	-12361.36006	7851.672848	15653.44052	-7915.428806	-8431.821506	77.59599181
1998	-38551.04314	-20176.38597	-62518.33452	-6046.585095	-9313.570401	532.1919193	1008.114894	-12752.281	8168.131489	15512.31708	-8018.706685	-8673.128708	80.4423335
1999	-40128.16275	-19741.71272	-63265.49261	-6016.65968	-8978.766054	567.251665	1040.689694	-14496.53262	8975.861279	16735.1654	-8132.185041	-9090.264143	86.32163359
2000	-43229.98321	-19650.09439	-69684.96345	-6632.515704	-8893.415544	632.5348939	1094.306546	-15276.52093	9451.810111	18896.40108	-8308.099737	-9955.662178	95.69773307
2001	-45258.96234	-22071.92721	-75580.74381	-6975.837682	-8936.573824	646.7647425	1156.852888	-16494.81267	10132.96639	18995.08487	-8428.640762	-10430.22722	99.08878479
2002	-48157.0325	-24680.41491	-81874.95842	-7465.622751	-8588.385393	667.3861542	1255.25249	-19148.94133	11505.53355	19784.35214	-8547.800713	-10621.84977	105.209539
2003	-49524.06017	-22940.35381	-79029.90885	-7519.901361	-9054.131608	719.269243	1306.87092	-20619.55973	12257.51631	20764.08304	-8841.118712	-11876.33508	112.3204125
2004	-54968.93473	-23293.96262	-85015.17105	-8188.846366	-10912.0804	815.5830507	1454.907398	-23594.85426	13907.0743	23462.33698	-9700.584034	-13529.75449	123.4802511
2005	-59409.23489	-21909.10362	-90234.43809	-8623.172155	-12807.10066	875.2004107	1607.666249	-26607.23355	15585.61708	24949.19597	-10368.99582	-14694.004	133.4912538
2006	-64317.45631	-23231.52487	-94256.29073	-8454.208141	-14329.69581	987.1413042	1624.432667	-30320.43477	17150.61029	26949.0553	-10893.99156	-17488.12662	144.4173744
2007	-69520.12128	-28450.53613	-102905.8552	-8942.865464	-18033.35937	1020.601554	1833.761436	-34473.47891	19461.02527	28324.95243	-11506.15382	-17725.75971	150.1309955
2008	-71630.08838	-31405.39194	-109918.2949	-9163.839923	-23207.16665	1024.37869	1851.400765	-32862.3098	18855.23401	29575.14206	-12225.89488	-16911.86005	146.0730144
2009	-71151.96921	-29408.70607	-103055.2246	-8542.23284	-22287.2119	995.5061295	1943.37467	-32553.07805	18999.28649	29438.25398	-13135.01988	-15900.15768	150.1338762
2010	-74910.6766	-27247.2857	-106188.854	-8618.110401	-21349.7145	1060.939672	1995.474712	-34126.09829	19794.51806	33002.03302	-14313.98298	-15694.51861	156.8806272
2011	-77894.73004	-27329.61466	-107096.106	-8297.748728	-22115.04344	1118.861826	1999.997545	-35533.47079	20344.07313	34299.11861	-15116.64599	-16757.33518	164.8558745
2012	-79315.50229	-26406.10196	-105071.391	-8250.439279	-22929.26105	1168.61944	1998.403539	-36141.72079	20638.014	35130.26115	-15459.34455	-17800.65569	167.6269671
2013	-81394.67919	-26261.40743	-106795.6214	-8401.40627	-24492.97066	1187.755205	1986.983348	-36559.12984	20706.53075	35904.19932	-16100.89744	-19020.53761	166.9926098
2014	-82261.32461	-27573.69627	-107832.877	-8835.778182	-25104.14736	1198.235587	1999.31033	-36690.37574	21219.17185	35994.39093	-16604.85994	-19283.10326	166.3637765
2015	-83570.1562	-26877.58404	-106272.8481	-8968.887769	-25574.48529	-	2037.305261	-37623.04966	-	37066.20843	-17023.04878	-19475.30134	171.987109
2016	-83916.32493	-28341.51456	-108150.8932	-9062.746154	-24864.89452	-	2014.485988	-37524.0712	-	37082.70866	-17449.12749	-18936.16121	169.4705374
2017	-85763.18841	-30262.15079	-110249.4862	-9074.230617	-25008.9208	-	-	-	-	38218.73283	-17909.58564	-19266.65011	175.0530443

Table 10 and 11 illustrate the monetary effect of Rand Water's infrastructure spending and turnover effect in the economy and the various sectors. Table 10 illustrates that the infrastructure spending by the firm has a negative effect on the overall gross value added on the economy. Relative to its counterparts, the share is significantly small and this can be attributed to the operational process which is limited to a few provinces in South Africa.

Water infrastructure within the urban setting, can at times, be disruptive to economic activities as result of poor infrastructure in the provision of water. The negative relationship between infrastructure spending and retail can be attributed to the fact that any disruptions in the infrastructure maintaining quality supply of water would lead to an increase in the price of bottled water as a result of an increase in the demand due to the shortage resulting from the disruption. On the other hand, the effects on Real Estate value added is positive. The infrastructure spending also has a positive effect on industry energy and agriculture. This can be as a result of spending on the development of infrastructure which improves access of water by these industries.

Table 11 presents the turnover effect of Rand Water SOC Ltd in the South African economy. The national Gross Value added is positive in relation to the turnover of the enterprise. This means that revenue gains for the firm are also substantially important for the value addition of the economy. The turnover has a negative effect on Public administration and agriculture, this might be as a result of the argument that increases in the price of water affects the ability of farmers (crops and livestock) to create value in the face of increasing costs of water.

Public administration, which is inclusive of state buildings and schools, would have a similar but different effect. The increase in the price of water does raise the cost of operations in public administration. However, since the state administration pillar still needs to operate, they will internalize the cost in order to provide key social services. This creates a trade-off setting whereby the public administration has lower resources to create value and as a result cannot pass on the costs to households\consumers like a profit-seeking organization.

Table 10: Average Real effect of Rand Water's Infrastructure Spending across sectors in millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	-16733	791.744	785.6223	416.6138	-1555.78	-11673.1	4095.772	-2450.04	2331.173	-4029.46	3830.176	-5763.15	405.973
1996	-17580	905.805	806.3797	417.3474	-1620.3	-12277.4	4373.286	-2574.68	2464.116	-4156.39	4223.894	-6242.71	426.1395
1997	-17924.1	884.0362	800.1169	419.6241	-1677.9	-12383.3	4564.104	-2822.87	2653.703	-4132.42	4342.141	-6429.22	444.5604
1998	-18059.6	836.6951	795.5183	412.7362	-1579.95	-12463.8	4819.283	-2912.14	2760.66	-4095.16	4398.796	-6613.22	460.8675
1999	-18798.5	818.6697	805.0256	410.6935	-1523.16	-13284.9	4975.006	-3310.47	3033.656	-4417.99	4461.046	-6931.28	494.551
2000	-20251.5	814.8703	886.7105	452.7314	-1508.68	-14813.8	5231.321	-3488.59	3194.517	-4988.54	4557.547	-7591.15	548.2683
2001	-21202	915.3014	961.7317	476.1664	-1516	-15147	5530.323	-3766.8	3424.734	-5014.59	4623.672	-7953	567.6962
2002	-22559.7	1023.473	1041.823	509.5988	-1456.93	-15630	6000.722	-4372.9	3888.633	-5222.95	4689.039	-8099.11	602.763
2003	-23200.1	951.3142	1005.621	513.3038	-1535.94	-16845.1	6247.483	-4708.74	4142.788	-5481.6	4849.944	-9055.65	643.5024
2004	-25750.8	965.978	1081.781	558.9656	-1851.12	-19100.7	6955.17	-5388.18	4700.304	-6193.92	5321.418	-10316.4	707.4389
2005	-27830.9	908.5493	1148.194	588.6124	-2172.59	-20496.9	7685.432	-6076.1	5267.617	-6586.44	5688.086	-11204.1	764.7936
2006	-30130.2	963.3888	1199.37	577.0791	-2430.89	-23118.5	7765.584	-6924.05	5796.552	-7114.39	5976.081	-13334.6	827.3912
2007	-32567.4	1179.816	1309.432	610.4345	-3059.18	-23902.2	8766.278	-7872.45	6577.425	-7477.62	6311.893	-13515.8	860.1255
2008	-33555.9	1302.351	1398.662	625.5181	-3936.86	-23990.6	8850.602	-7504.52	6372.68	-7807.66	6706.719	-12895.2	836.8766
2009	-33331.9	1219.55	1311.332	583.0876	-3780.8	-23314.4	9290.283	-7433.91	6421.367	-7771.53	7205.435	-12123.8	860.142
2010	-35092.7	1129.918	1351.206	588.2669	-3621.76	-24846.9	9539.346	-7793.12	6690.139	-8712.34	7852.175	-11967	898.7953
2011	-36490.6	1133.333	1362.751	566.3992	-3751.59	-26203.4	9560.968	-8114.52	6875.877	-9054.77	8292.489	-12777.4	944.4868
2012	-37156.2	1095.035	1336.987	563.1699	-3889.72	-27368.7	9553.348	-8253.42	6975.223	-9274.18	8480.482	-13572.9	960.3628
2013	-38130.2	1089.035	1358.927	573.4748	-4154.98	-27816.9	9498.753	-8348.74	6998.38	-9478.5	8832.417	-14503.1	956.7285
2014	-38536.2	1143.454	1372.126	603.1248	-4258.66	-28062.3	9557.682	-8378.71	7171.642	-9502.31	9108.874	-14703.3	953.1258
2015	-39149.3	1114.587	1352.275	612.2108	-4338.45	-	9739.317	-8591.7	-	-9785.26	9338.278	-14849.8	985.3428
2016	-39311.5	1175.295	1376.173	618.6175	-4218.08	-	9630.23	-8569.09	-	-9789.62	9572.011	-14438.7	970.925
2017	-40176.7	1254.942	1402.876	619.4014	-4242.51	-	-	-	-	-10089.5	9824.603	-14690.7	1002.908

Table 11: Average Real effect of Rand Waters' Turnover across sectors in Millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	167216.8	-11205.4	8945.969	-379.017	-1555.78	8239.026	8194.474	23289.38	55404	-775.384	-16193.1	10311.2	-910.453
1996	175681.1	-12819.7	9182.337	-379.684	-1620.3	8665.568	8749.7	24474.15	58563.6	-799.808	-17857.7	11169.21	-955.679
1997	179120.3	-12511.6	9111.021	-381.756	-1677.9	8740.331	9131.473	26833.37	63069.43	-795.196	-18357.6	11502.92	-996.991
1998	180474.5	-11841.6	9058.656	-375.489	-1579.95	8797.12	9642.014	27681.96	65611.42	-788.027	-18597.1	11832.11	-1033.56
1999	187857.7	-11586.5	9166.917	-373.631	-1523.16	9376.657	9953.572	31468.29	72099.6	-850.148	-18860.3	12401.18	-1109.1
2000	202378.7	-11532.7	10097.07	-411.875	-1508.68	10455.79	10466.39	33161.44	75922.71	-959.938	-19268.3	13581.78	-1229.57
2001	211877.2	-12954.1	10951.35	-433.195	-1516	10691.01	11064.6	35806.04	81394.17	-964.952	-19547.9	14229.19	-1273.14
2002	225444.4	-14485	11863.35	-463.611	-1456.93	11031.88	12005.74	41567.48	92419.47	-1005.05	-19824.2	14490.61	-1351.78
2003	231844.1	-13463.8	11451.12	-466.981	-1535.94	11889.5	12499.44	44759.82	98459.85	-1054.82	-20504.5	16202.01	-1443.15
2004	257333.9	-13671.3	12318.36	-508.522	-1851.12	13481.57	13915.32	51218.43	111710.1	-1191.89	-22497.8	18457.65	-1586.53
2005	278120.9	-12858.5	13074.61	-535.494	-2172.59	14467.04	15376.36	57757.54	125193.2	-1267.42	-24048	20045.95	-1715.16
2006	301098.5	-13634.7	13657.36	-525.001	-2430.89	16317.42	15536.72	65817.95	137764.2	-1369.01	-25265.5	23857.77	-1855.54
2007	325454.5	-16697.7	14910.65	-555.347	-3059.18	16870.52	17538.83	74833.15	156322.8	-1438.91	-26685.3	24181.95	-1928.96
2008	335332.2	-18431.9	15926.72	-569.069	-3936.86	16932.96	17707.54	71335.72	151456.7	-1502.42	-28354.5	23071.61	-1876.82
2009	333093.9	-17260.1	14932.29	-530.467	-3780.8	16455.69	18587.21	70664.45	152613.9	-1495.47	-30463	21691.42	-1928.99
2010	350690	-15991.5	15386.34	-535.179	-3621.76	17537.31	19085.52	74079.08	159001.7	-1676.51	-33197.2	21410.88	-2015.68
2011	364659.7	-16039.9	15517.8	-515.285	-3751.59	18494.76	19128.78	77134.13	163416	-1742.4	-35058.8	22860.8	-2118.15
2012	371311	-15497.8	15224.42	-512.347	-3889.72	19317.25	19113.53	78454.48	165777.1	-1784.62	-35853.6	24284.13	-2153.75
2013	381044.5	-15412.9	15474.26	-521.722	-4154.98	19633.57	19004.3	79360.57	166327.5	-1823.94	-37341.5	25948.32	-2145.6
2014	385101.7	-16183.1	15624.55	-548.696	-4258.66	19806.81	19122.2	79645.47	170445.3	-1828.52	-38510.3	26306.52	-2137.52
2015	391228.9	-15774.6	15398.51	-556.962	-4338.45	-	19485.6	81670.07	-	-1882.97	-39480.2	26568.72	-2209.77
2016	392849.5	-16633.7	15670.63	-562.791	-4218.08	-	19267.35	81455.21	-	-1883.8	-40468.3	25833.21	-2177.44
2017	401495.5	-17761	15974.71	-563.504	-4242.51	-	-	-	-	-1941.51	-41536.2	26284.08	-2249.17

Tables 12 and 13 illustrate the real economic effect of Transnet on the South African economy. In this regard, table 12 highlights the impact of Transnet infrastructure spending on the economy and sectors. At a glance, one can depict that Transnet infrastructure spending has a negative effect on the national gross value added, however a closer look into the sectorial effects paints a different picture.

This effect can be influenced by the retail and distributive trade sectors of the economy. In which the infrastructure spending can be disruptive, whereby upgrades at ports of entry would affect the logistics firms as well as the retailers whom import their commodities. The delays during such periods affect the value addition of the sectors. Transnet infrastructure spending has a positive effect on the manufacturing sector in the economy which can be attributed to the efficient services provided to the sector that enable downstream value addition for heavy industries such as steel processing and manufacturing with the provision of its natural gas midstream infrastructure and the development of logistics hubs and clusters. The ability of these firms to cheaply transport their goods to customers enhances the domestic value addition of the sector.

Table 13 illustrates that the Transnet turnover has a positive effect on the national gross value added in the economy with an overall value of R213.23 Billion worth of value added to the South African economy in 2017. This is done through its productions processes and service delivery. This figure is substantial for an economy of just over R3.5 trillion and shows the magnitude of the economic developmental role that the entity possesses.

In light of this, the table continues to highlight the turnover effect as positive for the manufacturing and energy industries. The value added in these sectors are closely tied to the services rendered by the enterprise through its logistical railway networks and large natural fuel pipelines that manage well over 16 Billion litres of liquid fuel annually, through its pipeline business unit.

Table 12: Average Real effect of Transnet's Infrastructure Spending across sectors in millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	-32898.5	5647.939	-2601.99	542.8681	5690.09	-10633.9	1637.616	2456.879	2563.944	-6612.36	-1189.02	-2304.64	-1605.71
1996	-34563.8	6461.598	-2670.74	543.824	5926.037	-11184.4	1748.575	2581.864	2710.162	-6820.64	-1311.25	-2496.41	-1685.47
1997	-35240.4	6306.31	-2650	546.7907	6136.727	-11280.9	1824.87	2830.746	2918.679	-6781.31	-1347.95	-2571	-1758.33
1998	-35506.9	5968.6	-2634.77	537.8154	5778.488	-11354.2	1926.898	2920.267	3036.315	-6720.18	-1365.54	-2644.58	-1822.83
1999	-36959.4	5840.015	-2666.26	535.1537	5570.763	-12102.2	1989.161	3319.7	3336.57	-7249.93	-1384.87	-2771.77	-1956.05
2000	-39816.3	5812.912	-2936.8	589.9312	5517.808	-13495	2091.644	3498.317	3513.494	-8186.21	-1414.82	-3035.64	-2168.51
2001	-41685.1	6529.341	-3185.27	620.468	5544.585	-13798.6	2211.194	3777.305	3766.698	-8228.96	-1435.35	-3180.35	-2245.36
2002	-44354.3	7300.987	-3450.53	664.0321	5328.556	-14238.6	2399.274	4385.099	4276.918	-8570.89	-1455.64	-3238.77	-2384.05
2003	-45613.4	6786.24	-3330.63	668.86	5617.522	-15345.5	2497.937	4721.87	4556.45	-8995.32	-1505.59	-3621.29	-2545.18
2004	-50628.3	6890.845	-3582.87	728.3595	6770.263	-17400.3	2780.892	5403.211	5169.636	-10164.2	-1651.96	-4125.44	-2798.07
2005	-54718	6481.175	-3802.83	766.9907	7946.005	-18672.3	3072.873	6093.045	5793.596	-10808.4	-1765.78	-4480.44	-3024.92
2006	-59238.6	6872.375	-3972.33	751.9622	8890.68	-21060.5	3104.92	6943.366	6375.346	-11674.7	-1855.19	-5332.41	-3272.5
2007	-64030.5	8416.268	-4336.86	795.4259	11188.57	-21774.4	3505.029	7894.411	7234.19	-12270.8	-1959.44	-5404.87	-3401.97
2008	-65973.8	9290.377	-4632.39	815.0806	14398.59	-21855	3538.744	7525.454	7009.001	-12812.4	-2082	-5156.7	-3310.02
2009	-65533.5	8699.715	-4343.15	759.7915	13827.82	-21239	3714.542	7454.64	7062.549	-12753.1	-2236.82	-4848.22	-3402.04
2010	-68995.4	8060.321	-4475.22	766.5405	13246.16	-22635	3814.125	7814.861	7358.158	-14297	-2437.59	-4785.51	-3554.92
2011	-71743.8	8084.676	-4513.45	738.0458	13721	-23870.7	3822.77	8137.149	7562.442	-14858.9	-2574.28	-5109.58	-3735.64
2012	-73052.4	7811.481	-4428.12	733.8379	14226.17	-24932.3	3819.724	8276.438	7671.708	-15219	-2632.64	-5427.71	-3798.43
2013	-74967.4	7768.678	-4500.79	747.2657	15196.36	-25340.6	3797.895	8372.025	7697.178	-15554.3	-2741.9	-5799.67	-3784.06
2014	-75765.6	8156.88	-4544.5	785.901	15575.55	-25564.2	3821.457	8402.08	7887.74	-15593.3	-2827.72	-5879.73	-3769.81
2015	-76971	7950.956	-4478.76	797.7405	15867.37	-	3894.08	8615.662	-	-16057.7	-2898.93	-5938.34	-3897.23
2016	-77289.9	8384.017	-4557.9	806.0888	15427.11	-	3850.463	8592.996	-	-16064.8	-2971.49	-5773.94	-3840.21
2017	-78990.9	8952.182	-4646.35	807.1102	15516.47	-	-	-	-	-16556.9	-3049.91	-5874.71	-3966.71

Table 13: Average Real effect of Transnet's Turnover across sectors in Millions of Rands for base year 2010

Year	Gross Value Added	Agriculture	Industry Energy	Industry-Manufacturing	Construction	Retail	Real Estate	Financial and Insurance	Financial Intermediaries	Distributive Trade	Public Admin	ICT	Other Services
1995	88808.76385	2084.654558	57335.58116	13067.19434	5690.089575	-12925.89711	5973.535892	-2215.151996	23710.32644	2499.088805	17203.52127	-12280.17598	5041.379
1996	93304.16453	2384.976182	58850.4827	13090.20227	5926.036512	-13595.08327	6378.27999	-2327.840433	25062.48782	2577.807492	18971.93577	-13302.03321	5291.807
1997	95130.72672	2327.659156	58393.41735	13161.6128	6136.726763	-13712.37574	6656.58164	-2552.235382	26990.77436	2562.942185	19503.04911	-13699.45977	5520.558
1998	95849.91588	2203.010558	58057.80479	12945.57108	5778.487721	-13801.4703	7028.751003	-2632.948365	28078.62709	2539.836003	19757.5184	-14091.51957	5723.061
1999	99771.12708	2155.549642	58751.65498	12881.50159	5570.762572	-14710.68373	7255.868131	-2993.081933	30855.265	2740.053301	20037.12094	-14769.25334	6141.343
2000	107483.2201	2145.546059	64713.11233	14200.03227	5517.80792	-16403.69055	7629.69407	-3154.125196	32491.37845	3093.913021	20470.56214	-16175.2942	6808.404
2001	112527.895	2409.9801	70188.24324	14935.07511	5544.584933	-16772.71688	8065.777963	-3405.66445	34832.90946	3110.070546	20767.56658	-16946.33574	7049.66
2002	119733.4012	2694.794533	76033.38108	15983.69136	5328.555796	-17307.49727	8751.836968	-3953.659253	39551.22251	3239.297497	21061.16816	-17257.67125	7485.121
2003	123132.2583	2504.80149	73391.31881	16099.90036	5617.522183	-18652.99479	9111.729573	-4257.296093	42136.22541	3399.709109	21783.88268	-19295.8751	7991.023
2004	136669.9145	2543.411177	78949.54725	17532.09307	6770.263161	-21150.72561	10143.86544	-4871.601634	47806.71732	3841.494981	23901.54362	-21982.24039	8784.988
2005	147709.8855	2392.201788	83796.43239	18461.97255	7946.004672	-22696.79798	11208.92651	-5493.56402	53576.84688	4084.938819	25548.46234	-23873.83515	9497.22
2006	159913.2546	2536.593751	87531.33572	18100.22528	8890.679698	-25599.79004	11325.82487	-6260.224282	58956.64037	4412.376344	26842.01421	-28413.53874	10274.56
2007	172848.7023	3106.444908	95563.77495	19146.42706	11188.57122	-26467.52332	12785.30117	-7117.69839	66898.88282	4637.652365	28350.33811	-28799.6291	10681.05
2008	178094.7385	3429.078435	102075.8943	19619.52725	14398.59493	-26565.47679	12908.28561	-6785.04221	64816.42531	4842.346262	30123.72849	-27477.25936	10392.35
2009	176905.9851	3211.065156	95702.48727	18288.68372	13827.82056	-25816.71722	13549.54355	-6721.195496	65311.61759	4819.933538	32363.74731	-25833.513	10681.26
2010	186251.3039	2975.064918	98612.53988	18451.13547	13246.16208	-27513.62215	13912.79403	-7045.975125	68045.29185	5403.432076	35268.62787	-25499.40439	11161.25
2011	193670.5914	2984.054218	99455.06173	17765.25001	13721.0008	-29015.7323	13944.328	-7336.553658	69934.43282	5615.804261	37246.33199	-27226.19769	11728.65
2012	197203.0743	2883.21811	97574.80512	17663.96179	14226.17189	-30306.10934	13933.21432	-7462.138315	70944.87884	5751.88746	38090.71668	-28921.31507	11925.8
2013	202372.5565	2867.419266	99176.01591	17987.17794	15196.35587	-30802.36206	13853.59078	-7548.32027	71180.41083	5878.604573	39671.45701	-30903.29765	11880.67
2014	204527.3072	3010.704895	100139.2659	18917.15616	15575.55277	-31074.15254	13939.53663	-7575.418454	72942.657	5893.371672	40913.18448	-31329.89677	11835.93
2015	207781.4707	2934.698093	98690.54122	19202.1401	15867.36803	-	14204.44384	-7767.986535	-	6068.86065	41943.5718	-31642.16735	12236
2016	208642.1542	3094.541109	100434.5924	19403.0883	15427.11135	-	14045.34393	-7747.55057	-	6071.562236	42993.39918	-30766.20853	12056.96
2017	213234.0328	3304.250711	102383.4559	19427.67621	15516.47065	-	-	-	-	6257.563791	44127.93507	-31303.16478	12454.13

4.3 Provincial Results

4.3.1 Denel SOC Ltd

Table 13 below illustrates the regression results for the spatial analysis of Denel's effect on the economic growth of the South African provinces. The table shows that there is a statistical significance of Denel turnover on 2 of the 9 provinces, namely the Eastern Cape and Mpumalanga. In this regard, a 1% rise in Denel value added will raise the gross value added by 0.02% and 0.01% in the Eastern Cape and Mpumalanga respectively. Within the spatial analysis, the turnover does not show the significance of infrastructure spending on the other provinces.

The infrastructure spending of Denel is found to be highly significant in the gross value created in the province of Gauteng, whereby the parameter is significant at the 1% level. Inferring that with 99% level of confidence we can infer that a 1% rise in Denel infrastructure spending will lead to a reduction in Gauteng value added by 0.02%.

A similar result can be found for the effect of infrastructure spending contribution in the Western Cape whereby a 1% rise in infrastructure spending will lead to a 0.02 reduction in the growth in value added in the province. This inference is statistically significant at the 10% level.

The spatial analysis also illustrates that the inertial term of value added is statistically significant across 5 provinces and this points to trend effect in the growth of value added in the models. For the models, the R^2 is significantly high and the models all exhibit satisfactory joint significance values. The models are all found to be jointly significant except for the Free State Province.

An alarming feature of this analysis is the presence of a high Durbin-Watson D statistic across all the models, with all statistics deviating upwards. This flags the possible existence of negative serial correlation. This is however has been corrected using Newey-West Heteroscedastic and Autocorrelation standard errors in the estimation procedure.

Table 14: Provincial Analysis of Value Added by Denel

	Gauteng	Western Cape	Eastern Cape	Northern Cape	Kwa-Zulu Natal
Constant	-0.018641 (0.011372)	-0.001419 (0.001693)	-0.002750 (0.003128)	-0.005115 (0.003992)	-0.001341 (0.005415)
Lagged VA	-0.800297 (0.264992)**	0.388924 (0.095681)***	0.283824 (0.104613)**	0.411644 (0.080238)***	-0.106025 (0.103911)
Turnover	-0.005420 (0.036997)	0.007275 (0.007532)	0.025662 (0.014871)*	0.012021 (0.013592)	0.001052 (0.019053)
Real Interest Rate	0.303246 (0.114752)**	-0.046660 (0.064327)	0.011058 (0.065993)	0.026240 (0.079116)	-0.098395 (0.075618)
Real GDP Growth	0.859762 (0.335691)**	0.685694 (0.082342)***	0.906516 (0.147251)***	0.695924 (0.107414)***	1.092112 (0.273990)***
Lagged Real Interest rate	-0.410592 (0.207056)*	0.019408 (0.085316)	0.025567 (0.074793)	-0.019276 (0.087453)	-0.132192 (0.121779)
Balance of Payments	0.024054 (0.015492)	-0.007443 (0.006153)	-0.002814 (0.008626)	-0.000391 (0.007618)	-0.005919 (0.016851)
Infrastructure Spending	-0.021515 (0.005875)***	-0.006464 (0.003024)*	0.003033 (0.007505)	-0.004417 (0.004872)	-0.002183 (0.010678)
No. of Observations	22	22	22	22	22
R-Squared	0.758054	0.916784	0.854896	0.839283	0.611667
Adj R-squared	0.604088	0.868241	0.770252	0.745532	0.385139
F-stat	4.923518	18.88609	10.09991	8.952208	2.700187
Prob (F Stat)	0.009723	0.000014	0.000334	0.000594	0.062769
Durbin-Watson D	2.729128	2.882344	2.92253	2.307826	2.772084
	p<1% ***, p<5% **, p<10% *				

	Free State	Limpopo	Mpumalanga	North West
Constant	0.011207 (0.012137)	-0.000299 (0.003868)	0.001426 (0.002042)	0.002111 0.005822
Lagged VA	0.323605 (0.200447)	0.282570 (0.160806)	0.317598 (0.061165)***	0.285352 0.090368
Turnover	-0.023869 (0.027297)	-0.003630 (0.009252)	0.014081 (0.006159)**	0.020303 0.024022
Real Interest Rate	0.040084 (0.109692)	0.052189 (0.103338)	-0.184799 (0.066221)***	-0.131992 0.150493
Real GDP Growth	0.191129 (0.207202)	0.591907 (0.111275)***	0.717423 (0.069016)***	0.693475 0.214594
Lagged Real Interest rate	-0.129226 (0.156794)	-0.063937 (0.116214)	0.191004 (0.079290)**	0.099642 0.127330
Balance of Payments	-0.035434 (0.020245)	-0.005737 (0.015821)	-0.005098 (0.008808)	-0.011567 0.022231
Infrastructure Spending	-0.013767 (0.007123)	-0.005843 (0.007840)	-0.002783 (0.003371)	-0.002784 0.003849
No. of Observations	22	22	22	22
R-Squared	0.404824	0.773515	0.926845	0.686259
Adj R-squared	0.057638	0.641398	0.884172	0.503243
F-stat	1.166015	5.854799	21.7194	3.749721
Prob (F Stat)	0.388406	0.003932	0.000007	0.021845
Durbin-Watson D	2.15627	2.574633	2.746011	2.936284

p<1% ***, p<5% **, p<10% *

4.3.2 Eskom SOC Ltd

Table 15 below illustrates the regression results for the spatial analysis on Eskom with regards to its effect on the economic growth of the South African provinces. This table to some extent provides consistent results with those provided in Table 2. The analysis shows that within the desired period of analysis, the value added by ESKOM SOC Ltd is not found to be statistically significant in all the 9 provinces which raises a point for concern as the entity is country's largest state-owned enterprise which contributes significantly in ensuring infrastructure development.

The State-owned enterprise's infrastructure is statistically significant for the determination of gross value added in Gauteng and the Free State province. At the 10% level of significance, a 1% rise in infrastructure expenditure will result in decreases in the growth of gross value added by 0.02% and 0.01% for each respective province.

The data analysis does not reveal the effect of the infrastructure spending committed to Kusile and Medupi, which are currently still under construction in Limpopo and Mpumalanga.

Table 15: Value added Analysis for ESKOM SOC Ltd by Province

	Gauteng	Western Cape	Eastern Cape	Northern Cape	Kwa-Zulu Natal
Constant	-0.027552 (0.007283)***	-0.000118 (0.005369)	0.004727 (0.005657)	-0.005952 (0.009403)	-0.002773 (0.008282)
Lagged VA	-0.846930 (0.316086)**	0.283973 (0.219288)	0.143401 (0.165275)	0.354745 (0.310451)	-0.156207 (0.087141)*
Turnover	0.037976 (0.059835)	0.008029 (0.023200)	-0.013734 (0.036426)	0.029377 (0.048778)	0.012742 (0.033510)
Real Interest Rate	0.221170 (0.150870)	-0.059150 (0.069602)	0.016895 (0.077737)	0.032810 (0.094326)	-0.070530 (0.064653)
Real GDP Growth	1.290931 (0.328472)***	0.719205 (0.059645)***	0.749826 (0.127371)***	0.721329 (0.184188)***	1.016600 (0.385375)**
Lagged Real Interest rate	-0.363046 (0.158207)**	0.040666 (0.081489)	0.008463 (0.081092)	-0.019098 (0.107182)	-0.118677 (0.076970)
Balance of Payments	0.052846 (0.019981)**	-0.003353 (0.011477)	-0.008156 (0.019805)	0.001996 (0.029738)	-0.007457 (0.019213)
Infrastructure Spending	-0.031445 (0.015389)*	-0.000566 (0.016271)	0.019763 (0.020624)	-0.003415 (0.03832)	0.015747 (0.017687)
No. of Observations	22	22	22	22	22
R-Squared	0.746242	0.900317	0.841415	0.848361	0.626655
Adj R-squared	0.58476	0.842169	0.748907	0.759904	0.40887
F-stat	4.621206	15.48315	9.095591	9.590738	2.877403
Prob (F Stat)	0.012248	0.000039	0.000551	0.000428	0.05193
Durbin-Watson D	2.629516	2.73175	2.420651	2.124786	2.675251
p<1% ***, p<5% **, p<10% *					

	Free State	Limpopo	Mpumalanga	North West
Constant	0.007550 (0.004352)	-0.003956 (0.006256)	0.004523 (0.004491)	0.010970 0.006115
Lagged VA	0.224256 (0.108365)**	0.387618 (0.384911)	0.257185 (0.157452)	-0.007988 0.210799
Turnover	0.013649 (0.039777)	0.010283 (0.066673)	-0.007749 (0.018929)	0.007806 0.027067
Real Interest Rate	-0.000558 (0.123608)	0.017615 (0.191776)	-0.194758 (0.063945)**	-0.122207 0.139054
Real GDP Growth	0.392702 (0.156385)**	0.758581 (0.063799)***	0.708057 (0.049222)***	0.532765 0.176942
Lagged Real Interest rate	-0.044756 (0.114467)	-0.060161 (0.252056)	0.185239 (0.073303)**	0.109464 0.107599
Balance of Payments	-0.024659 (0.021703)	0.004317 (0.010590)	-0.002273 (0.010170)	-0.019084 0.022849
Infrastructure Spending	-0.017552 (0.007897)**	-0.020457 (0.018839)	0.001389 (0.016753)	0.024720 0.020269
No. of Observations	22	22	22	22
R-Squared	0.328924	0.795492	0.917073	0.693809
Adj R-squared	-0.062537	0.676195	0.868698	0.515197
F-stat	0.840248	6.668192	18.95783	3.884451
Prob (F Stat)	0.575356	0.002257	0.000013	0.019289
Durbin-Watson D	1.900465	2.877569	2.77573	2.797674

p<1% ***, p<5% **, p<10% *

4.3.3 Rand Water SOC Ltd

Table 16 illustrates the regression results for the spatial analysis of Rand Water's effect on the economic growth of the South African provinces.

The SOE that operates in the Gauteng region is found by the model and analysis to not have a statistical effect on the growth of the provincial value added neither through the avenues of value added nor the infrastructure spending. Given the regional dynamic of the State-owned Enterprise we will evaluate the partial effects that it may have on other provinces except for Gauteng.

The SOE effect on the remaining provinces is also found to not be statistically significant due to its operational reach being limited. In the remaining models, the value added is illustrated to be driven by national economic growth as well as each individual provinces' inertial term.

Table 16: Value Added by Rand Water SOC Ltd by Province

	Gauteng	Western Cape	Eastern Cape	Northern Cape	Kwa-Zulu Natal
Constant	-0.020935 (0.00933)**	0.001673 (0.002618)	0.003149 (0.006308)	-0.000861 (0.003535)	0.005773 (0.007929)
Lagged VA	-0.894458 (0.258524)***	0.269869 (0.069614)***	0.225447 (0.099305)**	0.240425 (0.109628)**	-0.214899 (0.118507)*
Turnover	0.033059 (0.099518)	-0.008327 (0.012331)	-0.037617 (0.050239)	-0.025052 (0.031748)	-0.132530 (0.073454)*
Real Interest Rate	0.115239 (0.225368)	-0.060202 (0.066877)	0.064248 (0.108394)	0.034652 (0.073790)	0.052589 (0.128745)
Real GDP Growth	1.133593 (0.286239)***	0.707411 (0.087022)***	0.818705 (0.097346)***	0.680705 (0.068469)***	0.978500 (0.266295)***
Lagged Real Interest rate	-0.331316 (0.170191)*	0.040658 (0.059010)	-0.023260 (0.050001)	0.005362 (0.074235)	-0.151143 (0.075792)*
Balance of Payments	0.058905 (0.018281)***	-0.004294 (0.011119)	-0.009813 (0.013769)	-0.003239 (0.009649)	-0.023616 (0.017281)
Infrastructure Spending	-0.035016 (0.021232)	-0.000920 (0.009957)	0.007076 (0.005214)	0.007206 (0.002159)***	0.016468 (0.006951)**
No. of Observations	22	22	22	22	22
R-Squared	0.765408	0.899228	0.843796	0.83847	0.721348
Adj R-squared	0.616122	0.840444	0.752677	0.744245	0.558802
F-stat	5.127132	15.29725	9.260373	8.898534	4.43779
Prob (F Stat)	0.008364	0.000042	0.000506	0.000611	0.011842
Durbin-Watson D	2.389089	2.841339	2.298535	2.266399	2.35417

p<1% ***, p<5% **, p<10% *

	Free State	Limpopo	Mpumalanga	North West
Constant	0.008109 (0.006036)	-0.002042 (0.004100)	0.004188 (0.002972)	0.009412 (0.010031)
Lagged VA	0.154980 (0.088790)	0.223323 (0.074439)**	0.293276 (0.048734)***	0.134279 (0.096684)
Turnover	0.024047 (0.044993)	0.005193 (0.032362)	-0.000344 (0.013407)	-0.039899 (0.055889)
Real Interest Rate	-0.008301 (0.099761)	0.036222 (0.092784)	-0.202054 (0.058173)***	-0.099526 (0.169549)
Real GDP Growth	0.308374 (0.174502)	0.637523 (0.129797)***	0.708444 (0.057634)***	0.638829 (0.206142)***
Lagged Real Interest rate	-0.027213 (0.090519)	-0.017085 (0.077599)	0.179161 (0.057723)***	0.085863 (0.111415)
Balance of Payments	-0.023960 (0.018559)	-0.000951 (0.012901)	-0.001533 (0.013002)	-0.016620 (0.027854)
Infrastructure Spending	-0.003364 (0.010039)	0.003239 (0.006382)	-0.006072 (0.006241)	0.007038 (0.009522)
No. of Observations	22	22	22	22
R-Squared	0.301047	0.754012	0.920685	0.689665
Adj R-squared	-0.106676	0.610519	0.874417	0.508636
F-stat	0.738361	5.254691	19.89923	3.8097
Prob (F Stat)	0.645314	0.006128	0.00001	0.020662
Durbin-Watson D	1.993938	2.334437	2.716319	2.943947

P<1%***, P<5%** ,P<10%*

4.3.4 Transnet SOC Ltd

The regression results on table 11 are based on the spatial analysis of Transnet's effect on the economic growth of the provinces in South Africa. The analysis illustrates that the Transnet SOC Ltd value added is statistically significant in the determination of the growth of value added in the South African provinces.

The results from the regression analysis illustrate that Transnet turnover is statistically significant in 5 provinces, namely; Western Cape; Eastern Cape; Kwa-Zulu Natal; Limpopo and Mpumalanga. The contribution of the entity to the growth in these provinces is thus unanimously positive, as a 1% rise in the turnover of the state-owned corporate entity will realize expansionary economic growth. In the Western Cape this articulates to a rise of 0.01%, 0.02% in the Eastern Cape and 0.03% in Kwa-Zulu Natal.

The goodness of fit in the models are exceptionally high and the F-statistics in the respective 5 provinces are all statistically significant at the 5% level of significance. The other variable of interest in the study being firm infrastructure expenditures has contrasting results compared to the impact of gross value addition of the entity in the respective provinces. The data series and model illustrate that infrastructure spending for Transnet is not statistically significant in the various provinces.

Similarly, the analysis of ESKOM SOC Ltd in the model illustrate that the impact of the big infrastructure project that the entity has carried out in the Eastern or Western Cape region with the creation of the Special Economic Zones (i.e. Uitenhage and Saldanha Bay SEZ) is not evident in the model. Although statistically bias the model is able to output a positive contribution of the SOE to the economic growth in the provinces.

Table 17: Value added analysis for Transnet SOC Ltd by Province

	Gauteng	Western Cape	Eastern Cape	Northern Cape	Kwa-Zulu Natal
Constant	-0.026432 (0.009303)**	-0.001304 (0.002208)	-0.004134 (0.004611)	-0.003562 (0.003851)	-0.000899 (0.005544)
Lagged VA	-0.897891 (0.261393)***	0.303640 (0.077716)***	0.339671 (0.029759)***	0.413896 (0.102632)	-0.088816 (0.147174)
Turnover	0.030644 (0.019486)	0.012008 (0.003729)***	0.025134 (0.006130)***	0.008432 (0.007833)	0.031951 (0.009464)***
Real Interest Rate	0.261529 (0.203550)	-0.078034 (0.060063)	0.001692 (0.084492)	0.056967 (0.078778)	-0.048279 (0.091063)
Real GDP Growth	1.26407 (0.483272)**	0.761834 (0.071025)***	0.936003 (0.132559)***	0.73173 (0.070272)***	1.214775 (0.199188)***
Lagged Real Interest rate	-0.414586 (0.180058)**	0.049985 (0.061498)	-0.012858 (0.088592)	-0.080255 (0.069638)	-0.231402 (0.12945)*
Balance of Payments	0.058187 (0.020828)**	-0.000245 (0.008469)	0.002251 (0.018228)	0.005211 (0.007207)	-0.000514 (0.008244)
Infrastructure Spending	-0.009534 (0.017527)	0.001161 (0.003418)	0.002835 (0.004639)	-0.007523 (0.005908)	-0.011645 (0.00718)
No. of Observations	22	22	22	22	22
R-Squared	0.743317	0.907707	0.856049	0.854777	0.671884
Adj R-squared	0.579974	0.85387	0.772078	0.770063	0.480483
F-stat	4.55064	16.86015	10.19456	10.0902	3.510345
Prob (F Stat)	0.012944	0.000025	0.000319	0.000336	0.027412
Durbin-Watson D	2.485996	2.8227	2.528186	2.458341	2.639616
p<1% ***, p<5% **, p<10% *					

	Free State	Limpopo	Mpumalanga	North West
Constant	0.01234 (0.010141)	-0.002775 (0.002086)	0.002785 (0.003246)	0.003327 (0.006878)
Lagged VA	0.124526 (0.189426)	0.297198 (0.059676)***	0.268335 (0.056146)***	0.202229 (0.100321)*
Turnover	-0.004796 (0.021992)	0.01621 (0.007473)*	0.006236 (0.002636)**	0.015696 (0.010155)
Real Interest Rate	0.074263 (0.134943)	0.048395 (0.081926)	-0.199469 (0.061173)***	-0.184321 (0.109835)
Real GDP Growth	0.258456 (0.237956)	0.697938 (0.100054)***	0.738764 (0.069131)***	0.735482 (0.196689)***
Lagged Real Interest rate	-0.097296 (0.168503)	-0.064098 (0.091684)	0.190839 (0.06752)**	0.129933 (0.087024)
Balance of Payments	-0.029993 (0.022789)	0.002386 (0.011304)	-0.001113 (0.009634)	-0.005973 (0.018102)
Infrastructure Spending	-0.007682 (0.011107)	-0.003095 (0.003518)	0.001188 (0.005015)	0.005108 (0.003919)
No. of Observations	22	22	22	22
R-Squared	0.319269	0.777451	0.91813	0.689312
Adj R-squared	-0.077824	0.647631	0.870372	0.508078
F-stat	0.804016	5.988667	19.22479	3.803428
Prob (F Stat)	0.599715	0.003576	0.000013	0.020782
Durbin-Watson D	1.832867	2.400549	2.629106	2.805583

P<1%***,P<5%** ,P<10%*

CHAPTER 5: CONCLUSION

In summing up, this study is based on the analysis of the role of State-owned entities in driving growth through infrastructure expenditure and revenue. The study above investigated the impact of State-Owned Enterprises on the economy through the various industries as well as the provinces. Such a study had not been conducted within the context of multiple SOE's and the extent at which is provided above. The estimation of the various SOE's across their cross-sections is reviewed over the period of 1995 till 2017. Through the use of least squares estimation, the economic impact of the SOE's Turnover and infrastructure is investigated and there are varying cross-sectional results.

The results from the study illustrate that the value added (Turnover) and Infrastructure spending of the State-Owned Enterprises are significant contributors to the economic growth of South Africa. The contributions can be seen from and national, sectorial and spatial level.

They are differentiated by the nature of their business and key areas of operations, such as in the case of Rand Water. Contributions are also found to be symmetrical; these can be attributed to inter-sectorial frictions that are present between industries as one can notice the disruptions that infrastructure builds can have on markets of retail and real estate. Further research can be done by looking into the effect of an expanded cross-section with SOE's at a longer time horizon in an effort to combat some of the statistical bias created by a short time series.

SOEs continue to play a significant role towards contributing to higher economic growth rates in a number of countries as discussed in the literature. They are critical agencies used to deliver essential basic services, improve infrastructure development, develop new industries and therefore lead to high economic growth rates. In the attempt to illustrate the impact that these SOEs play, the study discussed the legal and regulatory framework governing SOEs; the role and importance of SOEs; some of the key challenges that SOEs face which have been detrimental to the success of these entities.

Further, this study also discussed some of the experiences of other countries which have managed to exploit the benefits that SOEs yielded in line with their developmental goals through their stringent legal and regulatory framework and other corporative governance measures implemented to ensure the success of their state-owned entities to reach their optimal efficiency. The paper further discussed how SOEs were used to expand the key infrastructure industries such as electricity, water and nuclear energy, rail, air, sea transport and telecommunications as a strategy to promote high growth rates.

The study further discussed how SOEs are also used as a redistribution strategy within an economy through the provision of the same services at the same price across the country, by subsidizing prices of products in poorer areas. In addition, the paper further discussed the importance of infrastructural development in growing the economy as this plays a key role in driving growth and is used as a mechanism by the government through their entities to carry out its developmental and commercial mandates.

These factors along with the use of Gross value addition and infrastructure expenditure of these entities form part of the theoretical foundations of the study as the study analyzes the impact that SOEs have at a spatial and provincial level in terms of their contribution to economic growth. The methodology section illustrates this with the use of the economic models showing how the parameters in the model contribute to the growth of the economy through their respective entities.

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Appendix

Table 9: Correlation Matrix for Denel Turnover over sectors

	Turnover	Infrastructure Spending	Agriculture	Industry Energy	Industry Manufacturing	Construction	Financial and Insurance	Financial intermediaries	Distributive Trade	Public Administration	Other Services	Real Interest Rate	Real Gross domestic Product	Retail	Real Estate	Gross Value Added	Balance of Payments
Turnover	1.000																
Infrastructure Spending	0.268	1.000															
Agriculture	0.311	0.371	1.000														
Industry Energy	0.298	-0.338	0.233	1.000													
Industry Manufacturing	-0.064	-0.359	0.334	0.766	1.000												
Construction	0.076	0.150	0.387	0.336	0.382	1.000											
Financial and Insurance	-0.339	-0.307	0.150	0.398	0.391	0.121	1.000										
Financial intermediaries	-0.226	-0.326	0.204	0.465	0.412	0.176	0.976	1.000									
Distributive Trade	-0.171	-0.480	-0.110	0.491	0.643	0.239	0.405	0.379	1.000								
Public Administration	-0.093	-0.100	0.050	-0.094	0.101	0.432	-0.072	-0.007	0.342	1.000							
Other Services	-0.257	-0.256	-0.071	0.082	0.252	0.346	0.264	0.307	0.568	0.895	1.000						
Real Interest Rate	-0.046	-0.027	-0.210	0.035	-0.096	-0.124	0.395	0.395	0.216	0.016	0.272	1.000					
Real Gross domestic Product	-0.208	-0.179	0.365	0.454	0.591	0.380	0.685	0.662	0.695	0.354	0.558	0.170	1.000				
Retail	-0.329	-0.251	-0.110	0.417	0.489	0.220	0.566	0.518	0.845	0.203	0.507	0.311	0.768	1.000			
Real Estate	0.149	-0.295	0.219	0.524	0.408	0.311	0.619	0.755	0.228	0.238	0.433	0.397	0.379	0.198	1.000		
Gross Value Added	-0.212	-0.315	0.297	0.663	0.811	0.490	0.711	0.726	0.771	0.322	0.574	0.170	0.886	0.792	0.573	1.000	-
Balance of Payments	0.037	-0.158	0.009	-0.178	-0.223	-0.260	-0.193	-0.122	-0.153	0.116	0.058	0.137	-0.312	-0.341	0.041	-0.257	1.000

Table 10: Correlation Matrix for Denel Turnover over provinces

	Turnover	Infrastructure Spending	Gauteng	Eastern Cape	Western Cape	North West	Northern Cape	Mpumalanga	Limpopo	Kwa-Zulu Natal	Free State	Real Gross Domestic Product	Real Interest rate	Balance of Payments
Turnover	1.000													
Infrastructure Spending	0.140	1.000												
Gauteng	-0.221	-0.100	1.000											
Eastern Cape	-0.243	-0.011	0.526	1.000										
Western Cape	-0.354	-0.106	0.593	0.940	1.000									
North West	-0.231	0.024	0.510	0.848	0.888	1.000								
Northern Cape	-0.318	-0.068	0.551	0.925	0.938	0.863	1.000							
Mpumalanga	-0.340	-0.166	0.418	0.900	0.955	0.837	0.888	1.000						
Limpopo	-0.355	-0.051	0.433	0.736	0.823	0.728	0.771	0.690	1.000					
Kwa-Zulu Natal	-0.168	-0.058	0.351	0.677	0.704	0.482	0.671	0.613	0.708	1.000				
Free State	-0.295	-0.108	0.243	0.356	0.542	0.320	0.447	0.449	0.731	0.536	1.000			
Real Gross Domestic Product	-0.366	-0.111	0.593	0.833	0.883	0.757	0.848	0.800	0.845	0.734	0.431	1.000		
Real Interest rate	-0.215	0.014	0.317	0.140	0.098	0.020	0.175	-0.033	0.344	-0.024	0.130	0.279	1.000	
Balance of Payments	0.244	-0.195	-0.236	-0.458	-0.488	-0.424	-0.434	-0.466	-0.382	-0.330	-0.439	-0.412	0.009	1.000

Table 11: Correlation matrix for Eskom over Sectors

	Turnover	Infrastructure Spending	Agriculture	Industry Energy	Industry Manufacturing	Construction	Financial and Insurance	Financial intermediaries	Distributive Trade	Public Administration	Other Services	Real Interest Rate	Real Gross domestic Product	Retail	Real Estate	Gross Value Added	Balance of Payments
Turnover	1.000																
Infrastructure Spending	0.269	1.000															
Agriculture	-0.240	0.328	1.000														
Industry Energy	-0.315	0.079	0.233	1.000													
Industry Manufacturing	0.014	0.325	0.334	0.766	1.000												
Construction	-0.053	0.670	0.387	0.336	0.382	1.000											
Financial and Insurance	-0.258	0.194	0.150	0.398	0.391	0.121	1.000										
Financial intermediaries	-0.268	0.191	0.204	0.465	0.412	0.176	0.976	1.000									
Distributive Trade	0.006	0.038	-0.110	0.491	0.643	0.239	0.405	0.379	1.000								
Public Administration	0.246	0.186	0.050	-0.094	0.101	0.432	-0.072	-0.007	0.342	1.000							
Other Services	0.160	0.140	-0.071	0.082	0.252	0.346	0.264	0.307	0.568	0.895	1.000						
Real Interest Rate	-0.371	-0.342	-0.210	0.035	-0.096	-0.124	0.395	0.395	0.216	0.016	0.272	1.000					
Real Gross domestic Product	-0.109	0.190	0.365	0.454	0.591	0.380	0.685	0.662	0.695	0.354	0.558	0.170	1.000				
Retail	-0.166	0.056	-0.110	0.417	0.489	0.220	0.566	0.518	0.845	0.203	0.507	0.311	0.768	1.000			
Real Estate	-0.169	0.155	0.219	0.524	0.408	0.311	0.619	0.755	0.228	0.238	0.433	0.397	0.379	0.198	1.000		
Gross Value Added	-0.129	0.335	0.297	0.663	0.811	0.490	0.711	0.726	0.771	0.322	0.574	0.170	0.886	0.792	0.573	1.000	

Balance of Payments	0.137	-0.092	0.009	-0.178	-0.223	-0.260	-0.193	-0.122	-0.153	0.116	0.058	0.137	-0.312	-0.341	0.041	-0.257	1.000
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Table 12: Correlation matrix for Eskom SOC Ltd over provinces

	Turnover	Infrastructure Spending	Gauteng	Eastern Cape	Western Cape	North West	Northern Cape	Mpumalanga	Limpopo	Kwa-Zulu Natal	Free State	Real Gross Domestic Product	Real Interest rate	Balance of Payments
Turnover	1.00													
Infrastructure Spending	0.28	1.00												
Gauteng	0.09	0.20	1.00											
Eastern Cape	-0.07	0.50	0.53	1.00										
Western Cape	0.00	0.46	0.59	0.94	1.00									
North West	0.08	0.42	0.51	0.85	0.89	1.00								
Northern Cape	0.10	0.44	0.55	0.92	0.94	0.86	1.00							
Mpumalanga	0.01	0.50	0.42	0.90	0.95	0.84	0.89	1.00						
Limpopo	-0.16	0.08	0.43	0.74	0.82	0.73	0.77	0.69	1.00					
Kwa-Zulu Natal	0.04	0.32	0.35	0.68	0.70	0.48	0.67	0.61	0.71	1.00				
Free State	-0.12	-0.05	0.24	0.36	0.54	0.32	0.45	0.45	0.73	0.54	1.00			
Real Gross Domestic Product	-0.09	0.23	0.59	0.83	0.88	0.76	0.85	0.80	0.85	0.73	0.43	1.00		
Real Interest rate	-0.32	-0.31	0.32	0.14	0.10	0.02	0.17	-0.03	0.34	-0.02	0.13	0.28	1.00	
Balance of Payments	0.10	-0.12	-0.24	-0.46	-0.49	-0.42	-0.43	-0.47	-0.38	-0.33	-0.44	-0.41	0.01	1.00

Table 13: Correlation Matrix for Randwater SOC Ltd over sectors

	Turnover	Infrastructure Spending	Agriculture	Industry Energy	Industry Manufacturing	Construction	Financial and Insurance	Financial intermediaries	Distributive Trade	Public Administration	Other Services	Real Interest Rate	Real Gross domestic Product	Retail	Real Estate	Gross Value Added	Balance of Payments
Turnover	1.000																
Infrastructure Spending	-0.405	1.000															
Agriculture	-0.428	0.186	1.000														
Industry Energy	-0.147	-0.067	0.351	1.000													
Industry Manufacturing	-0.231	-0.073	0.379	0.776	1.000												
Construction	-0.316	0.356	0.420	0.344	0.383	1.000											
Financial and Insurance	0.176	-0.311	0.175	0.401	0.390	0.121	1.000										
Financial intermediaries	0.154	-0.196	0.242	0.466	0.411	0.177	0.976	1.000									
Distributive Trade	-0.090	-0.279	-0.094	0.490	0.642	0.239	0.404	0.377	1.000								
Public Administration	-0.407	0.484	0.036	-0.087	0.103	0.432	-0.071	-0.004	0.346	1.000							
Other Services	-0.280	0.239	-0.055	0.073	0.250	0.346	0.263	0.305	0.567	0.900	1.000						
Real Interest Rate	0.258	-0.261	-0.184	0.012	-0.100	-0.124	0.395	0.392	0.211	0.021	0.269	1.000					
Real Gross domestic Product	-0.195	-0.057	0.332	0.507	0.606	0.385	0.700	0.680	0.716	0.352	0.575	0.191	1.000				
Retail	0.058	-0.371	-0.087	0.411	0.488	0.221	0.566	0.516	0.845	0.208	0.505	0.305	0.794	1.000			
Real Estate	0.032	0.182	0.288	0.515	0.406	0.313	0.620	0.755	0.224	0.244	0.431	0.390	0.406	0.191	1.000		
Gross Value Added	-0.154	-0.110	0.325	0.678	0.812	0.490	0.711	0.727	0.772	0.322	0.575	0.171	0.899	0.794	0.576	1.000	
Balance of Payments	-0.189	0.050	-0.002	-0.176	-0.223	-0.260	-0.192	-0.121	-0.151	0.115	0.059	0.141	-0.321	-0.340	0.045	-0.257	1.000

Table 14: Correlation Matrix for Randwater SOC Ltd over provinces

	Turnover	Infrastructure Spending	Gauteng	Eastern Cape	Western Cape	North West	Northern Cape	Mpumalanga	Limpopo	Kwa-Zulu Natal	Free State	Real Gross Domestic Product	Real Interest rate	Balance of Payments
Turnover	1.000													
Infrastructure Spending	-0.403	1.000												
Gauteng	-0.066	-0.045	1.000											
Eastern Cape	-0.247	0.006	0.526	1.000										
Western Cape	-0.240	-0.027	0.593	0.940	1.000									
North West	-0.385	0.164	0.510	0.848	0.888	1.000								
Northern Cape	-0.299	0.056	0.551	0.925	0.938	0.863	1.000							
Mpumalanga	-0.208	-0.127	0.418	0.900	0.955	0.837	0.888	1.000						
Limpopo	-0.178	0.043	0.433	0.736	0.823	0.728	0.771	0.690	1.000					
Kwa-Zulu Natal	-0.412	0.200	0.351	0.677	0.704	0.482	0.671	0.613	0.708	1.000				
Free State	0.117	-0.081	0.243	0.356	0.542	0.320	0.447	0.449	0.731	0.536	1.000			
Real Gross Domestic Product	-0.186	-0.068	0.593	0.833	0.883	0.757	0.848	0.800	0.845	0.734	0.431	1.000		
Real Interest rate	0.247	-0.258	0.317	0.140	0.098	0.020	0.175	-0.033	0.344	-0.024	0.130	0.279	1.000	
Balance of Payments	-0.176	0.060	-0.236	-0.458	-0.488	-0.424	-0.434	-0.466	-0.382	-0.330	-0.439	-0.412	0.009	1.000

Table 15: Correlation Matrix of Transnet SOC Ltd over sectors

	Turnover	Infrastructure Spending	Agriculture	Industry Energy	Industry Manufacturing	Construction	Financial and Insurance	Financial intermediaries	Distributive Trade	Public Administration	Other Services	Real Interest Rate	Real Gross domestic Product	Retail	Real Estate	Gross Value Added	Balance of Payments
Turnover	1.000																
Infrastructure Spending	-0.014	1.000															
Agriculture	-0.154	0.360	1.000														
Industry Energy	0.256	-0.366	0.351	1.000													
Industry Manufacturing	-0.084	-0.447	0.379	0.776	1.000												
Construction	-0.230	-0.037	0.420	0.344	0.383	1.000											
Financial and Insurance	-0.242	-0.036	0.175	0.401	0.390	0.121	1.000										
Financial intermediaries	-0.160	-0.028	0.242	0.466	0.411	0.177	0.976	1.000									
Distributive Trade	-0.175	-0.551	-0.094	0.490	0.642	0.239	0.404	0.377	1.000								
Public Administration	-0.115	-0.050	0.036	-0.087	0.103	0.432	-0.071	-0.004	0.346	1.000							
Other Services	-0.187	-0.178	-0.055	0.073	0.250	0.346	0.263	0.305	0.567	0.900	1.000						
Real Interest Rate	0.075	0.074	-0.184	0.012	-0.100	-0.124	0.395	0.392	0.211	0.021	0.269	1.000					
Real Gross domestic Product	-0.346	-0.168	0.332	0.507	0.606	0.385	0.700	0.680	0.716	0.352	0.575	0.191	1.000				
Retail	-0.347	-0.421	-0.087	0.411	0.488	0.221	0.566	0.516	0.845	0.208	0.505	0.305	0.794	1.000			
Real Estate	0.190	0.011	0.288	0.515	0.406	0.313	0.620	0.755	0.224	0.244	0.431	0.390	0.406	0.191	1.000		
Gross Value Added	-0.284	-0.336	0.325	0.678	0.812	0.490	0.711	0.727	0.772	0.322	0.575	0.171	0.899	0.794	0.576	1.000	
Balance of Payments	0.045	0.089	-0.002	-0.176	-0.223	-0.260	-0.192	-0.121	-0.151	0.115	0.059	0.141	-0.321	-0.340	0.045	-0.257	1.000

Table 16: Correlation Matrix of Transnet SOC Ltd over provinces

	Turnover	Infrastructure Spending	Gauteng	Eastern Cape	Western Cape	North West	Northern Cape	Mpumalanga	Limpopo	Kwa-Zulu Natal	Free State	Real Gross Domestic Product	Real Interest rate	Balance of Payments
Turnover	1.000													
Infrastructure Spending	-0.003	1.000												
Gauteng	-0.174	0.172	1.000											
Eastern Cape	-0.205	-0.080	0.526	1.000										
Western Cape	-0.288	-0.112	0.593	0.940	1.000									
North West	-0.205	0.005	0.510	0.848	0.888	1.000								
Northern Cape	-0.306	-0.212	0.551	0.925	0.938	0.863	1.000							
Mpumalanga	-0.314	-0.238	0.418	0.900	0.955	0.837	0.888	1.000						
Limpopo	-0.167	-0.054	0.433	0.736	0.823	0.728	0.771	0.690	1.000					
Kwa-Zulu Natal	-0.088	-0.151	0.351	0.677	0.704	0.482	0.671	0.613	0.708	1.000				
Free State	-0.143	-0.139	0.243	0.356	0.542	0.320	0.447	0.449	0.731	0.536	1.000			
Real Gross Domestic Product	-0.309	-0.100	0.593	0.833	0.883	0.757	0.848	0.800	0.845	0.734	0.431	1.000		
Real Interest rate	0.088	0.119	0.317	0.140	0.098	0.020	0.175	-0.033	0.344	-0.024	0.130	0.279	1.000	
Balance of Payments	0.024	0.022	-0.236	-0.458	-0.488	-0.424	-0.434	-0.466	-0.382	-0.330	-0.439	-0.412	0.009	1.000