Industrial Policy in Post-Apartheid South Africa: An Outlook on Technology and Industrial Policy in the cases of Brazil and South Korea

By Botlhale Modisaotsile

Abstract

South Africa is a country that has experienced premature deindustrialisation due to its inability to move out of middle-income status. The role of industrial policy in South Africa is pivotal to taking the country to greater economic heights and a higher-income status. South Africa's historical context indicates that the country experienced its highest GDP growth rates during the apartheid economy.

Since the demise of apartheid, the post-apartheid economy has experienced poverty and economic inequality that the South African government cannot eradicate. This research addresses the failure of South Africa to overcome premature deindustrialisation, and it discusses the state of the political economy and economic growth in a pre-apartheid and post-apartheid context. The thesis also addressed the significance of industrial policy through the establishment of the Industrial Policy Action Plan (IPAP). The shortcomings and successes of IPAP form a critical part of the research and present an analysis of different economic sectors. This research also assesses the state of industrial policy using two countries as case studies: Brazil and South Korea.

Introduction

This research project will use the political economy framework to analyse industrial policy in post-Apartheid South Africa. Hooks and Crookston (2013) define the political economy as a branch of social sciences that studies the relationship between a nation's population and its government when public policy is enacted. The assessment of the political economy framework is significant because it explains how society behaves when the government acts in their best interests. In the context of South Africa, this thesis will study how government actions and views toward industrial policy have emerged and evolved. The political

economy comprises the following elements: utility, wealth, value, commodity, labour, land, and capital (Jevons 1879). Grasping an understanding of the elements mentioned above is the first step to understanding the political economy. The political economy framework explains how power used by special interest groups enables the creation of rules that measure the balance of rent-seeking goals. The assessment of the South African political economy is essential because 30 years after the dismantling of apartheid, South Africa is still home to poor socioeconomic outcomes for its majority Black population. The overarching goal is to understand why South Africa's industrial policy failed to prevent premature deindustrialisation. The achievement of this goal will be done through a comparative case study analysis of two countries: Brazil and South Korea.

Industrial Policy Theory Framework

The key issue here is that South Africa has failed to prevent premature deindustrialisation in the

post-apartheid era. The assessment of the issue would have to start with the development and growth of South African industrial policy from the start of the twentieth century to the post-apartheid era.

When looking at the start of the twentieth century, South Africa became a state that was about to establish its economy as well as its government.

> "The assessment of the political economy framework is significant because it explains how society behaves when the government acts in their best interests."

From 1910 to 1994, South Africa was divided into four provinces made up of the two former British colonies of the Cape and Natal, and the two former Boer republics of the Transvaal (previously the South African Republic) and Orange Free State (Feinstein 2005). A key highlight of South African industrial policy is the establishment of ESCOM in 1922 through the Electricity Act (Freund 2018). Freund (2018) asserts that the idea behind ESCOM was to make it as independent as possible both from private capital and from any political interest within South Africa. ESCOM distancing itself from private capital and political interest gave it autonomy to become a sole provider of electricity and to contribute to the economy in sectors that require electricity.

Another key highlight of South African industrial policy is the election of the apartheid government in 1948. Ashman and Newman (2013) point out that the election of the Nationalist Party government in 1948 marked the pinnacle of the disjuncture between economic and political power in South Africa.

The apartheid government in South Africa had the power to ensure that the economic and political interests of the country are aligned on the condition that they benefit from these interests. The power dynamics of the apartheid government played a pivotal role in governing the native majority of the South African population. Consequently, the onus was on the apartheid government to inspire economic growth in their political position. Apartheid did not enable South Africa to grow more rapidly than countries that did not have similar low-wage, labour-repressive economies, but neither did it prevent a successful performance (Feinstein 2005).

The economic history of South Africa plays a pivotal role in the research context because it maps out the story of South Africa's economic development and the state of South African industrial policy. Furthermore, industrial policy is integral to the development of any economy, especially if it is well-constructed and strategically implemented. The final highlight of South African industrial policy is the post-apartheid era. The state of the South African economy in the post-apartheid era is equally important as its economic history. Both the past and present of the South African economy

will provide key information on the development of South African industrial policy. According to Ashman and Newman (2013), the new government of 1994 recognised the limitations of Industrial Policy driven by the desire to build up Afrikaner capital and to create employment for white workers. Essentially, the new government of 1994 was left with the task of reconfiguring South African industrial policy that accommodates all South Africans. In terms of key economic policies, the Mandela and Mbeki presidencies generated several policy documents such as the Macroeconomic Research Group (MERG) Report, the New Growth Path (NGP), the National Development Plan (NDP), among others (Francis *et al*. 2022). The journey of generating key policy documents paved the way for the creation of the Industrial Policy Action Plan (IPAP) and the National Industrial Policy Framework (NIPF) in the late 2000s.

Brazil Case Study

The significance of using Brazil as a case study is that it is a developing country with several challenges and successes across its industrial policy formulations and implementations. Furthermore, it is rich in numerous resources and a critical participant in the global economy like South Africa. According to Kharas and Kohli (2011), Brazil is the largest economy in Latin America, accounting for almost 40 per cent of the total GDP. Thanks to its rich resource base, Brazil grew at around 6 per cent for nearly a century (from 1900 onwards). Brazil's economy represents a large part of Latin America's total GDP, and the region's total GDP has continued to thrive based on Brazil's optimal performance. This section of the paper will address the state of import-substitution industrialisation and the protectionist regime of Brazil in the 1950s. This chapter will also discuss the establishment of Embrapa, and how Embrapa has shaped the agricultural sector in the Brazilian economy. This section of the paper will also outline the Brazilian political economy context and the state of Brazilian industrial policy in the 2000s.

Significance of using Brazil as a case study

Brazil's economic performance showed promising and consistent growth, making it one of the best developing economies. "In 1965, it was one of the wealthiest developing countries with a per capita income of $1,700 (in 2007 US dollars); Brazil continued to grow until 1978, when it reached $5,500 per capita, with an average growth of almost 9.5 per cent a year" (Kharas and Kohli 2011, p.283). It is worth noting that the per capita income is an average of how much people earn, and the average is not equally distributed. The growth of per capita income indicates wealth and prosperity for the economy. However, this success was short-lived because the Brazilian economy saw a period of decline, represented by the economy falling into the middle-income trap. "Brazil entered a long period of decline and stagnation. It did not regain its 1978 per capita income until 1995 and then only briefly in the burst of activity that followed the end of hyperinflation and the beginning of stabilisation – it was only with the commodity boom in 2006 that Brazil again surpassed its 1978 income" (Kharas and Kohli 2011, p.283-284).

> "…industrial policy is integral to the development of any economy, especially if it is well-constructed and strategically implemented."

To better understand the Brazilian case study, it is critical to discuss the start of Brazil's development of industrial policy strategies throughout the twentieth century, the 2000s and the early 2010s. Coutinho *et al.* (2012) point out essential six policy instruments that lead to effective Brazilian industrial policy, namely: financing, tax, trade-related measures, public procurement, technical and informational assistance, and regulation.

Import-substitution industrialization and Protectionism

The Brazil case study is prevalent because it addresses the three key structural challenges of

the middle-income technology trap (breaking into, linking up and back, and keeping pace). The main

industrial policy strategy adopted by the Brazilian government between the 1950s and 1970s was based on a protectionist regime structured around ad valorem tariffs (Andreoni and Tregenna 2020). The purpose of this industrial policy strategy was to strengthen the domestic economy. The protectionist mechanism strictly ensures that businesses within the domestic economy are thriving. Protectionism refers to a practice that protects a country's domestic industries from foreign competition through the taxing of imports, thereby boosting the domestic production of goods and services and limiting the presence of foreign goods and services in the market (Corporate Finance Institute 2022). The protectionist regime in the Brazilian economy aimed to advance domestic production, and it is key to note that domestic growth will require more participants (workers) to maintain the standards of the economy. Subsequently, the higher the workforce (the employment rate) is, the greater the GDP will be.

Because Brazil is rich in resources, the focus of the protectionist regime between the 1950s and 1970s considered their resources by implementing the Law of Similarities. The Law of Similarities states that a product can only be imported if it can be proven that a similar product was not produced in Brazil (Andreoni and Tregenna 2020). In terms of the Law of Similarities, Brazil strengthened their protectionist measures and ensured that the Brazilian government effectively executed the industrial policy strategy. As promising as protectionism may be to the vision of the government that implements it, it has its disadvantages. Although protectionism focuses on growing the domestic economy, it excludes the country's domestic economy from competing in the global economy. Protectionism stagnates technological developments because domestic producers are not under pressure from foreign competitors, so there is no incentive to innovate or invest in new product research and development (R&D) (Corporate Finance Institute 2022). Due to the lack of investment in research and development, the economy will fall behind and struggle to keep up with any innovations created in the global economy. Protectionism prioritises growth in the domestic economy, so it is critical to consider how this will negatively impact the public regarding product prices. There will be an increase in product prices due to the lack of competition. Consumers will consequently witness a price increase in a setting where there have been no significant upgrades or improvements in the products produced (Corporate Finance Institute 2022).

In the late 1950s, the government launched two institutions in the country to promote higher education and provide scholarships to students, namely: CAPES, a ministerial agency for coordination and human capital improvement, and FINEP, an agency set up to finance university studies and various academic projects (Czarnecka-Gallas 2013). In context to this statement, these institutions aimed to develop Brazil socially, politically and economically through the promotion and accessibility of education. In the medium-term to long term, the educational initiative invested in enhancing industrial policy in Brazil. From 1960 to 1980, the government intensified the Law of Similarities within an ISI strategy, which developed and diversified the domestic production system (Andreoni and Tregenna 2020). The goal of the ISI strategy - as a mechanism of protectionism - was to grow the economy independently with little to no reliance on other countries. Behind most policy directions, two elements are always present: the promotion of the competitiveness of firms and the defence of jobs in national economies (Ferraz et al., 2014). In this context, the purpose of the ISI strategy is to protect local enterprises and the domestic market against foreign competition and [simultaneously] enable domestic firms to learn, implement innovations and increase their international competitiveness (Czarnecka-Gallas 2013).

During this protectionist regime, the Brazilian government was responsible for creating state-owned enterprises to further enhance the economy on top of educating (and improving the lives of) the public. According to Andreoni and Tregenna (2020), a number of state-owned enterprises were developed in strategic manufacturing sectors. These companies and organisations serve as Brazil's pillars of the industrial and financial system, namely: the Brazilian Development Bank [BNDES] (1952), Petrobras (1953), Usiminas (1956), Eletrobras (1962)

> Today, Brazil is among the top-performing producers and exporters of orange juice, sugar, coffee, soya beans, beef, pork and chicken, as well as has caught up with the traditional big five grain exporters, namely: the United States of America, Canada, Australia, Argentina and the European Union *(Andreoni and Tregenna, 2018; Andreoni and Tregenna 2020).*

and Embraer (1969). Although these companies are influential to the Brazilian economy, they did not receive enough exposure to the global economy due to the implementation of the ISI strategy. The lack of strategic export-promotion methods did not allow Brazil to link up to global value chains to the same extent as China (Andreoni and Tregenna 2020). On the other hand, import substitution catered for diversification and the significant development of specific local production system linkages, but domestic companies fell behind in keeping pace with technological change (Andreoni and Tregenna 2020).

The case of Embrapa

After the protectionist regime, Brazil looked to take its trade measures and industrial policy strategies to greater heights. However, the economy faced a critical challenge that negatively impacted the government's plans. Andreoni and Tregenna (2018, p.28) state that the debt crisis during the 1980s and 1990s forced the Brazilian government to reduce its industrial policy interventions in favour of structural adjustment programs (SAPs) and macroeconomic stabilisation. Brazil has ascended in the production and trade of goods after the protectionist regime. The onus was on the Brazilian government to recognise what sectors work best in the economy and which firms contribute beneficially to the overall state of the economy.

Today, Brazil is among the top-performing producers and exporters of orange juice, sugar, coffee, soya beans, beef, pork and chicken, as well as has caught up with the traditional big five grain exporters, namely: the United States of America, Canada, Australia, Argentina and the European Union (Andreoni and Tregenna, 2018; Andreoni and Tregenna 2020). Consequently, Brazil began to solidify their status as a global participant over the years and improve the productivity of the aforementioned goods to ensure that its current account balance is in great form. According to Andreoni and Tregenna (2020), a network of intermediate institutes called Embrapa was at the centre of the Brazilian government's transformative policy package. This network fostered technological change and innovation, diversification and upgrading in agricultural farming (Andreoni and Tregenna 2020). The origin of Embrapa is integral to the research because it is considered an influential institution under the scope of industrial policy and institutional innovation. According to Alves (2010), Embrapa is a classic case of successful innovation that has main characteristics in its current form: a public corporation model of organisation, the scale of operation at a national level, spatial decentralisation, specialisation of research units, enhanced training and human resource remuneration, and a vision centred on agriculture, science and technology. Embrapa's structures in enhancing education and the development of distinct industrial sectors are vital because they understand what challenges they face as an institution and as a roleplayer of the Brazilian economy.

One of the core priorities for Embrapa was the modernisation of the agricultural sector and how best to improve it as a significant contributor to the

Brazilian economy. Embrapa, however, focused on environmental sectors that were not just limited to the agricultural sector. During its first decades, Embrapa created a network of national commodity centres and regional centres that focused on major cropping and animal production systems and eco-regional and national themes (Andreoni and Tregenna 2020). When assessing the agricultural sector, it is critical to recognise it as a sector essential to human living because it provides food that serves as a basic need for the public. Food prices were kept artificially low to avoid pressure on urban salaries (Alves and Pastore 1978; Baer 2008; Gremaud et al. 2004; Martha Jr and Alves 2018). Given the fact that Brazil kept food prices low, it meant that the consumers would benefit greatly in satisfying their basic needs. Low food prices also allow consumers to spend money elsewhere other than on food. On the other hand, firms would have to rely on high volumes of consumers buying their food products to ensure they see real profits. The foundation of Embrapa was inspired by the vision of growing the Brazilian economy using a holistic approach.

In the late 1960s, Brazilian policymakers realised that the strategy to increase food supply by expanding cultivated areas and adopting practices of limited technological content should be revised (Martha Jr et al. 2012, p.207). In this case, labour, capital, and land need to have a positive correlation to ensure the growth and efficiency of the sector, and the relevant technologies need to be used to promote productivity amongst the aforementioned factors of production. In 1972, Embrapa was founded as a response to the main weaknesses of the National Agricultural Research and Experiment Department (DNPEA), where the focus was on the main agricultural commodities and regions, experiment stations and existing projects (Andreoni and Tregenna 2018). In essence, addressing these weaknesses opened an opportunity for the government to be more knowledgeable about the agricultural sector, identify gaps in the different factors of production, and provide the necessary research to enhance the sector. This direct approach would lead to a higher total factor productivity for the agricultural sector. Total factor productivity (TFP) measures describe the relationship between output in real terms and the inputs involved in its production (Bureau of Labour Statistics 2022). The TFP is designed to measure the joint influences of technological change, efficiency improvements, returns to scale, reallocation of resources, and other factors on economic growth, allowing for the effects of capital and labour (Bureau of Labour Statistics 2022).

Embrapa's involvement in the agricultural sector provided a developmental approach to growing the economy, thus laying a foundation for the sector to expand its resources and use them to keep up with technological trends within and outside the country. Embrapa realised its growth as an institution with the government's support. According to Alves (2010), in the early years of Embrapa's establishment, the federal government understood the importance of technology for the development of agriculture. The government's relationship with the media was pivotal to Embrapa's success. The media had a crucial role in creating Embrapa's image. The media not only operates on top of achievements but also upon a consistent promise, if it is not for long (Alves 2010). The media's involvement applied indirect pressure on the government to ensure that Embrapa became a success. Since Embrapa focused heavily on agriculture, the organisation prioritised the needs of the farmers. The support from farmers, their different associations, and the media helped Embrapa cultivate a favourable image in the eyes of both the public and the government (Martha Jr and Alves 2018). It is worth noting that the government made a significant investment in Embrapa to realise its objectives and contribution to Brazilian industrial policy. Between 1974 and 1985, the government made considerable investments in infrastructure, operational costs, and personnel training – the enormous investments were around 17.2 billion Brazilian real (Martha Jr and Alves 2018). The government's support in the following decades would be consistent with maintaining the positive relationship between the farmers, the agricultural sector at large, Embrapa and the public. According to Martha Jr and Alves (2018), government support averaged 980 million Brazilian real in the 1970s, 1.9 billion Brazilian real in the 1980s, 2.21 billion Brazilian real in the 1990s, and 2.46 Brazilian real from the first decade of the 2000s. The significant expenditure since the establishment of Embrapa indicates the government's willingness to grow the industrial policy aspect of the economy and to advance technologies within Embrapa.

South Korea Case Study

Korea's history is significant to the research conducted because Korea is a developed country with an advanced economy. The Korean government had a focused analysis of what constitutes industrial policy. Considering this context, Itoh *et al*. (1988) define industrial policy as a set of policies designed to develop selected industries to increase the welfare of the country and achieve dynamic comparative advantages for these industries by using state apparatus in resource allocation. Essentially, the focus is on how sectors compete across countries - for example, the Korean services sector competing with the Chinese services sector. The competition between sectors also encourages growth and promotes industrial development, enhancing the economy domestically and internationally.

Significance of South Korean Case Study

In one specific case, the Korean government incorporated a financial element within the Korean industrial policy, an industrial-financial policy. Akkemik (2008) defines Korean industrial-financial policy as a core model that evaluates the supply-side, demand-side, international sector, and price normalisation. The industrial-financial policy aims to ensure that the optimal performance of sectors is complemented by rigid financial decision-making. The next point of focus is human development. An economy cannot exist without human capital, and its highly educated human capital represents the success of the Korean economy. "Thanks to the strong growth of school enrollments, the educational attainments of the labour force increased remarkably from 1945 to 1960; by the early 1960s, Korea already had a substantial stock of human resources" (Lee 2007, p.6). A vital driving force behind the consistent economic success of Korea is human capital with highly educated backgrounds. Korea's human capital blends in emphatically with its rigid industrial policy and government intervention.

According to Harvie and Lee (2003), the GDP per capita stood at 78 US dollars in 1960; in 1965, the GDP per capita was 105 US dollars; in 1970, it was 248 US dollars; in 1975, 598 US dollars; and in 1979, it was 1,649 US dollars. Based on the GDP per capita growth, it is clear to see the positive impact of

"Thanks to the strong growth of school enrollments, the educational attainments of the labour force increased remarkably from 1945 to 1960; by the early 1960s, Korea already had a substantial stock of human resources"

(Lee 2007, p.6).

industrial policy decisions in Korea. There was also a negative impact on unemployment because it decreased as GDP per capita increased. According to Harvie and Lee (2003), the unemployment rate stood at 11.7 per cent in 1960; in 1965, it was 7.4 per cent; in 1970, it was 4.5 per cent; in 1975, it was 4.1 per cent; and in 1979, it was 3.8 per cent. The GDP per capita and the unemployment rate of the Korean economy are significant reflections of Korean citizens benefiting from the decisions of their government. The significant drop in the unemployment rate meant that human capital became the heart of the economy and that Korean households would be able to live in better conditions due to employment and remuneration.

Formation of chaebol in Korea

The successful industrial policy story of the Korean political economy experienced organisations that looked to benefit from Korea's economic success; these organisations are *chaebols*. A *chaebol* is a group of prominent business enterprises

“*Chaebols* are organisations that contribute to the economy significantly by attracting foreign capital and generating revenue through exports.”

comprising several corporations (Chang, 1988). In Korea, from 1960 onwards, the government promoted large conglomerates named *chaebol* (Akkemik 2008). *Chaebols* are organisations that contribute to the economy significantly by attracting foreign capital and generating revenue through exports. In Korea, production activities in the new high-technology industries were concentrated in the *chaebol*, which had a large production capacity. They were, therefore, the main competitors of American high-technology producers (Akkemik 2008). In context to this statement, chaebols are businesses that generate profits and compete healthily against other businesses around the globe. A prime example of a *chaebol* is Samsung, which produces smartphones and tablets. In sum, *chaebols* pursue their profits and are incentivised to bring foreign capital in and be responsible for a portion of the country's economic growth. The goal of discussing Korean industrial policy was to highlight the approaches to establishing successful industrialisation and a cohesive relationship between large conglomerates and the government.

Historical context of the chaebol

The origin of the *chaebol* is one that was unique to the Korean economy. The *chaebol* is portrayed as an organisation created and managed by the state for national interests, with Korean President Park Chung Hee sitting on top as the Chief Executive Officer (CEO) (Baik *et al*. 2011). The purpose of the *chaebol* was for them to act as businesses and pursue the government's interests as well – this was done through a rigid partnership. Although the *chaebol's* purpose was to generate revenue, the partnership between them and the state was beneficial through the implementation of economic policy. Bearing this in mind, the vision of Korean President Park Chung Hee (henceforth Park) is vital to the study because of his close involvement with the *chaebol* in the political and economic matters of the country. The military coup of 1961 aimed to make the country independent from imports and, consequently, from foreign powers (Schneidewind 2016). In order to achieve these goals, a strong export industry needed to be built up, President Park and his regime depended on the financially strong and powerfully managed *chaebol* (Schneidewind 2016). As long as the *chaebol* accepted the general direction of the economic policy and refrained from getting entangled in partisan politics, President Park let the *chaebol* be the CEOs of Korean economic development (Kim and Park 2011). Consequently, President Park let the *chaebol* be in terms of their operations, but he was vocal and paternalistic in his interventions. Moreover, the *chaebol* would have to operate on his terms and in line with the economic policies that the government outlined. In the early 1960s, President Park's objective was to get the *chaebol* to collaborate on state-formulated industrial projects through an asymmetric exchange of political support and risk-taking between the state and the *chaebol* (Kim and Park 2011). In terms of the chaebol's risk-taking to generate revenue, the onus was on the Korean government to reassure the *chaebol* that they would be supported if the risks failed. In essence, the risks that would fail or not materialise as expected would require some form of monetary support for the *chaebol* to fall back on. According to Baik *et al*. (2011), President Park centralised power in the Economic Planning Board (EPB) and used it to encourage the *chaebol* to take risks in return for his political support.

Under the oversight of President Park, the EPB provided strategies for the government to ensure that the *chaebol* realised their productivity growth and growth as significant economic contributors. According to Kim (1992), the dominance of the EPB arose because the Ministry of Finance managed critical state resources; was internally centralised; occupied a privileged position in personnel recruitment; and had capable state agencies as

allies. Moreover, President Park also nationalised all commercial banks intending to control the sources of capital (Kim and Park 2011).

The nationalisation of commercial banks led to the government taking advantage of achieving industrial policy objectives. Commercial banks would lose the autonomy they would have because the government's decision-making processes largely influence their interests. Consequently, banks became an instrument through which the state could secure business compliance with the goals of industrial policy and macroeconomic planning (Baik *et al*. 2011). The bank nationalisation was significant because President Park could synergise industrial policy objectives with political power. At the heart of economic policymaking in Korea is the central coordination by the Deputy Prime Minister (DPM), who also serves as the Minister of the EPB and the President's top economic advisor (Choi 1987). The EPB gave financial direction in building an economic bureaucracy at the forefront of Korean economic development and policymaking.

The development and growth of the *chaebol*

A key point in the development of the *chaebol* was its partnership with the state and its unwavering support from an institutionally autonomous EPB. However, the success of the *chaebol* extended beyond the state-*chaebol* partnership and the EPB. *Chaebol* groups have been operating on the values of the Korean management system where relationships of family, alumni, region, and the state are critically important (Chang 1988). These core values proved vital when the *chaebol* participated in the global economy. Many Korean *chaebols* adopt specific tactics, such as gaining advantageous new family ties through marriage, to secure their existence and to maintain the family's dominance in management (Lee *et al*. 1991).

The rigid operation of *chaebols* allowed President Park to use them efficiently for improving sectoral performance and manufacturing products that would be sold to the public and exported to the participants of the global economy. The successful generation of rents led to the *chaebol* being able to generate more revenue and expand their businesses further. In the mid-1960s, the *chaebol* lived as exporters in a competitive world of global markets. They remained accountable to President Park as the state-designed vehicles for building a "rich nation, strong army" (Kim and Park 2011). In their role assigned to them as trading companies, the *chaebol* were the government's way of decentralising its administration of export incentives and undertaking the activities needed to strengthen Korea's export marketing capabilities (Westphal 1990). The presence of *chaebols* in the Korean economy motivated exports to increase due to their productive and innovative abilities. Baik *et al*. (2011) assert that the *chaebol* came to be the source of major innovative policy and the construction of special export zones and industrial complexes to launch Japanese-style general trading companies. When assessing major indicators of the Korean economy, a period of consistent growth inspired Korea's rapid industrialisation. According to Harvie and Lee (2003), exports in 1960 were at 33 million US dollars; in 1965, exports were at 175 million US dollars, and exports grew all the way to 4.5 billion US dollars consistently in 1974. The growth of exports reflected positively in the current account and led to enhanced growth of the Korean GDP. The GDP in 1960 stood at 2 billion US dollars; in 1965, GDP stood at 3 billion US dollars, and from there, the GDP grew consistently to 18.8 billion US dollars in 1974 (Harvie and Lee 2003).

The South African Case of Industrial Policy

The emergence of the South African economy represented the growth of a developmental state. The 1868 discovery of diamonds near Kimberley, followed by an 1886 gold boom in the Witwatersrand hills near Johannesburg and the exploitation of the coalfields of Witbank and Vryheid, sparked the birth of South Africa's industrial revolution (Majozi and Veldhuizen 2015). In 1902, the English and the Afrikaners ended the second Anglo-Boer War by signing the Treaty of Vereeniging. "The treaty of Vereeniging brought the war to an end on the 31st of May 1902, when the guns of war became silent; the treaty promised the vanquished Boers civil institutions and ultimately self-government, and it held out the prospect of constitutional reform for the White inhabitants within the two Crown colonies" (Devenish 2011, p.109). The Treaty of Vereeniging opened economic and political opportunities for the English and the Afrikaners.

The creation of economic and political control was at the expense of the native African people. According to Devenish (2011), Africans and other people of colour were left out of constitutional reform based on conciliation between British and Dutch South Africans. In context to the statement made by Devenish, the Treaty of Vereeniging strengthened the English and the Afrikaners' interests. This treaty consolidated the white political and economic elite pursuing their interests. The white people established their supremacy over the native Africans, Indians and Coloureds - however, this only occurred after resistance from the different tribes within the country (Lipton 1986). According to Swirzer (1993), the history of the Ciskei is a microcosm of South African history because the Xhosa resistance against white rule in the Ciskei was a representation of other tribes' resistance to white rule in other regions. The political power of the English and the Afrikaners meant that the rest of the South African population had no effective political representation in Parliament. The South African economy was set to grow based on the English and the Afrikaners working as a collective based on constitutional reform. They worked on establishing different sectors in the new South African state and exercised their political and economic power. The foundation of apartheid originates in legislative and customary measures of all the colonies/republics [the Cape, Natal, Transvaal and the Orange Free State], which formed the Union of South Africa in 1910 (Lipton 1986).

In 1907, representatives of most of the Transvaal coal mines established the Transvaal Coal Owners' Association (TCOA), which agreed on production quotas and a fixed price for coal (Alexander 2007). The establishment of a fixed coal price simply meant that buyers, sellers and investors can meet each other's needs in terms of business regarding coal. After 1910, there was a great increase in the demand for coal by power stations, as industries, mines and households were quick to appreciate the advantages of electricity (Jones and Muller, 2016). The establishments of the Electricity Supply Commission (ESCOM) in 1923 and Iron and Steel Corporation in 1928 were part of South Africa's road to industrialisation. Feinstein (2005) asserts that ESCOM and ISCOR were designed to exploit South Africa's resources of coal and iron ore. The discovery of coal played a pivotal role in the generation of electricity, and it also became the heart of both diamond and gold mining.

> "The 1868 discovery of diamonds near Kimberley, followed by an 1886 gold boom in the Witwatersrand hills near Johannesburg and the exploitation of the coalfields of Witbank and Vryheid, sparked the birth of South Africa's industrial revolution *(Majozi and Veldhuizen 2015).*"

A key highlight of South African industrial policy is the election of the apartheid government in 1948. Ashman and Newman (2013) point out that the election of the Nationalist Party government in 1948 marked the pinnacle of the disjuncture between economic and political power in South Africa. The apartheid government in South Africa had the power to ensure that the economic and political interests of the country are aligned on the condition that they benefit from these interests. The power dynamics of the apartheid government played a pivotal role in governing the native majority of the South African population. Consequently, the onus was on the apartheid government to inspire economic growth in their political position. Apartheid did not enable South Africa to grow more rapidly than countries that did not have similar low-wage, labour-repressive economies, but neither did it prevent a successful performance (Feinstein, 2005).

Coal mining was also a key contributor to the establishment of the South African Coal, Oil and Gas Corporation (SASOL). One of the government's most important projects was its support for SASOL, a major new public corporation formed in 1950 to convert coal into gas, and then gas into petrol, diesel, and other liquid products (Feinstein 2005). SASOL had to make its mark as a new public corporation because it relied on innovation to grow its economy. According to Barnard and Bromfield (2009), SASOL was the only firm using Fischer-Tropsch technology [converting fuel from gas and coal] in South Africa during the 1950s, and there was no need to develop mechanisms to share knowledge within the country. With the successful establishment of SASOL, coal became a critical resource for South Africa's industrial production. While SASOL may have been established as part of the effort to shift industrial development in the country away from its emphasis on the mining industry, its coal mining practices remained firmly rooted (Sparks 2012). In 1957, coal contributed 1.44 million British pounds to South African exports, which is low in comparison to gold [217 million British pounds], diamonds [30.68 million British pounds] and asbestos [10.95 million British pounds] (van Rhijn 1959). The fortunes of coal, however, took a positive turn in 1960 when there was an increase in coal production. In 1960, coal production stood at 38 million metric tons, which represented money sales of 27.5 million British pounds (Jones and Muller 2016).

Post-apartheid analysis of the South African economy and its industrial policy

The 1994 elections marked the start of a new dawn for all South African citizens. Economically, the new democracy did not meet expectations. South Africa has achieved stable economic growth since 1994, accelerating to 5 per cent in 2005 and 2006 (DTI 2007). Unfortunately, economic growth has been destabilised from 2007 onwards, reaching more lows than highs. In 2007, South Africa's economic growth went from 5.4 per cent to 3.2 per cent in 2008. In 2009, SA's economic growth took a further decline to -1.5 per cent and remained in the range of 3 to 0 per cent from 2010 to 2019 (World Bank 2022). In closing, SA's economic growth has shown little promise in the last decade. Consequently, it is pertinent for the research to find the shortcomings of the IPAP and investigate why the economy has not been growing - like how it has grown modestly from 1994 to 2006 - in recent times. The 1994 democratic elections marked the end of the apartheid, which meant that ESKOM had a compulsory duty, as a SOE, to ensure that there was electricity for all people of South Africa. The generation of electricity in South Africa could not have been possible without the abundant supply of coal. With regards to electricity supply, the government signalled from the late 1990s that ESKOM (formerly known as ESCOM) should not invest in new generation capacity as private-sector investment would be facilitated. In the 21st century, ESKOM continued to rely on large coal plants, even as new technologies became both cheaper and more flexible; it allowed the new investors in the coal mines to retain a higher share of the rents (Makgetla 2022).

A key matter to assess in the context of South African industrial policy is the Industrial Policy Action Plan. In essence, the South African government established the Industrial Policy Action Plan (IPAP) to improve the state of South African industrial policy. "South Africa's Industrial Policy Action Plan (IPAP) recognises the country's industrial financing incentive packages needed to be competitive in respect of their accessibility, costs, and conditions, to attract foreign direct investment" (DTI 2018, p.71). The IPAP aims to grow the South African economy on the condition that the plans put on paper are practised. The 2012 IPAP has presented key successes that benefited the South African economy. The manufacturing sector has delivered on most of its objectives within the IPAP. Davies (2021) asserts that the manufacturing sector recorded successes directly from the IPAP programs. These successes include:

1. Investments reached a total of 25.7 billion rands in the automotive sector, supporting around 300,000 jobs, with the APDP to embrace bus bodies, medium and heavy vehicles and minibus taxis.
2. The retention of 67,000 jobs and the creation of 7,000 new jobs in the clothing, textile, footwear and leather industries had lost 45,000 jobs between 2000 and 2010. The Clothing and Textile Competitiveness Programme provided government support to the clothing and textile sector to participate in competitiveness-raising initiatives.

3. Fundamental advances in metals fabrication industries, driven by a combination of infrastructure spending and localisation programs.
4. Significant investments in the agro-processing, household consumer goods, television manufacturing and pharmaceutical sectors, among others.
5. The film rebate programme supports a fourfold increase in the value of film productions.

The following constraints hold back the IPAP: lack of policy coherence and programme alignment, the concentration of ownership and control, high private sector input costs and electricity (DTI 2018). In context to this statement, these constraints must be challenged for industrial policy to flourish. Here, the reader can think of a sector's performance from the IPAP. For example, one can consider the automotive sector's performance based on the 2018 IPAP. In the context of the 2018 IPAP, the automotive sector remains a sector that can influence the economy positively in terms of industrialisation and improving the strength of its GVCs through GVC upgrading. The automotive sector contributes 33 per cent to the manufacturing GDP and about 6 per cent to the overall GDP, and it produces approximately 600,000 vehicles per year, thus creating 113,000 jobs (DTI 2018). As stated earlier, the automotive sector is export oriented. Therefore, the impact of exports plays a role in whether this sector is doing well globally. Exports in this sector (2018) are valued at 171 billion Rand (DTI 2018). The automotive sector has experienced a rapid increase in exports, with its share of manufactured exports increasing from 4.3 per cent in 1995 to over 20 per cent in 2019 (Black 2022). Exports have doubled in this period, which has also seen 45 billion Rands worth of investment by most of the world's leading global vehicle manufacturers – Mercedes-Benz, Toyota, BMW, Ford, and Isuzu, among others (DTI 2018).

Although the automotive sector has grown significantly in exports, the sector has produced high import penetration ratios in the last fifty years. Kennedy and Thirlwall (1979) define an import penetration ratio as a ratio of imports to domestic output. According to Black (2022), the import penetration ratios for motor vehicles stood as follows: 32 per cent in 1972, 24.2 per cent in 1990 and 65.1 per cent in 2016. Consequently, an import penetration ratio of 65.1 per cent means that imports are quite high for motor vehicles and, therefore, pose a threat to South Africa's competitiveness in the global economy. This perspective is also reflected in the manufacturing sector, where the current account is negatively impacted. Although the exports of manufactures have increased at a pedestrian pace, the rapid increase in import penetration coupled with modest export growth has led to the manufacturing sector recording a 300 billion Rand trade deficit in 2017 (Black 2022; DTI 2018). In sum, the automotive sector needs to use its resources better and enhance its GVCs if it wishes to be a mainstay in the list of South Africa's top sectors.

South Africa's manufacturing employs 320,000 fewer people than in 2008; this decline in manufacturing employment arises not only because of the slow growth rate of output but also because the number of jobs per unit of output needs to be higher (Kaplan 2019). The slow growth rate of manufacturing output makes matters challenging for the economy because manufacturing was a significant contributor to the GDP during the twentieth century. In sharp contrast to the IPAP, which envisaged a growing manufacturing share, the manufacturing share of GDP has fallen from 16 per cent to below 12 per cent (Kaplan 2019). The fall of the manufacturing share indicates that the strategies built within IPAP needed to be more stable to ensure manufacturing would prosper. South Africa's manufactured exports have grown far more slowly than its peers, and South Africa's manufactured exports are well below the country's potential (Kaplan 2019). Additionally, manufactured export growth has made it difficult for the manufacturing sector to show any signs of growth. The lack of growth in the manufacturing sector begs the question: why has industrial policy planning failed to counteract manufacturing

"South Africa's manufacturing employs 320,000 fewer people than in 2008..."

performance? The objectives and targets set out in the IPAP do not match the manufacturing sector's performance, so it is safe to conclude that the policy requires a rigorous review.

Premature deindustrialisation and the middle-income trap have become critical defining concepts of South Africa's unequal economy. South Africa has been unable to move out of middle-income status despite the efforts of the IPAP to turn the economy. Thus, the attempt to overcome the middle-income trap has not come to fruition. Structural adjustment programs have been introduced to take middle-income countries to higher heights in economic growth, but they have left the beneficiaries in large amounts of debt. In terms of the middle-income technology trap, South Africa has suffered from three structural challenges that have kept them from preventing premature deindustrialisation: breaking into globally concentrated industrial production; linking up with global value chains while linking back with local production systems; and keeping pace with technological change (Andreoni and Tregenna 2020).

Role of the Fourth Industrial Revolution (4IR) in overcoming the middle-income trap

The role of the Fourth Industrial Revolution (4IR) in overcoming the middle-income trap is crucial for South African industrial policy. The 4IR is the current and developing environment in which changing technologies and trends such as the Internet of Things (IoT) and Artificial Intelligence (AI) are changing the way we live and work (Kayembe and Nel 2019). The 4IR is a confluence of cyber, physical and biological technologies (Marwala 2022). 4IR is viewed as the revolutionary change that takes place when ICT thrives in all industries – primary, secondary, and tertiary (Lee *et al*., 2018). Consequently, the advent of the 4IR promises significant social and economic opportunities and challenges which demand that governments respond appropriately in supporting society transformation (Manda and Ben Dhaou 2019).

The context of South African industrial policy is one that can use 4IR to stimulate sectoral performance in various sectors such as renewable energy, manufacturing, tech manufacturing, power, information and communication technology, and education amongst others. Despite 4IR's capabilities to drive economic growth and foster innovation, there is a fear that 4IR may work against the society in terms of economic opportunities. Marwala (2022) asserts that 4IR will lead to talent shortages because many people do not have the required skills to adapt to the disruptions in industries, mass unemployment, and growing inequality. In the context of this statement, it would be beneficial for people to learn about the capabilities of 4IR and to learn more about IoT and AI to upskill themselves. The upskilling of human capital in the context of 4IR would drive industrial policy to optimal levels but the implementation of 4IR is not limited to people skills. The implementation of 4IR is fundamental for the growth of economic sectors where technology can catalyze productivity and efficiency in various economic sectors. According to Gastrow (2020), the purpose of a 4IR policy that is focused on a nation is to harness the power of new technologies towards the achievement of South Africa's developmental ambitions. 4IR is characterized as a global infrastructure for the information society that is enabling advanced services by interconnecting physical and virtual things based on existing and evolving interoperable information and communication technologies (Lee *et al*. 2018). In 2019, South Africa was ranked 67th out of 140 developing economies, where the manufacturing sector was the 3rd-worst performing sector in the first quarter of 2019 because its GDP share fell to 8.8% after recording performance of 12% in 2015 and 13% in 2016 respectively (Bayode *et al*. 2019). Consequently, South African sectors, such as manufacturing, that can be driven by 4IR-based technology are highly likely to compete with other sectors in global markets.

What can be done differently for South African industrial policy?

The South African government should consider being firm, direct, and detailed in reducing unemployment and poverty or increasing any major indicator (for example, the manufacturing share of the GDP). This approach can include a detailed key action plan or framework that has steps that the government can refer to if the approach is not successfully executed.

The IPAP should be reformulated to have a framework that will address the structural challenges of the middle-income technology trap. The IPAP should have a strategy that discusses how best innovation within the scope of the Fourth Industrial Revolution can be implemented in the South African economy.

References

Akkemik, K. A. (2008). *Industrial development in east asia: a comparative look at japan, korea, taiwan and singapore (With Cd-rom) Vol. 3*. Turkey: World Scientific.

Alexander, P. (1999). Coal, control and class experience in South Africa's Rand revolt of 1922. *Comparative Studies of South Asia, Africa and the Middle East*, 19(1), pp.31-45.

Alves, E.R., and Pastore, A.C. (1978). Import substitution and implicit taxation of agriculture in Brazil. *American Journal of Agricultural Economics*, pp. 865-871.

Alves, E.D.A. (2010). Embrapa: a successful case of institutional innovation. Área de Informação da Sede-Artigo em periódico indexado (ALICE). 19, pp. 64-72.

Andreoni, A. and Tregenna, F. (2018). Stuck in the middle: South Africa in the new global industrial landscape. Industrial Development Think Tank Policy Briefing Paper 11 [online]. Available from: https://www.competition.org.za/ccred-blog-structural-transformation/2020/4/20/stuck-in-the-middle-south-africa-in-the-new-global-industrial-landscape [Accessed: 3 October 2023].

Andreoni, A. and Tregenna, F. (2020). Escaping the middle-income technology trap: A comparative analysis of industrial policies in China, Brazil and South Africa. *Structural Change and Economic Dynamics*, 54, pp.324-340.

Ashman, S. and Newman, S. (2013). Industrial policy and South Africa's economic trajectory: from apartheid to present day., unpublished paper presented at: *UNU-Wider: Conference on learning to compete: Industrial Development and Policy in Africa*. Helsinki, 24-25 June 2013.

Baik, C.J., Domínguez, J.I., Hong, S.G., Im, H.B., Jun, B.J., Kim, E.M., Kim, H.A., Han, Y.S., Kim J.H., Kim T. & Hutchcroft, P.D. (2011). *The Park Chung Hee era: the transformation of South Korea*. Cambridge, Ma: Harvard University Press.

Barnard, H. and Bromfield, T. (2009). The development and management of an intellectual property strategy in a developing country context: The case of Sasol. *The Economics of Intellectual Property in South Africa*, 84.

Bayode, A., Van Der Poll, J.A. and Ramphal, R.R. (2019). 4th industrial revolution: Challenges and opportunities in the South African context. *Conference on Science, Engineering and Waste Management (SETWM-19)*, pp. 174-180.

Black, A. (2022). Industrial policy in South Africa. In: Oqubay, A., Tregenna, F., and Valodia, I., eds. *The Oxford Handbook of the South African Economy*. Oxford Academic.

Bureau of Labour Statistics (2022). Total Factor Productivity - 2021. *Bureau of Labour Statistics* [online]. Available from: https://www.bls.gov/news.release/pdf/prod3.pdf [accessed: 12 November 2022].

Chang, C.S. (1988). Chaebol: The South Korean Conglomerates. *Business Horizons*, 31(2), pp.51-57.

Choi, B.S. (1987). The structure of the economic policy-making institutions in Korea and the strategic role of the Economic Planning Board (EPB). *Korean Journal of Policy Studies.*

Corporate Finance Institute (2022). What is Protectionism?. *Corporate Finance Institute* [online]. Available from: https://corporatefinanceinstitute.com/resources/economics/protectionism/ [accessed: 4 November 2022]

Czarnecka-Gallas, M. (2013). The efficiency of industrial policy in 21st century? The case of Brazil. *Gospodarka Narodowa. The Polish Journal of Economics*, 265(7-8), pp. 5-35.

Davies, R. (2021). *Towards a new deal: A political economy of the times of my life*. Jonathan Ball Publishers.

Devenish, G.E. (2011). The South African Act revisited some constitutional and political reflections on lessons learnt from the centenary of the Union of South Africa in 1910. *Obiter*, 32(1), pp. 108-125.

Department of Trade and Industry and Competition 2007 (2007). *Industrial Policy Action Plan 2007/08-2009/10* [online]. Available from: indpolactionplan3aug20070.pdf [Accessed: 3 October 2023].

Department of Trade and Industry and Competition 2018 (2018). *Industrial Policy Action Plan 2018/19-2020/21* [online]. Available from: publication-IPAP1.pdf [Accessed: 3 October 2023].

Feinstein, C.H. (2005). *An economic history of South Africa: Conquest, discrimination, and development*. Cambridge University Press.

Ferraz, J.C., Kupfer, D. and Marques, F.S. (2014). Industrial policy as an effective development tool: Lessons from Brazil. *Transforming Economies*, pp.291-305.

Francis, D., Habib, A. and Valodia, I. (2022). South Africa's post-apartheid economic development trajectory. *The Oxford Handbook of the South African Economy*, pp.91-110.

Freund, B. (2018). *Twentieth-century South Africa: a developmental history.* Cambridge: Cambridge University Press.

Gastrow, M. (2020). Policy options for the fourth industrial revolution in South Africa. *HSRC*.

Gremaud, A.P., Vasconcellos, M.A.S.D., and Toneto JR, R. (2004). *Economia brasileira contemporânea*. 5th edition, Sao Paulo: Editora Atlas.

Harvie, C., and Lee, H.H. (2003). Export-led industrialisation and growth: Korea's economic miracle, 1962–1989. *Australian Economic History Review*, 43(3), pp. 256-286.

Itoh, M., Kiyono, K., Okuno-Fujiwara, M., and Suzumura, K. (1988). *Sangyou Seisaku no Keizai Bunseki* (Economic Analysis of Industrial Policy), Japan: Tokyo University Press (in Japanese).

Jevons, W. S. (1879). *The theory of political economy*. Macmillan and Company.

Jones, H.S. and Muller, A. (2016). *The South African Economy, 1910–90*. Springer.

Kaplan, D. (2019). South Africa's Industrial Policy: Time for a Review and a Rethink.

Kayembe, C. and Nel, D. (2019). Challenges and opportunities for education in the Fourth Industrial Revolution. *African Journal of Public Affairs,* 11(3), pp. 79-94.

Kennedy, C. and Thirlwall, A. P. (1979). Import Penetration, Export Performance and Harrod's Trade Multiplier. *Oxford Economic Papers*, 31(2), pp. 303–323.

Kharas, H. & Kohli, H. (2011). What is the middle-income trap, why do countries fall into it, and how can it be avoided? *Global Journal of Emerging Market Economies*, 3(3), 281-289.

Kim, E.M. and Park, G.S. (2011). Chapter Nine. The Chaebol. In: Kim, B.Y. and Vogel, E.F. eds. *The Park Chung Hee Era.* Cambridge, Ma: Harvard University Press, pp.265-294.

Lee, J.W. (2007). Economic growth and human development in the Republic of Korea, 1945-1992. *Reconstruction, 1945*, 61.

Lee, S.M., Yoo, S. and Lee, T.M. (1991). Korean chaebols: Corporate values and strategies. *Organizational Dynamics*, 19(4), pp. 36-50.

Lee, M., Yun, J.H.J, Pyka, A., Won, D., Kodama, F., Schiuma, G., Park, H., Jeon, J., Park, K., Jung, K., Yan, M., Lee, S., Zhao, X. (2018). How to respond to the Fourth Industrial Revolution, or the Second Information Technology Revolution? Dynamic new combinations between technology, market, and society through open innovation. *Journal of Open Innovation*, 4(21), pp.1–24

Lipton, M. (1986). *Capitalism and apartheid: South Africa, 1910-1986.* New Africa Books.

Makgetla, N. (2022). Mining and Minerals in South Africa. *The Oxford Handbook of the South African Economy*, 261.

Manda, M.I., and Ben Dhaou, S. (2019). Responding to the challenges and opportunities in the 4th Industrial revolution in developing countries. In: *Proceedings of the 12th international conference on theory and practice of electronic governance 3-5 April, Melbourne,* (pp. 244-253).

Martha JR., B.G. and Alves, E. (2018). Brazil's agricultural modernization and Embrapa. In Amann, E., Azzoni, C.R., and Werner Baer, W. *The Oxford Handbook of the Brazilian Economy*. Oxford University Press, pp. 309-337.

Martha JR, B.G., Contini, E. and Alves, E. (2012). Embrapa: its origins and changes. *The regional impact of national policies: the case of Brazil*, 204.

Schneidewind, D.K. (2016). *Economic miracle market South Korea*. Singapore: Springer.

Sparks, S. (2012). Apartheid Modern: South Africa's oil-from-coal project and the making of a company town' [unpublished]. DPhil dissertation, University of Michigan.

Switzer, L. (1993). *Power and resistance in an African society: The Ciskei Xhosa and the making of South Africa*. University of Wisconsin Press.

Van Rhijn, A.J.R. (1959). The Importance of the South African Mining Industry. African Affairs, 58(232), pp. 229–237.

Westphal, L.E. (1990). Industrial policy in an export-propelled economy: lessons from South

Korea's experience. *Journal of Economic perspectives*, 4(3), pp.41-59.

World Bank, (2022). South Africa: Economic Indicators. *World Bank Group* [online]. Available from: https://data.worldbank.org/country/south-africa?view=chart [accessed 27 June 2022].