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Masters Research Project

The Paradox of Learning-by-doing in South Africa's Industrial Sector: Industrial revival of a once-thriving sector vs launching a new one

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Abstract

This study evaluates whether South Africa's industrial strategy should prioritise revitalising legacy sunset manufacturing industries or investing in emerging sunrise sectors. It is framed by heterodox growth theories drawing on structuralist and mission-oriented insights to analyse the paradox of learning-by-doing. The paradox of learning-by-doing in the context of manufacturing revival and global competitiveness is that countries must produce at scale to build skills and efficiency, yet rising global competitors already operate at such scale that new entrants struggle to start. In essence, you need experience to compete, but you can't gain experience without already being competitive, trapping latecomers in a cycle that may prevent them from catching up. Under this lens, accumulated production experience does not automatically translate into competitiveness. A comparative analysis of mature industries (steel, furniture, clothing and textiles) versus new sectors (renewable energy) highlights how historical capabilities interact with structural constraints. Findings show that legacy sectors retain valuable know-how but face intractable constraints: outdated technology, scale disadvantages, and fragmented firms limit productivity. Findings show that legacy sectors retain valuable know-how but face intractable constraints: outdated technology, scale disadvantages, and fragmented firms limit productivity. For example, South Africa's once-thriving steel industry remains uncompetitive as small domestic mills lose ground to large-scale foreign producers. Similarly, the furniture sector still possesses a deep skills base yet demand collapse and low-cost imports have eroded its competitive edge. In emerging sunrise sectors like renewable energy, huge investments have built capacity, but productivity gains have lagged expectations. Analysts attribute this to fragmented policy and a lack of coordinated learning infrastructure. These patterns underscore that automatic, market-driven learning alone is insufficient. The policy implication is a mission-oriented manufacturing ecosystem combining active state leadership with private-sector innovation. Such an approach can reconcile short-term competitiveness goals with long-term capability-building and resilience.

Keywords: *Learning-by-doing, industrial revitalisation, manufacturing*

1. Background

Manufacturing industries have been perceived as backbones of economic development, mainly because these industries assist in modernising the agricultural sector while also reducing the population's reliance on agricultural produce or subsistence farming, and providing employment in secondary and tertiary sectors (Haraguchi, Cheng, & Smeets, 2017). However, the past two decades have been characterised by fast emerging economies undergoing profound structural transformation. While industrial production has substantially increased on a global scale, it remains highly concentrated in regions which were able to exploit their relatively cheap forms of productive capacity. The consequence of this concentration of industrial production is the premature deindustrialisation occurring in many low-and middle-income countries, of which South Africa knows all too well (PAIRS, 2016). South Africa's manufacturing sector alongside its global counterparts, is facing a host of new challenges on account of the implications of the COVID-19 pandemic and pre-existing sectoral handicaps, the sector has had to contend with over the years. PAIRS (2016), and Andreoni, Mondliwa, Roberts, and Tregenna (2021) further state that premature deindustrialisation is a result of escalating costs of energy and inefficient production capacities. The global reduction of carbon footprints for all goods and services, as a result of flawed industrial and macroeconomic policy, is a significant threat to these low- and middle-income countries as it dwindles their opportunities for productive capacity in the form of technological development and advancement, their capacity in being instrumental in global value chains and tradable sectors (PAIRS, 2016, p. 9). Like other developing countries, South Africa's manufacturing sectors have been grappling with a significant decline in recent years, with industries such as clothing and textiles, and steel withstanding the worst of the crisis (Oqubay, Tregenna, & Valodia, 2021). The decline, a multifaceted issue influenced by micro and macro factors highlights the country's need for localisation capabilities as a means of expansion, survival and security (PAIRS, 2016).

The global landscape of manufacturing sectors witnessed transformative shifts over the past few decades, with the emergence of China and other export-focused countries as a manufacturing powerhouse playing a pivotal role. The introduction of Chinese exports,

spanning a range of products such as steel, furniture, clothing and textiles has had far-reaching implications for industrialisation worldwide, particularly impacting economies like South Africa (Han, 2018). China's meteoric rise in manufacturing began in the late 20th century, driven by its vast labour force, low production costs, and rapid industrialisation efforts (Han, 2018). As China progressively opened to international trade and investment, its export-oriented approach reshaped global manufacturing dynamics. This phenomenon witnessed back then was notably referred to as the theory of Creative Destruction by Joseph Schumpeter (Caballero, 2010). He defined this concept as the unabating process and product innovation mechanism by which older production units are replaced by newer ones. The mass production of steel at highly competitive prices flooded global markets and global dominance, leading to decreased demand for steel from countries such as South Africa and undermining their steel industries (Han, 2018). This phenomenon had cascading effects on countries that were historically steel producers and disrupted their established industrialization trajectories. Overcoming this disruption in production capacities was and remains a challenge. This trend has impacted many other emerging economies, where these labour-intensive industries were meant to be key drivers of economic growth and employment. Takala-Greenish (2015), states that due to steady declines in employment, investment and respective gradual declines in real output and real added value, the country's textile and clothing sector suffered immensely as they failed to maintain competitiveness. Despite export promotion initiatives, exports have not grown, and cheaper imported products have slowly conquered the domestic market (Takala-Greenish, 2015). We have witnessed the demand for locally produced steel, and clothing and textiles wane leading to disruptions through global supply value chains and dampening prospects for spillover effects into other industrial sectors.

The South African government, in its final attempt to save local manufacturing capabilities, has implemented a wide range of interventionist strategies to revive near-defunct sectors and attempt to establish new auspicious industries. The domestic steel manufacturing industry, which was one of the main pillars of the local economy in the apartheid-era, has lost its competitive edge and current trading conditions have been fuelled by increases in costs, low demand and labour costs which on the whole, have

risen faster than the inflation rate, all of which combine to make running competitive steel mills and downstream steel businesses very challenging (SEIFSA, 2022). The textiles and clothing sector in South Africa has always faced drastic decline to the point of obsolescence as a consequence of the rise in costs, labour inflexibility, and increased global competition (Takala-Greenish, 2015). Against the backdrop of all these challenges, there has been specific attention placed on the nuances of South Africa's policymakers on whether they have opted to reconceptualise distressed manufacturing sectors or lay the foundation of establishing competencies in new latent sectors.

The country has opportunities to develop new industrial capabilities which revolve around new technologies and one such sector that has been gaining increasing attention globally, and potentially holds promise for South Africa, is the renewable energy technologies sector (TIPS, 2021). As nations strive worldwide to transition to more environmentally friendly and sustainable energy systems, renewable energy technologies have emerged as a crucial driver of economic and environmental transformation. In the context of South Africa, the renewable energy sector presents a unique opportunity for fostering sustainable development and energy security (Schmid, 2012). The country has ample natural resources, making it well-suited for the deployment of solar and wind energy projects. This integration can help us diversify the energy supply, reduce dependency on fossil fuels, and mitigate greenhouse gas emissions, contributing to global climate change mitigation efforts. South Africa's commitment to renewable energy development is evident through various policy initiatives and programs, such as the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The REIPPPP program continues to facilitate private sector investments in renewable energy projects, leading to capacity additions in the renewable energy sector. However, the industry still faces its own set of challenges. The challenges include technological complexities, policy and regulatory uncertainties, and grid integration issues (Akinbami, Oke, & Bodunrin, 2021). Bordering on these challenges and opportunities lies the controversial US-China currency and trade war in which another dimension of trade, the value of Chinese currency vis-à-vis the US dollar is investigated. The motivation behind this investigation is whether the Chinese government is deliberately undervaluing their currency which has led to the USA having a mounting

account deficit (Archana, 2020). Research has shown that China's growth success and comparative advantage in manufacturing has partly relied on policies of reserve accumulation and currency undervaluation. This undervaluation has net export promotional attributes which may be detrimental to South Africa's manufacturing revitalisation plans. The reasoning being that South Africa's manufacturing sector is faced with acute complexities in the context of attempting to rescue crisis-affected sectors or launching new ones.

In macroeconomics, labour productivity is used as an indicator for dynamically measuring economic growth and competitiveness within an economy (Tezzele, 2022). On the backdrop of this notion, labour productivity also provides information about the efficiency and quality of human capital in the production process (International Labour Organization, 2019). The most important determinants of labour productivity are human capital, physical capital and technological change. The human capital element is the accumulated knowledge, expertise and skills that these individuals possess. Physical capitals implies the equipment and facilities available to workers to produce services and goods, while technological change refers to the combination of advances in technology and innovation (the process of putting the advancement into a new product or service) (Tezzele, 2022). Increases in productivity can then be attributed to the growth of one of these elements. However, if the real gross domestic product increases while labour hours remain static, it is a clear signal that the labour has become more productive.

This introduces the concept of learning-by-doing which is based on learning from experiences resulting from one's own actions (Tezzele, 2022). Learning takes place through various attempts to solve a problem (Arrow, 1962), and it was observed and concluded that the number of labour hours expended in production is a decreasing function of the toral number of products of the same type previously produced (Wright, 1936). Early research pointed out that the concept of learning-by-doing in the manufacturing sector has been acknowledged as a productivity enhancing factor in the production function. However, what we also need to understand is that learning in the production function is finite and can plateau or depreciate (Tezzele, 2022). When a

technological change occurs, past knowledge can become irrelevant, and the knowledge passed down to workers can be lost.

This paper contributes to existing literature by investigating the manufacturing challenges faced in South Africa in relation to the concept of learning-by-doing and increased competitiveness at a global level. The paper is comprised of six chapters which are a build-up on whether it would be a formidable endeavour to establish a new sector from the ground up or to resurrect a once-thriving industry as part of our strategy to regain competitiveness at a global level. The study firstly explores the contradictions of theories that underpin industrial growth. It then investigates the significance of manufacturing in sunset industries and examines the notion of learning-by-doing in sunrise industries. The study further considers the paradox of learning-by-doing, where capabilities developed in declining sectors can simultaneously constrain and enable innovation. It then highlights the need for a mission-oriented manufacturing ecosystem that connects industrial policy, capability development and sustainability transitions. Subsequently, the research examines the revival of once-thriving industries through cases of the steel, furniture, and clothing and textile industries. It evaluates the historical background of each industry, the policy interventions implemented for their supposed revival, and the outcomes achieved. It also investigates the emergence of new industries, focusing on renewable energy systems in South Africa. The analysis also considers the background and evolution of this industry, reviews the policy frameworks and interventions that have supported its growth, and assess the progress toward establishing a competitive renewable energy base. The study concludes by synthesising insights from both established and emerging industries.

2. Methodology

The research adopts a qualitative research design, underpinned by an inductive approach that prioritises theory-building from evidence in order to investigate the revival processes and challenges faced by crisis-affected sectors as opposed to new sectors in the South African economy and it is chosen for its suitability in exploring complex, context-dependent economic events (Bowen, 2009). Unlike quantitative approaches that

emphasise hypothesis testing and statistical generalisation, qualitative designs prioritise depth, contextualisation and the generation of explanatory insights (Bryman, 2016). The research question of whether South Africa's industrial policy should prioritise revitalisation of sunset industries or the establishment of sunrise industries, requires sensitivity to historical trajectories, institutional dynamics and policy discourses that are not captured through numerical indicators alone. In line with Blaikie and Priest (2018), this study therefore employs theory-building rather than theory testing using empirical and documentary evidence to refine understandings of the paradox of learning-by-doing.

The primary method applied is document and case study analysis, a strategy well established in the social sciences for examining bounded systems in their real-life context. Yin (2003), argues that case studies are especially appropriate when research questions are framed as "how" and "why" questions, when the researcher has little control over behavioural events, and when the focus is on contemporary phenomena. All three conditions apply here. The study seeks to understand the "how" and "why" learning-by-doing may or may not translate into industrial revitalisation in South Africa. This form of analysis or research design also allows for what Yin calls "analytic generalisation" in which findings are not statistically generalised to a population but rather to theoretical propositions. Accordingly, the study does not that its case studies are representative of all South African industries. Rather, they provide analytical leverage for theorising about the paradox of learning-by-doing and its implications for policy.

The case study approach is complemented by a comparative logic of inquiry informed by (Ragin, 2014), who emphasises the importance of configurational analysis in the social sciences. Ragin argues that outcomes in complex social systems often result from different combinations of conditions rather than single causal factors. Applying this reasoning, the study treats each industry analysed not as isolated instances but as configurations of policy, institutional capacity, and global constraints. The comparison across "sunset" and "sunrise" industries is thus designed to reveal how differing and yet interconnected factors shape the paradox of learning-by-doing. This comparative strategy helps identify patterns across industries while remaining attentive to sectoral specificity, enabling richer theoretical insight.

This research makes use of a systematic procedure to evaluating and review existing documents. The document analysis enables systematic examination of industry reports and academic studies to identify patterns and evaluate policy effectiveness (Bowen, 2009). The research is expected to draw upon multiple sources of evidence to seek convergence and corroboration. Triangulating the data will allow us to provide a confluence of evidence that breeds credibility (Bowen, 2009). As pointed out by Robert (1994), document analysis as a research method is most relevant to qualitative studies which are able to produce rich descriptions of a single phenomenon. In addition, the documents will allow us to uncover meaning, develop understanding and discover insights relevant to the paradox at hand.

As argued by Cleland (2017) as cited in (Islam & Aldaihani, 2022), qualitative research addresses the research question concerning the 'how' and 'why' adopting a qualitative approach to this research will help us explore and investigate the interplay between South Africa's industrial productive capacity and how it is influenced by endogenous and exogenous factors. By applying this reasoning, the study treats each case not as isolated instances but as configurations of policy, institutional capacity, and global constraints. The comparison across "sunset" and "sunrise" industries is thus designed to reveal how differing constellations of factors shape the paradox of learning-by-doing. This comparative strategy helps identify patterns across industries while remaining attentive to sectoral specificity, enabling richer theoretical insight than a single case could provide.

In addition to case study analysis, the study employs document analysis as a core method. Document analysis refers to the systematic examination and interpretation of written materials in order to elicit meaning, contextualise events and triangulate evidence (Bryman 2016). This method is particularly valuable in industrial policy research where policy documents not only reflect government intentions but also shape the discursive terrain within which stakeholders operate. Document analysis was conducted through a process of thematic coding then coded for recurrent themes such as localisation, upgrading, skills development, and global competitiveness. This approach

ensures that the analysis goes beyond descriptive reporting to identify the assumptions and nuances embedded in the texts.

The combined use of case study and document analysis enhances methodological rigour by allowing for triangulation across sources and perspectives. The case studies provide contextual depth, while document analysis ensures systematic coverage of formal policy narratives. Together, they generate a nuanced picture of how learning-by-doing operates across old and new sectors in South Africa. Nonetheless, it must be acknowledged that the research design is faced with certain limitations wherein while interviews with policymakers and industry experts were planned, only one questionnaire was responded to. This limits the degree of primary empirical insight, though it does not undermine the study's ability to answer the research question. Rather, the absence of interview data is addressed explicitly as a limitation (see section 3). The reliance on secondary sources and official documents may introduce bias insofar as such documents reflect certain framings and interests, but this is mitigated through cross-referencing with critical academic literature. Ultimately, the chosen methodology is appropriate for research that aims to clarify conceptual debates and critically evaluate industrial policy options.

3. Theoretical Background

3.1. Growth Strategies Behind Manufacturing

From time immemorial economists have sought to devise ways in which they could study and understand the causes and determinants of economic growth. And in recent years, the shape up of 'endogenous growth theory' models have eclipsed the famed neoclassical growth models of Robert Solow which pivot around exogenous growth models (Oqubay, 2015). The main feature of this "newly" introduced theory was to stress the importance of exogenous components of demand as a determinant of long-run economic growth. Nicolas Kaldor was one of the first economists to pay special attention to this aspect and persisted in attempting to demonstrate the positive correlation between augmented economic growth and the increased share of manufacturing output

in Gross Domestic Product (GDP). In 1966 Kaldor, published seminal papers on the United Kingdom's low economic growth. Although at the time, inefficient resource management, restrictive trade unions, low investment inflows and price distortions were put forward, he argued that these factors were implausible in the economic dynamic of the time (Marconi, Reis, & Araújo, 2016). Alternatively, he developed an approach based on the analysis of stages of growth and development and subsequently concluded that the British economy at the time "suffered from premature maturity". He described this as a consequence of domestic manufacturing capabilities declining when compared to its economic counterparts. Britain at the time, debilitated its manufacturing growth potential before attaining productive maturity (Marconi, Reis, & Araújo, 2016).

This approach would analyse the role of the manufacturing sector as a causal factor of economic growth. He acknowledged that the primary source of growth was premised on the interaction processes between increases in supply which simultaneously induces increases in demand to arise from increases in demand as a result of industrial activities (Oqubay, 2015). This perspective was influenced by the school of thought which contended that economic development was and continues to be described by principal transformations in the structure of production and employment. Romer's growth model supports this notion in that it maintains that when growth is driven by production innovation, a significant two-way causality between structural changes and growth arises (Oqubay, 2015). Therefore, the establishment and growth of new and existing industries, respectively, determine innovative incentives which lead to high aggregate growth when the focus is placed on manufacturing activities (Korkmaz & Korkmaz, 2017). Accordingly, the manufacturing industry is the principal source of long-term economic growth, the spearhead of modernisation, skilled job creation and the fundamental cause of positive spillovers, ergo the groundwork for grand-scale industrialisation (Korkmaz & Korkmaz, 2017). Kaldor established empirical laws for the long term to elucidate the underlying causes of observed growth disparities among developed nations. Kaldor's perspective asserted that developed countries share dual characteristics akin to those of developing nations (Wells & Thirlwall, 2004). These traits encompass a substantial agricultural sector marked by low productivity and an excess of labour, along with a capital-intensive industrial sector characterized by swift technological advancements

and growing returns. Kaldor's model underscores the dynamic interplay between escalating demand triggered by supply expansion and the subsequent surge in demand spurred by heightened industrial activities (Wells & Thirlwall, 2004).

The transition of labour resources from the agricultural sector to the more productive industrial sector hinges on the latter's demand for labour, forming the foundation for growth. Consequently, the industrial sector, particularly manufacturing, acts as the "growth engine," as progress is inherently linked to intensified industrial endeavours (Wells & Thirlwall, 2004). Kaldor introduced the three growth laws. Kaldor's theory dissects the economy into three primary sectors: manufacturing, agriculture, and services, with manufacturing occupying a position of prominence in terms of economic growth. Kaldor further asserts that the expansion of manufacturing output propels GDP growth and elevates productivity within the manufacturing sector, subsequently fostering increased productivity within agriculture and services (Wells & Thirlwall, 2004). The laws are articulated as follows: The first law establishes a positive correlation between the economy's growth rate and that of its manufacturing sector. The second law (Verdoorn Law) posits that an escalation in the growth rate of manufacturing output leads to heightened labour productivity within that sector. Lastly, the third law posits that the growth rate of manufacturing output corresponds to increased productivity in non-manufacturing sectors (Wells & Thirlwall, 2004). Kaldor reinforced the arguments of Hirschman, Prebisch and Resenstein-Rodan by accentuating that productivity is sector-specific and that the manufacturing sector enjoys increasing returns to scale as inferred by Verdoorn's law (Marconi, Reis, & Araújo, 2016). He supports this claim by accentuating that industrialisation is heavily backed by the notion of promoting manufactured exports and that these exports remain imperative factors for the growth path of developing nations.

Economic literature contains extensive debates on the correlation between economic development and international trade, commonly referred to as the notion of unrestricted globalised trade. The topic which dates back to the ages of neoclassical economics was consolidated as a central theorem known as the Hecksher-Ohlin-Samuelson model of comparative advantages (Marconi, Reis, & Araújo, 2016). This theorem was greatly

criticised by proponents of the structuralist approach as they understood aggregate demand to be a determinant of a developing nation's growth and that this came with the advantage of sectorial analysis. Structuralist economic development literature speaks on the importance of structural change as a process necessary to reconfigure the productive structure of economies through technological means, and industrial reforms. The nucleus of technically related structural change rests on the creation and dissemination of innovative breakthroughs in competitively advantageous industries (Marconi, Reis, & Araújo, 2016). This leads to extensive linkage effects and learning processes that trickle down to other production structures. Subsequent to the exhaustion of infant industry protectionism in the latter years of the 20th century, it was recognised that orientating manufacturing capabilities towards exports was a crucial strategy to maintain manufacturing growth at a level above domestic demand (Purnama & Yao, 2019). This strategy poses two distinct implications. The first is that there is a need for exports or public investment (autonomous source of demand) to stimulate the share of manufacturing in beneficiation. And secondly, that induced demand as a result of increasing income is insufficient (Marconi, Reis, & Araújo, 2016).

In further contrasting these theories, Bresser-Pereira (2014) argues that endogenous growth theory and structuralist approaches offer contrasting frameworks for understanding how manufacturing can drive long-run economic development. While both acknowledge the centrality of productivity and technological advancement, they differ fundamentally in how growth is generated, the role of policy, and the mechanisms through which manufacturing transforms an economy. Endogenous growth theory attributes sustained manufacturing productivity to internal economic processes, particularly investments in research and development (R&D), knowledge creation and human capital formation (Fontana, 2003). Within this framework, firms and individuals make forward-looking decisions to innovate generating technological spillovers that offset diminishing returns to physical capital (Fontana, 2003). Knowledge, as a non-rival and partially excludable good, allows the benefits of innovation to extend beyond individual firms, fuelling cumulative and self-sustaining growth. The private sector plays the central role: competitive markets, strong intellectual property rights, and fiscal incentives for R&D are viewed as the main catalysts of innovation. From this perspective,

manufacturing expansion depends on firms' ability to move up the technological frontier through learning-by-doing and innovation-driven efficiency gains (Darity & Davis, 2005). Government policy should therefore focus on providing the right environment, investing in education, maintaining macroeconomic stability and supporting innovation ecosystems so that market-driven ingenuity can flourish.

The structuralist approach on the other hand situates manufacturing within a broader process of economic transformation (de Paula & Oreiro, 2025). Growth arises not primarily from internal innovation within existing firms, but from deliberate shifts of resources from low-productivity sectors such as agriculture or raw material extraction toward higher-productivity, modern manufacturing industries (Bresser-Pereira, 2014). Manufacturing is valued not simply for its productivity levels, but for its potential to generate dynamic economies of scale, strong backward and forward linkages, and technological learning across sectors (Alvarez, 2024). Structuralists argue that market forces alone cannot ensure such transformations, as developing economies often face entrenched structural rigidities, ranging from institutional weaknesses and information asymmetries to coordination failures and external dependency (Alvarez, 2024). Consequently, state intervention becomes not just supportive but essential. Strategic industrial policies, such as infant industry protection, public investment in key sectors and targeted subsidies are necessary to build domestic capabilities, coordinate investment and foster inter-industry integration (Alvarez, 2024).

The key distinction between the two perspectives lies in their conceptualisation of the source and driver of economic growth. While structuralists regard innovation and industrial upgrading as outcomes of deliberate structural reconfiguration guided by state intervention and/or coordination (de Paula & Oreiro, 2025), endogenous growth theorists view innovation as an internally generated process sustained by private incentives (Darity & Davis, 2005). Manufacturing for the latter is platform for continuous technological improvement. And for the former, manufacturing is a transformative engine through which an economy diversifies, accumulates capabilities and achieves structural maturity.

3.2. Why "Manufacturing Experience Matters" in Sunset Industries

The deficiencies in crises-affected manufacturing sectors in Sub-Saharan Africa and other emerging economies can be partly attributed to Joseph Schumpeter's theory of Creative Destruction (Caballero, 2010). Maliranta (2005), states that the success of export-oriented economies can be credited to R&D advances when the initiative of productivity-enhancing restructuring is undertaken. Additionally, in the context of China, and to some extent, other developing economies, the rapid increase of targeted R&D intensity is one of the characteristics which led to the development of their manufacturing economy (Shen & Lin, 2020). This claim is reiterated by researchers who have studied China's global manufacturing dominance, in that incremental technological and innovation changes have been proven to gradually transform its domestic industrial landscapes (Zhou, He, & Zhu, 2017). While global industrial superpowers have inadvertently weakened manufacturing capabilities in other regions, a question which remains to be answered is whether sunset industries in Sub-Saharan Africa can be rejuvenated.

The cornerstone for revitalising crisis-affected sectors is said to lie in manufacturing experience. In that, although a country's industrial sector might have been uncompetitive among experienced industrial policy-focused countries, the inherent wisdom in tried-and-true methods honed through years of manufacturing experience makes it far easier to reestablish competence and competitiveness. This is a sentiment shared in the book titled *"The Rise of the Rest"* written by Alice Amsden. In it, she explains that prewar manufacturing experience emerges as a necessary condition for triumphant postwar industrial expansion and that without these minute capabilities no latecomer would have been successful industrial hubs (Amsden, 2001). The East Asian Tigers are used to further contextualise this path dependency. The invasion of Manchuria in the 1930s by Japan provided a lightning rod for the industrialization of its Asian neighbours, non-colonies and colonies alike and while foreign investments made their way into Southeast Asia's manufacturing sector between 1914 and 1918, productivity only expedited in the 1930s. In the course of preparing for war in its colonies, Japan, hastily experimented with industrial policies to advance their manufacturing capabilities. Amsden (2001), states

that this was an initiative which led to Taiwan and Korea's exceptionally successful postwar industrial promotion systems. Amsden further explains that Koreans abhorred the experience of colonisation under Japanese rule that it moulded a nationalistic historiography that deprecated all of Japan's contributions to Korea's industrial growth.

The advancement of industrialisation in Korea began alongside World War 1 and accelerated simultaneously with the invasion of Manchuria in the early 1930s. While the export-oriented Western economy struggled to supply its Asian markets during the war and Japan dominated this unserved market, they too, could not meet the demands of their colonies. Subsequent to this development the 1911 Corporation Law was relaxed, and while at this period Korea's industrial capacity was premature, it was nascent of what it was to become. Since Korea was regarded as the bridge between China and Japan in Tokyo, this presented an opportunity for its industrialisation. It is imperative to note that development was aggressively pursued by the Korean government during this period and by the 1940s it had become an exporter of significance (Amsden, 2001). By the end of the war, Korea had accumulated immense manufacturing experience in the form of managerial elites with production capabilities in various industries, a workforce accustomed to paid labour, and entrepreneurs with execution skills, both in the private and public sectors. As such, their leading sectors were not something that instantly sprang up into existence during the much-celebrated five years of development. Rather, it represented the pinnacle of an extensive process of capability development which took place over three decades (Amsden, 2001). In the chapter, four elements are listed as being major contributors to this industrial policy success and they are: human capital in the form of a productive and capable labour force, production knowledge, salaried management and project execution skills in both the public and private sector (Amsden, 2001). Regardless, this idea of existing experience in manufacturing poses a consequential challenge for emerging economies in Sub-Saharan Africa. Mkandawire (1988), confers on this by claiming that Africa's industrial sectors have been dealt with harshly, in that they were either brought to a virtual standstill, or the minute levels of industrialisation post-independence were back-pedalled through vagaries of the world capitalist system. He further cautions that if most of the structural factors that have over decades that have prematurely deindustrialised and prevented Africa from launching

viable and maintainable industrialisation strategies are present, then once again Africa will miss whatever opportunities that micro and macro recoveries may bring.

3.3. Learning-by-doing in Sunrise Industries

Economic growth is directly linked to increases in labour productivity as increases in the latter translates in an economy being able to achieve marginal increases for the same amount of work (Sprague, 2014). The amount of revenue generated in an economy is dependent to the extent to the trends at which productivity grows over a period of time. Drawing on the literature, the conceptual framework of labour productivity consists of; R&D, innovation and education (Tezzele, 2022). Innovation is understood as the implementation of creative ideas to generate value while R&D is the culmination of these creative ideas to develop or improve existing products and services (Baumann & Kritikos, 2016). R&D is a key factor for continued innovation and a significant component in developing new competitive advantages. Studies have been done on the relationship between innovation and labour productivity, and many deduce that innovation and investments in research matter. Crépon, Mairessec, and Duguet (1998), gave one of the most influential accounts of this theory by introducing a model that explained productivity as a function of innovation and research investment. By observing data on innovation output in French manufacturing and economic methods, they were able to reveal that productivity has a positive correlation with higher innovation output (Crépon, Mairessec, & Duguet, 1998) and in the long-term economic policies that favour research are able to increase productivity (Erdil, Cilasun, & Eruygur, 2013).

Rapid technological change makes many skills obsolete while creating demand for new ones, as such, human capital is a significant contributor to productivity growth (Engelbrecht, 1997). Even though the willingness to learn new ways of work exists and increases with the workers' socio-economic status, workers usually to improve their knowledge and skills because of a myriad of reasons (Tezzele, 2022). However, in order to improve the workers' ability to imbibe the required skills and knowledge needed for new technologies brought about by the R&D process and keep pace with competition, companies need to invest in training and educational programmes (Tezzele, 2022). This

claim is supported by Bartel (1995), who studied the relationship between on-the-job training, learning-by-doing and worker productivity and found that these attributes had a significant effect on productivity in the long-run.

In order to visually represent the impact of various policies on labour productivity, Tezzele (2022), developed a systems dynamics model which presented the relationship of diverse variables that determine the value of labour productivity per hour worked. The variables that were taken into consideration include business expenditure on R&D, education, adult participation in learning programmes. The author states that the mere adoption of new technologies and introduction of new processes has proven to require time and effort that leads to insignificant labour productivity in the short run (Tezzele, 2022). The study showed that the R&D does not necessarily increase the workers' knowledge and skills and that it was therefore important to invest in workers' education to teach them how to use developments. As stated before, learning-by-doing enhances problem-solving and efficiency, enabling workers to identify bottlenecks, optimise processes, and adapt to technological change. It also fosters a culture of innovation and collaboration, which becomes essential in industries characterised by rapid technological innovation (Oqubay, 2015). As technology advances, experiential learning ensures that workers remain responsive and inventive, bridging the gap between knowledge and practical application. However, in the era of seamless information exchange and rapidly increasing competitiveness, learning-by-doing has become obsolete, as it is time consuming.

3.4. The Paradox Explained

The concept of learning-by-doing originates from the seminal insight that productivity increases as firms and workers gain experience through production (Arrow, 1962). The author incontrovertibly argued that per capita income growth could no longer be explained solely by simple increments in the capital-labour ratio, as classical theory suggested. Building on Arrow's (1962) proposition, Solow (1956) and Abramovitz (1993) emphasised the central role of technological change as a driver of long-term economic growth. In their formulations, technical progress, though often treated exogenous, was

recognised as an essential complement to capital formulation. Arrow (1962) advanced this understanding by arguing that knowledge itself evolves and grows over time through production experience, making learning an endogenous progress. Mainstream economics thus posits that productivity improvements occur automatically through market competition and innovation (Romer, 1990) and as firms accumulate experience, efficiency increases and economies of scale are achieved (Solow, 1956). Within this paradigm, industrial change is primarily a function of market-driven technological progress, and the role of the state is largely confined to correcting market failures or providing public goods. From this perspective, deindustrialisation or sectoral decline reflects national resource reallocation in response to shifting global advantages (Rowthorn & Ramaswamy, 1999).

However, the heterodox and structuralist traditions challenge these assumptions by asserting that learning-by-doing is neither automatic nor evenly distributed. Scholars such as Hirschman (1958), Kaldor (1966), Mkandawire (1988), Amsden (2001), argue that industrial transformation depends on the deliberate coordination of state, market, and institutional forces. From this perspective, industrial policy plays an active role in nurturing dynamic comparative advantage through targeted investment, technological upgrading, and strategic protection of infant industries (Amsden, 2001). Learning, in this view, is not a spontaneous by-product of market activity but an institutional process shaped by historical trajectories, power relations, and global asymmetries. When longstanding industries fail to revive despite extensive experience, this cannot be attributed simply to inefficiency or market misallocation. Rather, it reflects structural and institutional limitations that constrain technological absorption, innovation, and viability (Hirschman, 1958).

This tension between automatic market learning and institutional learning constitutes what this study and many researchers have repeatedly referred to as learning-by-doing. If experience and cumulative knowledge should, according to mainstream economics, translate into renewed competitiveness, why do mature industries frequently stagnate to decline? The paradox thus challenges the linear regression assumptions embedded in orthodox growth models and reinforces the heterodox insight that learning requires

deliberate coordination, policy coherence, and sustained investment in innovation as will be further examined in the next section 4 (Michl & Tavani, 2022). In the South African context, the persistence of low productivity, limited diversification, and stalled upgrading, despite decades of production experience, epitomises this contradiction (Pillay, 2025).

The paradox of learning-by-doing is not merely theoretical as it manifests practically in the challenges of reviving declining industries or strategically launching new ones. When attempting to resuscitate a fading sector, it is often assumed that historical experience should naturally facilitate revival. Yet factors such as outdated technologies, global competition, and organisational inertia frequently hinder recovery. Similarly, in the case of new industries, existing technical expertise may not translate into rapid efficiency gains. Here, the productivity paradox emerges in that greater cumulative experience does not necessarily yield proportional improvements. Instead, firms often face steep initial learning curves followed by diminishing returns, unless complementary factors such as technology adoption, innovation systems, and adaptive institutions are in place. Thus, experience alone does not guarantee growth as it must be accompanied by flexible strategies and supportive ecosystems that enable learning to translate into competitiveness (Mazzucato, Doyle, & von Burgsdorff, 2024).

This conception of learning-by-doing aligns closely with broader theories of experiential learning, which emphasise the integration of knowledge and practice. Anzai and Simon (1979), describe experiential learning as an active, iterative processes in which individuals engage directly with real-world challenges, refining their understanding through feedback and adaptation. Within manufacturing, such learning is crucial because it embeds problem-solving and technological capability within the production process. Amsden (2001) similarly demonstrates that late-industrialising economies succeeded not merely through exposure to global markets but through state-supported learning, capacity-building and tacit knowledge accumulation.

While reinforcing the notion that learning-by-doing ensures that workers remain responsive and inventive, the historical evolution of industrial learning further supports

this view. During the 1950s, many developed economies pursued ambitious industrialisation strategies that emphasised technological capability-building through infant-industry protection, subsidised credit, and import substitution (Duong, 2014). These measures allowed domestic firms to internalise learning costs and develop competencies over time. By the 1980s, however, as globalisation and neoliberal policy frameworks gained prominence, such as state-led industrial policies were scaled back, limiting opportunities for long-term learning (Irwin & Klenow, 1994). Their research shows that industrial depends on the willingness to finance sustained periods of loss-making while technological capabilities mature. Smith (1776), in *The Wealth of Nations,* had already recognised this dynamic in his pin-factory analogy. He theorised that specialisation, born of repetitive practice and incremental improvement, generates tacit knowledge and productivity gains (Smith, 1776). Where developing countries fail to invest in such cumulative learning, they remain trapped in low-productivity equilibria where they're unable to engage competitively in global production (Acemoglu & Zilibotti, 2001).

Reconciling these traditions is therefore essential for understanding South Africa's industrial trajectory. The paradox accentuates that neither orthodox market efficiency nor heterodox state activism alone can explain productivity outcomes. As Mazzucato (2018) contends, effective industrial transformation requires mission-oriented strategies that combine state leadership with private innovation, aligning public investment with long-term developmental missions.

3.5. The Need to Develop a Mission-oriented Manufacturing Ecosystem

Now more than ever, is it necessary to question the role that the state has in the economy which has been a contentious topic since Adam Smith's "*Wealth of Nations*". This question is notably imperative in the context of South Africa where we have seen tremendous withdrawal of the state support in domestic manufacturing sectors. This policy position is justified by rendering the economy more dynamic. The recovery of sector demand in the economy to pre-dormant levels is critical to rebuilding confidence

in the economy. The country's manufacturing sector has encountered a host of challenges on account of pre-existing sectoral handicaps which have been exacerbated by the COVID-19 pandemic (Abedian, Tsoanamatsie, & Stuart, 2021), and the government alongside other stakeholders have set out efforts to revive sunset industries and cultivate sunrise industries. To this end, it is imperative to endeavour to get an understanding of whether the theory of learning-by-doing in the context of sunrise sector revival and manufacturing experience in sunset industries holds. Learning-by-doing, in relation to the manufacturing sector speaks to improving production processes through increased understanding and knowledge of the underlying production systems (Ryu, McCann, & Wan, 2022, p. 1636), and is key to gaining a competitive advantage in the long term (Egelman, Epple, Argote, & Fuchs, 2017).

The success of revival in the manufacturing sector is highly dependent on the implementation of structural reforms unique to the domestic environment as set out in respective Master Plans. The notion of Master Plans was initiated in 2019 as means to reinvigorate the country's industrial policy and it is important to assess which reforms have been adopted and implemented in favour of a viable theory of change and experiential learning. These Master Plans came as a means to reimagine industrial policy by making it more effective in the wake of micro-and macroeconomic conditions. The strategy of rejuvenating the manufacturing sector in the country was meant to highlight the significance of collaboration between the government and key economic players at the industry level, both in formulating Master Plans, overseeing their execution and grounded in collective research (Makgetla, 2024). It is further stated that stakeholder engagements and evidence-based analysis would be the core of ensuring that there was shared understanding of the constraints faced by producers. Furthermore the research would ensure that inputs were continuously tested against desired outcomes (Makgetla, 2024). Given this, it is essential to examine the preliminary progress achieved by the Master Plans. We are reminded that structural reforms required for active industrialisation evolve rapidly, and the market disruptions caused by the 2020 pandemic render it impossible to reliably project how the country's economic conditions would have fared, absent revival objectives.

Expanding the manufacturing sector's revival strategy would require large-scale new investments, a dramatic increase in state support, and major disruptions to existing value chains. The government has not formalised the intent of the revival and emergence project in both sunset and sunrise industries, and as such, the assumption will be posited that the Department of Trade Industry and Competition's (DTIC's) impressions constitute the goal of the state (Makgetla, 2024). The Master Plans discussed in this study lacked a comprehensive strategic narrative. In other words, they did not explore the industry's potential to drive inclusive industrialisation, establish goals based on that potential, systematically identify key challenges to achieving those goals, or outline a high-level strategy to overcome them (Makgetla, 2024). Additionally, while a set of clear strategic measures were listed there was little indication of prioritisation, few addressed input costs and the technological advancements that were inherent in the sector at a more global level. Bernstein (2024), opposes the often-favoured policy mix of protectionism inherent in the Master Plans as it is argued that the government often overlooks the structure of the planning process. Consequently, the recommendations that emerge tend to fall within the government's immediate jurisdiction and while businesses may desire market efficiency, these are often beyond the individual department's control (Bernstein, 2024). It is further reiterated that the fragility of Master Plans lies in their industry-specific focus as it overlooks key differences in the industry such as the fact that constraints faced by small, emerging firms are vastly different from those encountered by more established firms. Likewise, firms in different regions have unique priorities and distinctions also exist between companies with a mandate to export and those that do not. Another critical challenge is considering the needs of future entrants. Since the Master Plans are shaped by existing firms and labour representatives, they do not account for businesses that might emerge if policies prioritised overall economic growth and innovation rather than protecting established players (Bernstein, 2024).

A more forward-thinking approach is needed to focus on fostering a dynamic, expanding economy by creating conditions that support new entrants and innovation (Bernstein, 2024). Mazzucato (2023), deliberates on these challenges by explaining that sustained economic growth relies heavily on investment from both public and private sectors and

that progress must be framed in terms of whether a country can act as a catalyst for investment across industries. A fundamentally new perspective on industrial strategy is required. One that positions the public and private sectors as collaborative partners in addressing complex challenges and advancing shared objectives. Investment-driven growth is certainly most effectively stimulated when there is an unclouded vision and direction. She further asserts that if the public sector can set that direction, it will attract private sector investment, fostering joint initiatives that drive overall investment, innovation, and productivity (Mazzucato, 2023). We note that industrial strategies have relied on both "vertical" and "horizontal" policies where the former have traditionally focused on targeted interventions in specific sectors and the latter aims to enhance the overall environment for knowledge creation by expanding knowledge and skill opportunities, improving workforce skills and developing innovative infrastructure (Mazzucato, 2023). The absence of foundational investments in relation to horizontal industrial strategies, a robust strategy would fail to take form. On the other end of the spectrum, while vertical policies have aimed to stimulate growth, they have also led to policy capture where certain industries benefit from support being required to adopt transformative and innovative practices (Mazzucato, 2023). Furthermore, many countries inclusive of South Africa as noted in the study above, have overly relied on industrial strategies aimed at price competitiveness leading to unsustainable trade relationships and significant fiscal costs. Given the pressing challenges of climate change and structural economic shifts, such sector-specific industrial strategies are increasingly inadequate.

It is necessary to adopt a mission-oriented approach to industrial strategy which will endeavour to shift the focus form specific industries and instead direct efforts toward addressing major societal challenges that require contributions from multiple sectors (Mazzucato, 2023). This concept aims to foster cross-sector collaboration and investment, ensuring that industrial strategy is not about selecting government winners but rather engaging different stakeholders willing to solve key societal problems (Mazzucato, 2023). It is explained that instead of targeting individual industries, as in the case of the Master Plans commissioned by the DTIC, mission-driven strategies prioritise broad issues that can stimulate innovation across various sectors, attract diverse

investment, and drive economic activity that might not have emerged otherwise. Rather than prescribing rigid solution, missions encourage the development of diverse, bottom-up innovations that address complex challenges as they do not solely rely on top-down control but rather provide a clear direction of growth, shaping business expectations about future opportunities while encouraging experimentation and risk-taking (Mazzucato, 2023). Mazzucato (2023), further postulates that in this context, the role of the government extends beyond merely correcting market failures or reducing investment risks. Instead, it actively participates in shaping markets by promoting risk-taking, sharing both risks and rewards, and creating an environment that directs economic activity toward long-term strategic goals. A case study is put forth to demonstrate the effectiveness of this approach by using Mexico's steel manufacturing sector as an example. In 2004, the state launched a cluster strategy to unite public agencies, businesses and think tanks to strengthen manufacturing and the development of human capital. This led to the creation of industry clusters and the Parque de Investigación e Innovación Tecnológica (PIIT) to address skill fragmentation. Funded by both public and private sectors, each cluster operated under a long-term strategic plan focused on human capital, innovation and investment (Mazzucato, 2023). Fast forward 14 years thirteen strategic clusters were erected, and they aimed to drive innovation, boost productivity and improve employment quality across various industries. The initiative fostered cross-sector collaboration, governed by an executive board including business, think tank and government leaders. The program highlighted the power of effective PPPs, rather than a divide between government and business (Mazzucato, 2023).

Missions play a crucial role in shaping economies and fostering collaboration among economic actors to achieve shared goals and they can transform challenges into opportunities (Mazzucato, Doyle, & von Burgsdorff, 2024). By prioritising objectives rather than specific sectors, industries or technologies, the government can drive cross-sector investment, innovation, and cooperation to tackle complex problems. This approach can generate spillover effects, amplifying impact and promoting sustainable, inclusive, and resilient economic growth (Mazzucato, Doyle, & von Burgsdorff, 2024). When effectively designed, missions can lead to positive economic outcomes such as increased

productivity, job creation and economic growth although these can be seen as by-products rather than the primary goal. A mission-driven industrial strategy should be an integral part of a broader economic growth agenda, with all ministries sharing responsibility for its advancement (Mazzucato, Doyle, & von Burgsdorff, 2024). It should not be confined to ministries focused solely on industry, innovation, or the economy but should span the entire government. Missions must be positioned above any one ministry, playing a coordinating role across various policy priorities and government sectors, ensuring alignment and cooperation across the board (Mazzucato, Doyle, & von Burgsdorff, 2024). This whole-of-government approach is crucial to ensure that collective efforts are greater than the sum of individual ministries' actions. To overcome these, missions should be designed to foster alignment, focusing on shared objectives that cut across ministries rather than being compartmentalized within each department. Therefore, by aligning ministries around common goals, missions can break down barriers and promote cross-sector collaboration (Mazzucato, Doyle, & von Burgsdorff, 2024).

To make this approach effective, a central body within the government should be responsible for overseeing the missions, with the backing of top executive offices, under the direct oversight of the Presidency. This oversight entity would set strategic priorities and facilitate coordination across ministries and it would also require the establishment of new governance structures that can encourage cooperation between different institutions, sectors, and levels of government (Mazzucato, Doyle, & von Burgsdorff, 2024). Propping up manufacturing capabilities and ensuring its success, requires incorporating missions into the core processes of government in the form of mandate letters, departmental budget submissions and budget cycles so that ministries prioritise funding that supports mission objectives. Furthermore, Mazzucato, Doyle, and von Burgsdorff (2024), state that procurement policies should be leveraged as a strategic demand-side tool to stimulate innovation and investment, ensuring that government priorities are met while creating new market opportunities. Lastly, for mission-oriented strategies to succeed, long-term finance is essential. Public and private financial institutions, including development banks, play a critical role in providing the patient, long-term capital necessary to support such strategies. However, we need to appreciate

that missions require not just patient finance but directed finance, positioning public institutions as lenders of first resort (Mazzucato, Doyle, & von Burgsdorff, 2024).

4. Revival of Once-Thriving Sectors

The process of reviving a sector that has experienced a crisis presents unforeseen challenges that surpass the current understanding of theory and literature. As a result, learning and revitalisation efforts are comparatively more straightforward and effective in new sectors than in sectors specifically targeted for rejuvenation in a broader context.

4.1. Steel and Metal Fabrication Industry

4.1.1. Background

The steel manufacturing industry was regarded as one of the most important sectors contributing to the country's Gross Domestic Product (GDP) growth (Khoza, Mafini, & Loury Okoumba, 2022), with the industry contributing about 15% to the GDP. The industry's productivity played a vital of economic growth domestically and in neighbouring Southern African Development Community (SADC) countries (Khoza, Mafini, & Loury Okoumba, 2022). The industry has been in a perpetual productivity decline since 2010 as it is plagued by structural problems and persistent excess capacity to market demand negatively impacting trade and employment. The emergence of the coronavirus pandemic in 2019 worsened the situation as this resulted in an estimated R1 billion being lost in direct cash-flow revenue and labour costs. The inconsistency from a supply-side perspective is attributed to a lack of competitiveness in the supply-chain.

The Master Steel Plan developed under the re-imagined Industry Strategy and the 2020 Reconstruction and Recovery Plan, was developed as a collaborative framework between organised labour, regulators and key industry players to address a highly fragmentated value chain. Recognising that the steel industry is in crisis, the plan called for long-term, coordinated action rather than short-term investment cycles typical of the small and medium, often family-owned firms that dominate the sector. Although investment continues, its impact remains muted by weak aggregate demand, limited

policy coordination, and excess production capacity especially in basic long steel products while failing to meet demand from the automotive and mining sectors. South Africa can produce up to ten million tonnes of steel annually and yet domestic consumption hovers around four million tonnes. This imbalance raises production costs, inflates local prices, and subsequently undermines competitiveness against cheaper imports, some of questionable quality (Parker, 2025). Policymakers have repeatedly emphasised the need for infrastructure investment, particularly through State-Owned Enterprises (SOEs), to stimulate demand and restore economies of scale (Creamer Media Reporter, 2025).

The global steel market has further eroded domestic competitiveness and the rapid expansion of China's steel overproduction, has depressed global prices and diverted surplus steel to developing markets, including South Africa, following United States of America (USA) and European Union (EU) protectionist measures (DTIC, 2021). Rising energy costs, unreliable electricity, and import parity pricing of key raw materials have worsened the situation. Many firms have resorted to cost-cutting to stay solvent rather than investing in new technologies or efficiency improvements (Monage, 2023). The COVID-19 pandemic intensified these vulnerabilities, halting production and demand across both primary and downstream steel operations. While the DTIC continues to channel support through its Export Promotion Programme, success is concentrated in a few sub-sectors, notably the wire industry, which contributes roughly 40% of steel exports (DTIC, 2021). Yet capacity utilisation remains near 60% with peaks last seen two decades ago. The Industrial Development Corporation (IDC) provides financial assistance to new entrants, but its project-based investments often lack a unifying industrial vision.

High-borrowing costs remain a structural constraint. Domestic banks' reduced appetite for the sector and the IDC's reliance on commercial financing have made lending expensive and restrictive. Consequently, firms face high-interest debt, limited credit insurance, and reduced export financing, particularly with the SADC. Chronic underinvestment in plant modernisation and skills development has led to closures of niche and speciality production lines, widespread job losses, persistent fragmentation.

The industry's atomised structure, composed mainly of small firms, has weakened its representative associations and hindered effective policy advocacy.

The industry faces reduced credit insurance, shrinking demand and chronic underinvestment in technology and skills, leading to downsizing and job losses. Fragmentation among small players weaken industry representation and policy influence. Reliable data is scarce, complicating decision-making. Despite some modernisation efforts, the sector remains in crisis, requiring coordinated, long-term-focused efforts to recover and thrive.

4.1.2. Policy Interventions

Efforts to the revive the steel sector have placed significant focus on the short-term survival and augments on-going support measures for long-term growth and sustainability. The policy decisions undertaken are intended for long-term certainty and it is imperative to note that the cost of competitiveness, re-orienting towards the green industry, and the predictability of demand are vital to re-injecting investment and confidence in the sector (DTIC, 2021). The government has instituted a multi-faceted approach to support the domestic steel-making industry. The support was and is envisaged in the form of adjustments to trade policy, pursuance of localization, financing measures, and interventions in the trade of scrap metal. In a move to tighten controls on steel imports, 10% import tax has been implemented for most basic steel products (DTIC, 2021).

These measures come alongside a series of trade actions taken since 2015, including anti-dumping duties on unfairly priced imports, safeguard actions on import surges, and adjustments to existing import taxes on finished steel products. To incentivize domestic manufacturing and value addition, rebates are available for products not currently produced domestically or those that undergo further processing before export (DTIC, 2021). Furthermore, a system to identify suspiciously low import prices has been established, and government agencies are collaborating to tackle illegal steel imports. These comprehensive actions aim to create a fairer playing field for the domestic steel

industry. The Master Plan seeks to emphasize implementation and the long-term impact, wherein the former will identify short-medium and long- term deliverables (Hunter, Tsegaye, & Kapingura, 2025). The deliverables are segmented into three categories, namely: supply-side measures, demand-side measures and cross-cutting measures which will be constituted by a workstream determined to ensure that implementation is executed effectively and does not solely focus on the notion of trade measures (DTIC, 2021).

Addressing key cost drivers, infrastructure inefficiencies and regulatory barriers will be essential in enabling the sector's long-term growth and global competitiveness and one key focus is reducing input costs in the value chain (Burger, 2025). Logistics issues, particularly the cost and efficiency of rail and port services, pose challenges. The Master Plan states that Transnet's freight tariffs, train availability, and limited rail network coverage affect industrial logistics. The government has expressed commitment to improving rail infrastructure, which would boost efficiency and stimulate industrial growth and stimulate industrial growth (AIIM, 2024). Port costs and inefficiencies are another major concern, as transporting goods within South Africa is often more expensive than importing from Asia (AIIM, 2024). The Port Tariff Incentive Programme (PTIP) has been introduced to regulate port tariffs, particularly benefiting small to medium enterprises. Additionally, the DTIC is collaborating with Transnet and the Steel Oversight Council to address freight and port tariff concerns (DTIC, 2021).

Moreover, energy costs, supply security remain significant barriers to investment. The fluidity that exists in electricity pricing and frequent loadshedding and municipal mismanagement have contributed to the country's operational disruptions and excessive costs (Burger, 2025). This has led numerous industry players to procure self-generation measures to mitigate against these issues. The government on the other hand, has sought to introduce a revised electricity tariff framework for energy-intense industrialists, so that they can consume electricity at more affordable rates (Mahony & Baartman, 2018). Meanwhile, securing an adequate of ferrous for domestic use is another pressing issue. Demand for scrap is expected to exceed supply, leading to concerns about affordability and expect loopholes. The government is exploring

measures to ensure local availability, as the loss of developmental pricing has significantly increased costs (SAISA, 2022). This has prompted discussions on setting fair pricing conditions for local steel producers. The government was considering implementing a structured pricing approach to ensure affordability while maintaining competitiveness. In addition to this, labour costs need to be managed to support industry recovery (Mahony & Baartman, 2018).

South Africa's R&D capacity plays a vital a role in making the steel industry more sustainable, competitive, and aligned with the Fourth Industrial Revolution (4IR). A key focus is greening the industry by reducing emissions, water and electricity usage, and waste through circular processes and the hydrogen economy. However, the high initial costs of green technology pose a challenge for industry-wide adoption (Eneroth, 2023) . The Department of Science and Innovation (DSI) has pledged to collaborate with the Steel Master Plan to align key performance areas with industry needs, ensuring that R&D leads to commercialised innovations rather than being licensed abroad. Despite significant intellectual property (IP) development, much of it has not been locally utilised, highlighting the need for targeted innovation that drives competitiveness and local production (TESD, 2025). The use of embedded sensors, predictive maintenance, and machine learning in production and mining can optimise processes and supply chains, yet many companies struggle to integrate these technologies. .

Resource mobilisation was essential as a strategy for sector revival and one of the significant issues identified was the reduction of credit insurance and loss of cover for African markets, which inadvertently negatively affected domestic sales and exports (Bam & De Bruyne, 2019). The state sought to address by creating a mutual trade credit insurance company for self-insurance or establishing a state-backed credit insurer to expand the Export Credit Insurance Corporation (ECIC) (DTIC, 2021). In addition, it was imperative that investment strategies for the steel industry are aligned with the Master Plan to enhance value chain progression, particularly toward machinery manufacturing, and to ensure the competitiveness of primary stell production. However, excessive capacity created by multiple funds has diluted efficiency. The R1.4 billion Downstream Steel Development Fund, established by the IDC to provide concessional financing and

support struggling balance sheets, has seen low uptake due to strict criteria and bureaucratic obstacles (Karombo, 2025). Additionally, the DTIC's industrial funding branch is working on a metal fabrication fund, but both funds require optimization to unlock growth opportunities. The restrictive eligibility criteria, which emphasize transformation over broader industry support, have excluded many small and medium-sized enterprises (SMMEs), limiting the sector's recovery (Makgetla, 2024).

A policy review is needed to enable more businesses, including family-owned companies, to access support for modern technology, product development, and process upgrades. The primary steel industry and its pricing structure are critical for the broader industry's stability. The availability and cost of primary steel influence downstream industries, yet there is uncertainty about the ongoing security of supply for flat and long steel products. Despite some differing views, most industry players agree that South Africa requires a viable primary steel industry that beneficiates iron ore. The challenge lies in ensuring that primary steel production remains competitive and continues to support downstream industries, including mini-mills and foundries that rely on scrap metal from primary steel producers (DTIC, 2021). The industry must work backward from value-added products to identify bottlenecks and reduce excessive margins along the supply chain.

The crisis in the steel industry is not solely due to global oversupply but also results from decades of low economic growth in South Africa and the lack of significant infrastructure projects since 2010 (Korkmaz & Korkmaz, 2017). Changes in primary steel plant ownership have not led to the necessary investment and growth, raising concerns about national interests. In terms of pricing, intense competition for basic long steel products has driven prices below import levels, while the cost of hot-rolled coil is based on international pricing excluding China and Russia (Makgetla, 2024). Preliminary studies indicate that primary producers' steel pricing is not the sole reason for high downstream costs margins along the value chain contribute significantly (Zadeh, 2025). Urgent price studies are needed to identify cost drivers and ensure fair pricing mechanisms. The country still struggles to match steel supply wit market demand, specifically for specialised grades required by the automotive and mining industries. Steel production

capacity has dropped from twelve million metric tons to about nine million tons, with only eight million tons being effectively utilised (Zadeh, 2025).

The demand-side measures that the state has pledged to implement revolve around localisation and import replacement. The Master Plan aims to implement the outcomes of NEDLAC negotiations, which is to support local manufacturing production and capacity. A critical aspect is the designation of steel products for local manufacturing, requiring public entities to procure locally made steel (Makgetla, 2024). And while this has benefitted domestic firms, gaps in enforcement have allowed some entities to bypass these rules, leading to local businesses losing contracts and jobs (Kgaloshi & Nyika, 2024). Additionally, some product specifications unnecessarily exclude local manufacturers. To address this, a Compliance Investigation Unit has been proposed to enhance enforcement, ensuring accountability and preventing unfair exclusions. State-owned enterprises (SOEs), metros, and municipalities must commit to adhering to local production designations, with transparency on any deviations. The DTIC will collaborate with key SOEs including Transnet, Eskom, Airports Company South Africa (ACSA), South African National Roads Agency Soc Ltd (SANRAL), Passenger Rail Agency of South Africa (PRASA), and Denel to formalise localisation commitments through signed charters. There is also a proposal to revise Broad-Based Black Economic Empowerment (BBBEE) procurement rules to reduce incentives for intermediaries who add little value and instead prioritize manufacturers contributing to local production (DTIC, 2021). To maximise localisation in infrastructure projects funded by public money, the Infrastructure and Investment Office in the Presidency and Infrastructure South Africa have engaged with industry stakeholders with proposals including discouraging the use of intermediaries who merely import components, increasing procurement transparency, and involving industry early in project design to ensure local suppliers meet required specifications (Makgetla, 2024).

The DTIC, in partnership with the Department of Public Enterprises (DPE), Cooperative Governance and Traditional Affairs (COGTA), and the Steel Oversight Council, aims to establish localisation agreements with state-owned enterprises (SOEs), water boards, and metros. The initial phase will involve securing commitments from Transnet, Eskom,

ACSA, SANRAL, and Denel to prioritise local manufacturing (DTIC, 2021). The second phase will involve detailed agreements outlining procedures, targets, and monitoring mechanisms (DTIC, 2021). A scorecard system may be introduced to support localisation goals. Transnet has pledged to collaborate with the Steel Master Plan and the DTIC to maximise local content. As part of these efforts, Transnet has reviewed its rail procurement strategy and issued a global request for information (RFI) for a 20-year supply of locally manufactured rails to support investment in domestic rail production (Creamer, 2025). Furthermore, Transnet has identified procurement inefficiencies due to intermediaries, who inflate costs without adding value, and as such this has highlighted the need for reforming BBBEE procurement codes to prevent misuse. Transnet also plans to work with the DTIC to develop a rail industry Master Plan, create an electronic procurement system for greater transparency, and advance port expansion projects such as the Durban port extension (DTIC, 2021). Beyond domestic projects, Transnet aims to explore regional opportunities under the African Continental Free Trade Agreement (AfCFTA), requiring comprehensive business intelligence and funding strategies (Makgetla, 2024).

4.1.3. Evaluation

As denoted earlier, the production of machinery presented a unique technological centre for the domestic market as it provided the necessary provision for hardware equipment in the most infrastructure and mining-related projects (Makgetla, 2024). The government has laboured to create a strong domestic steel industry and after the privatisation of Iscor in 1989, they were faced with a challenge of either protecting and growing downstream manufacturing or protecting ArcelorMittal South Africa (AMSA) from import-parity prices and the influx of imports (Khoza, Mafini, & Loury Okoumba, 2022). However, till this day the steel value chain remains sluggish, and while there was modest downstream fabrication growth towards the end of the 2010s, minute gains in production have been halted by the inactivity caused by the pandemic, a seemingly deliberate lack of focus and the burden of complexity (TESD, 2025). The steel Master Plan aimed to create a stable trajectory for the industry as a mechanism to build investor confidence to scale up production capacity, human capital and expertise (Hopley & Motala, 2025). However, no

explicit targets were set nor challenges facing the industry were identified which showed the remissness on the part of the state (Hopley & Motala, 2025). On the backdrop of the value added in steel production, share of imports in crude steel and machinery falling between 2019 and 2022, the industry's challenges are exacerbated by ArcelorMittal South Africa's (AMSA) announcements that they would be stopping long steel production which accounts for a third of their output (Hopley & Motala, 2025).

Existing research has neglected to present the lack of integration between production efficiency and energy efficiency during production planning in the steel industry and the value chain's stagnation over the years is attributed to policy decisions that fail to determine the efficient tools needed to support optimisation (Pelser, Marais, van Laar, & Matthews, 2022). It is further explained that the reduction of operational costs in order to expand downstream steel manufacturing led to less profits for upstream iron ore suppliers and although in principle, measures to bolster competitiveness within the value chain would be able to offset these opportunity costs (Makgetla, 2024), this would require concerted efforts and action to significantly improve technology and upgrade Transnet and Eskom services (Pelser, Marais, van Laar, & Matthews, 2022). Revival strategies took a notably different approach which relied extensively on commissioned research by trusted experts without first establishing consensus on a fundamental mission-oriented strategy that is in congruent with national interests (RSC, 2023). Revival defaulted to the relatively straightforward task of advocating for government interventions to stimulate demand and enhance infrastructure (Makgetla, 2024). This approach failed to outline a clear strategy for improving the industry's competitiveness in line with Schumpeter's theory of creative destruction and (McCraw, 2007). In addition, this is one of the failures that Mazzucato, Doyle, and von Burgsdorff (2024) point out when countries attempt to revive sunset industries. They state that governments should not merely fix market failures but rather shape and create markets by setting bold, problem-solving missions that produce clear direction for investment, innovation, policy and which are centred on societal challenges.

Moreover, the justification for extending the export ban as stated above, has shifted from security concerns and infrastructure protection (Ngwenya, 2025) to cost support for

scrap-based mills and decarbonisation efforts (Monage, 2023). This inconsistency suggests that the Master Plan may be used to legitimise decisions that lack stakeholder support (Monage, 2023). However, rather than implementing a comprehensive and coordinated industrial policy, the current approach has been fragmented and short-sighted, often exacerbating divisions within the industry. The scrap metal export ban exemplifies this, as it distorts the market and creates pockets of conflict among different segments of the sector (Monage, 2023). This comes at the cost of enhancing complementarities across the value chain and undermining the Master Plan's initial vision. Tutani (2024) laments the fragmented domestic steel industry and states that South Africa is Africa's second-largest steel producer after Egypt. However, while Egypt has doubled its production over the past decade, South Africa has lost around 30% of its output in the past twenty years (Tutani, 2024). The fragmentation is caused by regulations set by the Competition Commission which hinder large producers to work collaboratively and impede R&D efforts and prevent shared production runs, despite the existential challenges facing the sector (Tutani, 2024). Three years post the introduction of the Master Plan, the domestic steel industry has shown little sign of recovery with one key reason for this stagnation being that foreign competitors dominating both domestic and global markets operate on far larger production scales (Chaudhuri, 2025). Given these circumstances, it is necessary to reconsider the country's competition policies and regulations as the decline of domestic industries can be attributed to multiple factors, with the most significant issue appearing to be the inefficiency of small-scale production runs relative to foreign competitors (Tutani, 2024).

The industry needs to address the opportunity of firm consolidation. Large firms should be permitted to merge, share production runs, acquire smaller companies, and pool innovation budgets as this would enhance efficiency and competitiveness (Tutani, 2024). Firm consolidation or acquisitions guided by the prescripts of the country's competition laws can play a strategic role in reviving or managing sunset industries, particularly when viewed through the lens of experience, knowledge retention and capacity building. These consolidations as explained (Saraswathy, 2021). To ensure the sector's sustainability, there is an urgent need for clarity on policies, tangible deliverables and consensus on action plans to restore confidence in the country's competitiveness and ability to attract

both domestic and foreign investment (Monage, 2023). The issue of pricing locally produced raw materials for downstream manufacturing remained unresolved and in addition, the Master Plan has not addressed the rise of emerging technologies, particularly mini mills, which intensified competition for traditional large-scale steel plants (Makgetla, 2024).

4.2. Furniture Industry

4.2.1. Background

The furniture industry is an integral part of daily life in South Africa and an important sector. The industry is labour intensive, which in-turn provides employment opportunities throughout the country (DTIC, 2021). Furniture production draws on local materials and local skills, and the industry has a long history in South Africa and a significant skills base which needs nurturing. There are also rather large South African companies involved in the business of raw material production, manufacturing, and retail throughout Southern Africa (Fortune Business Insights, 2025). Despite the industry's long and rich history, similar to most of South Africa's industries, it has experienced significant decline in the past two decades with local demand for furniture declining by 23% and exports of furniture dropping by 46% between 2002 and 2018 (SAFI, 2025). Demand has stagnated, imports are increasing and a number of important industry players collapsed as did their retail operations (DTIC, 2021). These challenges as explained by the Western Cape Tourism, Trade and Investment Promotion Agency (Wesgro) (2022), have reduced the industry's productive capacity and the with increased fragmentation, more and more players oriented more to imports. South Africa is experiencing difficult economic conditions with consumer spending patterns reflected the economic downturn caused by the impact of the pandemic, as spending was focused on essential items (Kraak, 2017).

A report released by the Furniture Processing &Manufacturing Sector Education Training Authority (FP&MSETA) over a decade ago expressed that the growth in local demand has diminished as disposble income is under pressure (FP&M SETA, 2014). These inherent economic circumstances have resulted in heavy reliance on demand for manufacturing

products from outside the country. It was envisaged that the ballooning costs of commercial costs of energy and transport would make it difficult for manufacturers to retain a competitive advantage in both local and international markets (Doubell & Muller, 2023). The DTIC (2021) and Watson (2025) state that the escalation of low cost Asian imports, waning reinvestment in skills development and technological innovation, failure to keep up with the mature growth of global furniture trade, insufficient R&D funding has attributed to the decline of levels of competitiveness in the industry. The industry's cost and profit margins are heavily dependent on the price of commodities (cotton, steel, iron and aluminium) used in the manufacturing process and the intense volatility of these commodties has a significant impact on the performance of the industry (Eybers & Mayet, 2020). It was concluded that contradictions in the production was a result of disruptive industrial action, insufficient demand from local and/or external markets, skill shortages, inadequate energy supply, and serious competitiveness challenges at a factory level due to rising input costs (FP&M SETA, 2014).

The Southern Cape region of the country, historically known for its quality timber resources, was a major role player in the regional economy of the Western Cape (Doubell & Muller, 2023). The International Labour Organization (ILO) has cautioned that the survival of small business firms following a crisis extends beyond short-term disruption, which can potentially erode future economic growth and social stability (ILO, 2021). And it is on this backdrop that President Ramaphosa made the assertion in 2019 on setting out of a "reimagined industrial strategy". The country had reached a turning point wherein public-private partnerships were being considered in an effort to revitalise the furniture industry (DTIC, 2021). The industry which played an integral part of the economy has a long and rich history, a significant skills base, and deserves to be nurtured and expanded (Doubell & Muller, 2023). However, even though the sector rests on a solid foundation, manufacturing productivity has significantly declined over the past decade and counting.

Although revival was envisaged as the economy faltered, Kraak (2017), explains that globalisation and China's engrossing low-cost competition have caused the inevitable demise of furniture manufacturing hubs. Research explicitly unveils that global value chain disruptions drifted furniture buyers away from South African manufacturers

towards relatively cheaper Asian manufacturers notably China and Vietnam – which had achieved economies of scale (Kraak, 2017).

4.2.2. Policy Interventions

The state developed an action plan underpinned by several core pillars, which would be used to rebuild the industry. The first pillar was conceptualised as a mechanism that would boost demand for local furniture and supply chain stability. The DTIC (2021) advised that the furniture industry faces challenges from inconsistent, seasoned demand and shifting retailer expectations, leading to inefficiencies in the form of a boom-bust effect and working capital strains. To this effect, greater predictability of market demand would be able to support the growth of the industry (Mikobi, Nwobodo-Anyadiegwu, & Mbohwa, 2018). There was general understanding that maintaining competitiveness required firms to improve their demand management systems (Mikobi, Nwobodo-Anyadiegwu, & Mbohwa, 2018).

The first pillar focused on stabilising and increasing demand for locally manufactured furniture by addressing the volatility and unpredictability that has plagued the industry (DTIC, 2021). Local and international furniture manufacturers have long struggled with inconsistent demand cycles, particularly due to seasonal purchasing patterns and the erratic nature of retailer procurement strategies (Friedrick, 2024). This inconsistency has led to inefficiencies, cash flow challenges, and even business closures (Wesgro, 2022). To counter this, the state proposes a dual approach: engaging retailers and reforming state procurement practices. Retailers are encouraged to commit to reducing their reliance on imports and to actively support local manufacturers (DTIC, 2021). This aligns with the broader national goal, as agreed upon at the National Economic Development and Labour Council (Nedlac), to reduce imports by 20% from 2019 levels. Researchers acknowledge that not all retailers are equally reliant on imports, and a nuanced, collaborative approach is necessary to ensure that local manufacturers can meet the quality, volume, and diversity demands of the market (DTIC, 2021). On the public sector side, the government has designated office and school furniture as products that must be locally sourced in procurement processes. In doing so, the government will establish

compliance monitoring systems with designation requirements and revise technical specifications to better align with local manufacturing capabilities with the aim of unlocking greater demand for South African-made furniture through both public and private sector channels. Globalisation has attracted considerable attention worldwide, however, Andres Coca-Stefaniak, Parker, and Rees (2010) state that globalisation can only offer a limited explanation for the behaviour of firms. Drawing from strategists like Michael Porter, they advise that there is a definite element of competitive advantage to be gained in a 'localisation' strategy (Andres Coca-Stefaniak, Parker, & Rees, 2010).

The second pillar relates to strategic trade interventions to level the playing field for local manufacturers and enhancing the competitiveness of the South African furniture industry (DTIC, 2021). One of the key issues identified were the influx of imported furniture and raw materials, some of which are under-invoiced or do not meet local quality standards. These imports often undermine local producers who are required to comply with stricter regulations and higher input costs (DTIC, 2021). The first targeted action for the industry was to introduce a rebate on certain upholstery fabrics that are not produced locally. This would reduce input costs for manufacturers of lounge and upholstered goods, making them more competitive. The DTIC and the International Trade Administration Commission (ITAC) were tasked with evaluating and implementing these tariff adjustments. This includes improving customs classification systems, enhancing monitoring at ports of entry, and ensuring that imported furniture complies with international quality standards (DTIC, 2021). The intervention seeks to explores the potential of imposing international quality standards on imported furniture and raw materials, which would ensure that imported goods meet the same safety and durability benchmarks as locally produced items, thereby protecting consumers and promoting fair competition (DTIC, 2021). Finally, the plan emphasises the importance of expanding export markets. With the gradual implementation of the AfCFTA, South African manufacturers have a unique opportunity to access new markets across the continent. The DTIC, in partnership with South African Furniture Initiative (SAFI), Proudly SA, and Clout SA, would support export promotion through trade missions, marketing campaigns, and diplomatic engagement. The ultimate aim of these efforts was to

position South Africa's furniture industry as a competitive and desirable product in regional and global markets (Makgetla, 2024).

The South African furniture industry faces a significant skills crisis with many of the traditionally trained artisans nearing retirement (DTIC, 2021). There has been a marked decline in the training and development of new talent to replace the outgoing labour force, and this has been echoed by authors such Jordaan and Barry (2009) and Moodley (2024). Thus, rests the underpinning of the third pillar. The authors further state that compounding this issue is the growing need for reforming the domestic education system by making Further Education and Training (FET) colleges more attractive as sources of modern skills training in areas such as computer-aided design (CAD), digital fabrication and advanced manufacturing techniques, which are not being adequately addressed in the current training ecosystem (Jordaan & Barry, 2009). The overarching aim is to build a pipeline of skilled workers who can support the industry's gradual revival, innovation, and competitiveness in both local and international markets (DTIC, 2021).

The fourth pillar seeks to address the institutional weaknesses that have hindered the effective coordination and representation of the South African furniture industry. The sector is highly fragmented, with a large number of small and medium-sized enterprises (SMEs) spread across different regions (DTIC, 2021). It is noted that the fragmentation which exists in the industry has made it difficult to build a unified voice and to implement industry-wide strategies. Furniture manufacturing-related industrial policy has always been confronted by a number of constraints and institutional arrangements needed to direct and manage industrial policy effectively are very demanding (Kaplan, 2007). Kaplan (2007) identified two systemic exogenous constraints with the first relating to the country's macroeconomic framework and the second being international agreements. Firstly, he argued that South Africa, like many other developing countries in Latin America, have adopted orthodox macroeconomic policies focused on lowering domestic inflation. Although this inflation targeting has achieved notable success (Gereziher & Nuru, 2023), it has not brought about the desired stability in key prices that matter for investors and exporters (exchange rate and interest rate) (Kruger, 2025). In this regard, the South African Furniture Initiative (SAFI) has emerged as a key coordinating body to

represent the various sub-sectors within the industry and to enhance the inclusion of smaller players (DTIC, 2021). This would involve advocating for more favourable conditions for trade engagements to ensure that micro and small enterprises remain operationally viable. Secondly, Kaplan (2007) asserted that rules and regulations governing global trade and intelletual had to be relooked as they have siginicantly reduce the country's freedom to pursue industrial policy that embody's national interests.

4.2.3. Evaluation

While understanding that effective industrial policy requires coherence in terms of the goals and objectives of the said industrial policy and that there is uniformity in terms of responsibility with government such that the policy is effectively overseen and directed (Phayane-Skakhane, 2025). It is further stated that while endeavours to revitalise industries by aligning government support, regulatory policies and private sector participation has benefitted some industries from the Master Plan approach, the furniture industry still faced challenges in implementation and impact (Makgetla, 2024). While the Master Plan aimed to enhance local manufacturing, increase employment and boost competitiveness through financial incentives, trade protection, and procurement policies, institutional capacity remains one of the key constraints to unlocking industry revival (Phayane-Skakhane, 2025). Industrial revival requires significant initial investments and extended timeframes to yield measurable returns and Ramadhan (2025) further articulates that in a competitive global economy characterised by rapid technological evolution and market volatility, securing stable financial resources for the long-term would be advantageous and essential to maintain competitiveness and foster productivity growth. Ramadhan (2025) also adds that adequate long-term financing is a foundational component of sustainable business strategies, which is pivotal in enabling industries to achieve large-scale objectives such as R&D, infrastructure expansion, and product innovation. As it has been reported by the National Empowerment Fund (2024), the level of support allocated to the industry has been modest compared to other larger industries. The report further states that between 2021 and 2022, the furniture manufacturing industry received R144 million in government tax subsidies, a fraction of what other manufacturing industries benefitted from.

Despite the miniscule interventions that the industry has seen, the furniture industry's contribution to GDP and employment remains limited, accounting for only 0.5% of private formal employment (Makgetla, 2024). This is reflective of the structural challenges, related to the high production costs, limited-to-no access to finance as for small manufacturers as a result of meeting the required criteria, and weak enforcement of local procurement policies (institutional capacity) (Makgetla, 2024). These have hindered the industry's attempts of revival and constrained the industry's ability to significantly contribute to the country's economic growth.

4.3. Clothing and Textile Industry

4.3.1. Background

South Africa has a wide range of industrial policy challenges, and the clothing and textile is not exempt from this experience (DTIC, 2020). Molekwa, Zandamela, and Matsepe (2021), write that the clothing and textile value chain holds catalytic potential to stimulate growth that is powered by the household demand for apparel in the world of fast fashion. They further that reiterate that the domestic clothing and textile industry, like other industries, has undergone a turbulent period in which local firms are closing down as a result of local supply capacity being displaced by increased imports. Domestic retail performance has been under immense pressure, as a result of limited credit guarantees, dominance of e-commerce platforms and tightening market conditions (Karombo, 2024). The consequences of these market disruptions have been experienced in the form of unavoidable costs of meeting the necessary contractual obligations, adoption of subpar quality manufacturing processes, delivery pressures and the displacement of local production (DTIC, 2020). The DTIC (2020) Master Plan depicts a bleak picture in that the value chain only accounts for less than 1.8% of the country's Gross Value Added at around R74 billion. It further relays that over 55% of all clothing and textile purchases/consumption in the country is through imports which is disproportionately higher than local purchases (DTIC, 2020). Mbatha (2018), Wood and Bischoff (2020) state that the clothing and textile industry has for long been protected against foreign competition since the days of high apartheid, both in terms of active protectionist

measures and via the growing effects of trade sanctions. However, despite these interventions, the manufacturing value chain has continued to perform sub-optimally, despite isolated success. The poor performance existent in the industry can be attributed to the incongruous nature of industrial and market labour policies (Mbatha, 2018) that are biased against rising wage costs, labour-intensive growth, inadequately equipped factories from a technological and human capital perspective, exchange rate volatility, declining consumer demand for domestic clothing and intensifying international competition, particularly those from Asian countries (Molekwa, Zandamela, & Matsepe, 2021).

Contrary to the experience of South Africa, the clothing and textile value chains in other developing countries have performed better over the past decade in areas such as exports, domestic market growth, product expansion, regional and international competitiveness, and employment (DTIC, 2020). Unlike common assumptions, the main challenge in South Africa's clothing and textile industry does not seem to be labour costs, nor is reducing wages the best strategy for growth (DTIC, 2020) as countries with higher minimum wages, such as Poland and Romania, continue to thrive in this industry. Similarly, Türkiye, which employs seven times more workers than South Africa in its clothing and textile industry, also maintains significantly higher wages (DTIC, 2020). Despite having higher nominal tariff protection than most comparator countries, South Africa still experiences high levels of imports, which reduces the actual effectiveness of tariff protection (DTIC, 2020). South Africa's trade agreements with regional partners have provided opportunities for the clothing and textile industry, but growth has been limited due to low per capita income in these markets and the influx of second-hand imports (DTIC, 2020).This raises the question of whether past and present industrial policy measures adopted by our policymakers are suitable for firms attaining comparative advantages.

While the country's industrial policies may hold potential for future productive expansion, offering avenues for increased market access (Cao, Scudder, & Dickson, 2017), it seems the protection against foreign competition has allowed value chain inefficiencies to go unchecked (Molekwa, Zandamela, & Matsepe, 2021) and resulted in

failure to develop export capacity (Bisseker, 2009). This optimistic point of view regarding the incumbent's policy direction is contrasted by Molekwa, Zandamela, and Matsepe (2021) who state that the government lacked the capacity to define and implement selective industrial policies in the early years post-apartheid. They further argue that as the years went by, the government has not attempted to coordinate economic policy, resulting in a fundamental barrier to industrialisation (Cilliers & Ngundu, 2025). We need to remember that the success of the clothing and textile industry strongly linked to market access, both domestically and internationally, as well as the strength of value chain capabilities and the effectiveness of government policies and incentives (le Roux, 2025) . . As the global recession and trade wars intensify, one of the country's most labour-intensive sectors faces imminent collapse. Bisseker (2009), argues that while a new government rescue initiative aims to revive the industry, the intervention may have come too late to reverse the industry's downward spiral. The industry has long struggled to attract investment, companies have consistently failed to modernise, and this has left them unable to compete with low-cost producers and cheap imports (Cilliers & Ngundu, 2025).

4.3.2. Policy Interventions

South Africa's clothing and textile manufacturing sector has a rich history, and has, in the past contributed significantly to the country's economy and overall manufacturing capacity (May, 2025). The industry has struggled over the past two decades, with its contribution to GDP steadily diminishing as the years pass (DTIC, 2020). By 2030, the government aims to revive the clothing and textile industry by establishing a commercially viable, sustainable, and dynamic value chain (DTIC, 2020). The focus will be on providing high-quality products to customers while fostering job creation, inclusivity, and transformation (DTIC, 2020). It is imperative to note that the encouraging revival through industrialisation and structural changes will not suffice if they are not complemented by processes to develop deep and robust domestic production, learning and income linkages (Gehl Sampath, 2014). The primary intent of the revival initiative is to create a clothing and textile environment conducive to creating new jobs as a means to tackle the elevated levels of unemployment.

The industry needs an overhaul to be able to compete on a global scale, therefore, the economic policy needs to be uncompromising in its efforts to improve cost efficiencies, process and product competitiveness (Wood & Bischoff, 2020). From 2009, the developmental finance institution of the state, the IDC, has been tasked with supporting the domestic clothing and textile industry and the resolution was to utilise its abundant natural, human and technological materials to make South Africa the local and international supplier of South African clothing and textiles (Wood & Bischoff, 2020). Technological advancements are key to any value chain improvements and as such, they will be embraced to reduce lead times across the value chain (Prince, 2024). It is understood that rapid technological advances, particularly in automation has the unique ability to enable firms to achieve high accuracy and speed in their functions (Molekwa, Zandamela, & Matsepe, 2021). The authors state that competitiveness in the industry would be promoted by encouraging manufactured exports that were necessary for the firms to move up technology and skills ladder. The issue that was assessed in the market was that local firms were acquiring machinery with specific technologies, however that machinery was outdated and not suited for an industry that was competitive in nature (Cao, Scudder, & Dickson, 2017). Ensuring better financial returns was another critical aspect in the Master Plan process. The increased profitability would encourage higher levels of investment, leading to greater economic activity and job creation (Mansikkamaki, 2023). The authors that in this regard the marginal productivity of labour theory would need to hold. This theory posits that firms will only hire workers up to the point where the marginal cost of labour equals the marginal revenue product (Mazumdar, 1959).

The rationale behind these objectives Master Plan is to position South Africa as a leader in the global clothing and textile market while driving growth (DTIC, 2020). There exists an implementation component that will determine whether the Master Plan can revive the industry as set out in the strategic report. The implementation needs to be as meticulous as possible and will be guided by two principles namely; (i) Building the demand drivers to fuel growth through the value chain, and the verticalization of supply chains and (ii) developing an ecosystem to respond to internal and external pressures, which will inform

the stakeholders' actions and government policy (DTIC, 2020). The first principle assumes that the stakeholders have a shared ambition for the value chain to be fully verticalized to produce finished goods using locally sourced raw materials (DTIC, 2020). The understanding of this approach is that in order to achieve this, the sophistication of the value chain will be achieved through demand drivers that will stimulate investment in the upstream value chain (Corbishley, Biyase, & Mason, 2021). The DTIC (2024) goes further by reiterating that the initial priority will be expanding clothing and textile manufacturing capacity, laying the foundation for increased demand and fostering the growth and development of the entire value chain. The second principle uniquely articulates that the success of South African retailers, especially in the face of weak consumer demand and growing competition, is closely linked to the efficiency and productivity of their supply chains (DTIC, 2020). As such, in order to remain cost-effective and responsive to fast-changing fashion trends, retailers need to establish dedicated supply chains that seamlessly align with their operational models. The Master Plan aims to facilitate the creation of vertically integrated supply chains within dynamic ecosystems of specialised suppliers and service providers. These integrated networks will combine large-scale manufacturers with SMMEs simultaneously driving industry transformation and enhancing overall competitiveness (DTIC, 2020).

4.3.3. Evaluation

The clothing and textile industry experienced a steady production decline subsequent to the opening up of international markets and increased competition and this forced many firms to radically rethink how they organise their production lines (Wood & Bischoff, 2020). As is the case with other Master Plans, it was important for the state to establish engagement mechanisms to set a clear set of commitments focused on strategic plans with measurable time-frames and outcomes (Makgetla, 2024). The proposed industry's restoration was reimagined to create a value chain that was competitive, dynamic, and sustainable and one that would be able to stimulate aggregate demand (Nattrass & Seekings, 2021). This would in turn spur growth in employment and advance inclusion and transformation (MENA Report, 2024). Makgetla, (2024) mentions that this policy directive was central to facilitate industry-level engagements and as such the inclusion

of retailers in the process of revival was acknowledged as an astute tactic as they had committed to boost domestic manufacturing by foregoing the reliance on imports (Invest SA, 2023).

The Master Plan primarily focused on strategies to curb imports, aiming to create opportunities for local producers to increase sales and in turn, generate sustainable employment. This was one of the economic development models that Alexander (1967) thought could be deployed in efforts to kick-start large-scale industrialisation. A failure of the Master Plan was that it dedicated minimal attention to analysing factors that constrained the clothing and textile industry's overall competitiveness and rather implied that weak enforcement of existing tariffs left local producers inadequately protected (Makgetla, 2024).

The state had teased initiatives to boost demand by strengthening tariff enforcement and prioritising local procurement. Although the benefits of free trade are well known and have been strongly argued for, but nevertheless, the distributional consequences of open trade have seen many countries adopt protectionist policies (Wilson & Shanahan, 2012). Empirical evidence of the impact of trade protection in the late nineteenth century shows that there was a positive correlation between these measures and economic growth (Wilson & Shanahan, 2012). This may have been the underlying reason for trying to protect the local clothing and textile industry. Hong (2013), states that even though protection has worked in some countries, it worked less so in the twentieth century. He states that this paradox is of particular interest considering the extensive literature in support of free trade and the costs of rent seeking and lobbying. He further raises that if on the one hand, tariffs have the capacity to be welfare enhancing but on the other hand to be a function of special interest politics, the natural question is which dominates, and when (Wilson & Shanahan, 2012). One approach to answering this question lies not in determining the levl of protection, but rather, in revealing what is protected. He states that shown that growth-enhancing (positive externality) industries will receive greater protection only when the institutional quality of a country is sufficiently high. Intuitively, countries with good institutions protect for the right reasons to enhance welfare and growth. The introduction of protectionist measures did not work as anticipated as textile

manufacturers, which account for around 40% of value add and formal employment in the value chain, were forecasted to lose revenue due to the proposed rebate on imported materials. Moreover, high tariffs on imported clothing were seen to lead to higher prices which would be a burdensome cost passed on to customers (Makgetla, 2024).

Similar to the 2007 and 2008 global financial crisis the COVID-19 was an arduous period for the country and in particular this ailing industry. Restrictions on retail had a severe impact on sales and in response protocols to reopen stores were utilised (Muthu & Wesson, 2023). The government, through initiatives like the Clothing and Textiles Competitiveness Programme (CTCP) to stabilise employment and improve overall competitiveness for the industry (Kurasha, 2020). The programme also aimed to change the structure of the clothing, textiles, footwear, leather and leather goods manufacturing industries by providing assistance to invest in competitiveness improvement interventions (Kurasha, 2020). And yet despite these numerous interventions, progress on key competitiveness initiatives remained limited and/or non-existent (Makgetla, 2024). Efforts to launch an export drive

As of 2024, efforts to launch an export drive and a skills development plan had made little headway. In practice, implementation faced significant delays and government funding for the industry remained modest over the past few years, and while the Master Plan was resolute on restricting imports and supporting existing producers resulted in minimal direct financial costs or risks. However, this strategy carried certain risks, as even if successful, it was unlikely to create significant employment opportunities or foster smaller producers. This contrasted with other industrialised economies, where the clothing and textile manufacturing sector has played a key role in job creation (Makgetla, 2024). The domestic market remains underdeveloped and as such, it would be nearly impossible to undertake an inward-looking approach that would drive manufacturing exports and employment growth. The historical position of the domestic industry has always focused on serving local and regional markets and would find difficulty with the significant barriers to entry in the global market as a latecomer given the country's geographic distance from major trade hubs (Makgetla, 2024).

The impact of the policies undertaken is evident in the stories of two companies in the clothing and textile sector, which highlight the benefits of collaboration between government, business and labour in strengthening the South African economy (MENA Report, 2024). Since its rollout, the Master Plan has contributed to the creation of a significant number of jobs and a contributing component of the plan is the focus on import substitution, competitiveness enhancement, transformation and job creation (MENA Report, 2024). According to the DTIC's Director for Clothing and Leather, Dr. Jaywant Irkhede, by July 2024, more than R1.87 billion has been approved for 154 businesses, collectively employing nearly 24,000 people, with R.41 billion already disbursed (MENA Report, 2024). Evidence is provided of this success with a beneficiary company called R and L Apparel, a woman-owned business based in Newcastle, KwaZulu Natal. The company received financial assistance for purchasing equipment, machinery, and initial working capital to expand its Cut, make, Trim (CMT) manufacturing capacity (MENA Report, 2024). This investment enabled the company to increase production, improve product quality, create jobs and expand its clientele which now includes The Foschini Group through Celtico, a key CMT supplier in Newcastle. The funding assisted in increasing the staff complement from 17 to 103, of which 98 are women (MENA Report, 2024).

Similarly, Agento, a company based in Mandeni, KwaZulu Natal, which manufactures apparel and corporate clothing for a major retailer and various corporate clients received funding for operational expenses (MENA Report, 2024). This allowed the company to create 45 new jobs, profit margins to increase and production to grow rapidly due to the additional acquired capacity. The importance of the Master Plan is underscored by this evidence as it is able to foster sustainable and innovative practices in the industry, if and when implemented in alignment with what industry players require. Former Minister Patel explained that in order to achieve the objectives of the Master Plan, the industry would need to r-invent itself so that each of us makes a substantial contribution (Invest SA, 2023). He gave evidence of its impact in Keates Draft, a rural area in Msinga, where the closure of a shoe factory years ago affected around 3,000 families. In response a local entrepreneur launched the Msinga Clothing Factory five years ago to provide

employment opportunities and skills training. With support from the Health and Welfare Sector Education and Training Authority (HWSETA), which aligns with the government's clothing and textile Master Plan, local community members received adequate training (Invest SA, 2023). Currently, the factory employs 100 women who produce garments for major local retailers such the Foschini Group, Ackermans and Mr Price. This concerted aligns with the state's call for retailers to back local manufacturers, thereby strengthening the domestic supply chain and generating the required employment (Invest SA, 2023).

In closing the discussion on the clothing and textile industry, an industry expert, based on a questionnaire presented to them, posits that South Africa possesses strengths, being a leading producer of natural fibres like mohair and wool, accounting for a sizeable portion of global mohair production (Pick, 2025). Opportunities for the sector include quick response capability development, regional and international export growth, and investment in new technologies (Pick, 2025). However, weaknesses such as weak human capital, skills deficits, outdated production processes, and deficient supply chain capabilities have been identified. Pick (2025), mentions that major threats include the continued growth of imports, international retailers increasing their footprint without local procurement, fraud/under-invoicing, infrastructure challenges like load shedding and port delays, and the need for more skilled labour. The rise of global e-commerce platforms and reduced consumer spending also pose challenges. that they recognise the notion of experiential learning and leveraging institutional knowledge and state that it would be important to develop skills through intergenerational knowledge transfers making it essential for learning advanced techniques and adapting to new technologies. In conclusion, she acknowledges that Trade agreements have had mixed effects on the sector. While some agreements have opened export opportunities, others have intensified foreign competition, leading to job losses (Pick, 2025). Agreements with China led to a surge in low-cost imports, negatively impacting local producers (Pick, 2025). AGOA allows duty-free exports to the US, but manufacturers have faced challenges in utilizing it effectively (Pick, 2025).

5. Launching New Sectors

5.1. Renewable Energy Industry

5.1.1. Background

Concerns over environmental quality and climate change have escalated domestically and globally in recent years (Weideman, Inglesi-Lotz, & Van Heerden, 2017). While noting that past emissions stemmed from energy sectors in high-income countries, in the past decade, the share of emissions caused by developing countries has been gradually increasing, with rapid economic growth being the contributor to higher energy demand (Pegels, 2010). The South African government first acknowledged the importance of energy from renewable sources in the White Paper on Energy in 1998, stating that it intended to provide "focused support" for the implementation of renewable energy systems in the country (Weideman, Inglesi-Lotz, & Van Heerden, 2017). In 2003, a white paper on renewable energy marked the first time that renewable energy took priority in the domestic policy space. In 2008, there was a convergence of mass electrification, relatively strong eonomic growth in a number of industrial sectors and inadequate load planning culminated in electricity demand far-outstripping supply (Krupa & Burch, 2011). Rolling power outages, which would soon be termed "loadshedding" spread virulently across the country and were a clear indication that coal delivery coordination and deficient coal production could not keep up with demand (Krupa & Burch, 2011).

Between 2002 and 2009, the country increased coal proudction from 124.1 to 141.2 million tonnes (Krupa & Burch, 2011), with that comfortably sitting at 247 million tonnes (Stats SA, 2025). Although renewable energy was and still remains a contested topic in South Africa, it is deeply interwoven with many aspects of sustainable development and yet historically the country's economic policies have not favoured renewable energy technologies (Narassimhan, 2025). In recent years, the government has increasingly trifled with the idea of integrating green industrial policies into their national objectives to address socio-economic and environmental issues in the pursuit of the energy transition (Narassimhan, 2025). Ukoba, Jen, and Yusuf (2025), postulate that South Africa's energy sector is undergoing a transformative, driven by policy reforms from the Operation Vulindlela initiative, technological advancements and the global transition

toward more sustainabel energy systems. Concerns regarding energy security and economic sustainability have heightened the need for energy diversification (Ukoba, Jen, & Yusuf, 2025).

Renewable energy technologies are believed to provide the least-cost alternative to generating electricity (DMRE, 2023). Public policy has been overhauled in numerous developed and developing countries with the aim of accelerating the decarbonisation of the economy. The decarbonisation of economies complements the Sustainable Development Goal (SDG) 13 which aims to combat climate change and the impacts thereof (UNDP, 2024). The immense support and advocacy for climate action has further driven the exponential development and rollout of renewable energy solutions such as solar panels, inverters and lithium-ion batteries and wind energy generation turbines (DMRE, 2023). Globally, the introduction of the renewable energy solutions sector rose from around 18% to 28% in energy supply between the years 2000 and 2021. Installed capacity worldwide in 2000 and 2021 was 849GW and 3258GW respectively (DMRE, 2023). Projections show that global renewable energy market will reach between 5.4TW and 10.8TW by 2030 as demand of new cleaner sources such as New Energy Vehicles (NEVs) and green hydrogen intensifies (Ukoba, Jen, & Yusuf, 2025).

The early development and deployment of renewable energy and battery technology in South Africa was characterised by miniature country-wide pilot projects. The majority of pilot projects were in the telecommunications industry as substitute power for network towers and the electrification of remote areas (DMRE, 2023). The government undertook a deliberate approach to extend the use of renewable energy in the country's energy mix by launching the former version of the REIPPPP in 2011. The programme was developed to promote the use of renewable energy in South Africa with the purpose of helping the country meet its renewable and clean energy targets as outlined in the Integrated Resource Plan (IRP) (Energy Group , 2023). A lot of red tape has been eased since 2021, allowing the private sector and households to install small-scale embedded generation (SSEG) technologies. The rollout of renewable energy technologies in South Africa is expected to increase exponentially over the next few years as the country aims to decarbonise while simultaneously maintaining energy security. The DMRE (2023) states

that there are efforts in place to procure utility-scale renewable energy and battery storage of 22.9GW between 2022 and 2030 and in addition various spheres of the state (at national, provincial and regional level) have plans for extensive rollout of renewable energy. The growing market of renewable energy technologies both internationally and domestically, presents a unique opportunity for South Africa for sustainable economic development as outlined in the National Development Plan (NDP) 2030 programme. This opportunity will take the form of both demand and supply side opportunities and the pursuance of these industrial value chains coupled with the country's existing manufacturing capabilities may well be an unprecedented opportunity (DMRE, 2023).

5.1.2. Policy Interventions

South Africa is currently undergoing a significant transition in its energy sector with aims to reduce its reliance on coal and increase the integration of renewable energy sources (Ukoba, Jen, & Yusuf, 2025). The government has set ambitious targets to enhance renewable energy's share in the country's energy mix with aims to raise the contribution of renewable energy to 30% in the next five years. The South African Renewable Energy Masterplan (SAREM) released in 2023 articulated a set of vision and actionable objectives underpinned by four key areas which would be championed through initiatives such as the REIPPPP. These areas would leverage rising demand for renewable energy technologies and storage capacity to unlock industrial manufacturing capacity/supply-side capabilities within the country's value chains (DMRE, 2023) and attract substantial investments for renewable energy projects (Eberhard, Kolker, & Leigland, 2014)The Integrated Resource Plan (IRP) of 2019 outlined the focus the country's energy up to 2030 and it placed significant emphasis on diversification. The rationale of developing diversified competency would be to unlock new and unexplored value chains while simultaneously bolstering South Africa's supply-side capabilities (Oyewo, Aghahosseini, Ram, Lohrmann, & Breyer, 2019). The domestic renewable energy and battery storage value chains are underpinned by four fundamental pillars and catalytic interventions.

The first pillar is concerned with meeting local renewable energy demand and storage needs by unlocking the potential of the market and ensuring that all necessary energy

systems are ready (DMRE, 2023). The objective of this catalytic strategy is to elucidate market demand clearly for renewable energy and storage technologies (DMRE, 2023). The pursuance of this policy objective of industrial development is conditioned so that public procurement can be utilised as an anchor within the market to account for the majority of storage demand and renewable energy projects in the near future (DMRE, 2023). The second pillar focuses on promoting industrial growth by developing renewable energy and storage value chains through localisation initiatives in both public and private sector markets, which would then be supported by enabling and industrial policies (DMRE, 2023). This initiative would be recognised through consistent local content targets for local manufacturing and cross-cutting supply-side support. The SAREM states that the re-activation of the 12I Tax Incentive would be instrumental as it designed to support Greenfield Investments, better defined as "new industrial projects that utilise only new and unused manufacturing assets" (DTIC, 2022). The plan is to complete these alongside other interventions such as the use of Special Economic Zones (SEZs) and, or Industrial Development Zones to attract investment. These as detailed by the SAREM are value propositions to remedy the lack of support that the government has displayed in years past (DMRE, 2023).

The third pillar speaks to the need to encourage inclusive development in renewable energy and battery storage by transforming the industry, fostering the growth of emerging suppliers and advancing a just transition (DMRE, 2023). The government claims that the pillar is upheld by the need to transform the main players in the market of developing the much-needed technology for renewable energy and storage facilities (Oyewo, Aghahosseini, Ram, Lohrmann, & Breyer, 2019). Therefore, the purpose is to establish transformation objectives in the form of the development and implementation of a B-BBEE sector specific scorecard, creating a Transformation Fund to finance new entrants, launching renewable energy projects across public facilities and launching public procurement rounds wherein renewable energy activities can be directed towards just transition hotspots (Oyewo, Aghahosseini, Ram, Lohrmann, & Breyer, 2019). The last pillar for developing capacity in the renewable energy technologies sector is the need to strengthen domestic human capital and R&D to support the adoption of renewable energy and storage technologies, while driving related industrial development and

enabling active participation in the energy transition (Krige, 2023). The government has identified that the lack of skills is rapidly as a major hindrance for the growth of the sector and as such a dedicated platform which would match the skills required by the sector with South Africa's broader education system (DMRE, 2023). The government envisages that these four pillars are the prerequisite to achieving socio-economic objectives that are set out in the National Development Plan (NDP) as a means of contributing to economic revival.

5.1.3. Evaluation

The perceived rollout of renewable energy and storage projects is expected to play a critical role in stimulating economic growth by driving direct investment that significantly contributes to the ailing local economy. For instance, the government's REIPPPP projects bid from Windows 1-4 injected investments worth over R200 billion into the economy (National Treasury, 2025). This economic policy integration strategy is pursued in tandem with other energy-related strategies that will enable low-carbon energy known for its affordable and reliable characteristics, to ensure that there is a level of energy security while reducing energy costs (DMRE, 2023). The government posits that expanding industrial capacity in the sector is equally vital, as manufacturing operations create spillover effects like increased economic activity and job creation.

The logic behind the eruption of domestic industrial capabilities is particularly strategic in addressing supply constraints, ensuring availability for the domestic market, and protecting against price volatility (Makgetla, 2024). Furthermore, the value chain supports wide-ranging employment opportunities across development, construction, manufacturing, operations, and maintenance, with REIPPPP projects already committing to over sixty-two thousand job-years and the solar industry directly employing approximately twenty thousand people (National Treasury, 2025). Building local skills and supporting technology commercialisation can further enhance South Africa's competitiveness, bridging gaps in innovation and opening export opportunities. The sector also provides a unique platform for inclusive development, with the REIPPP laying foundations for transformation in projects. By fostering a broader local supplier base, the

value chain can amplify its benefits to the economy while contributing to a just transition, particularly in coal-dependent regions like Mpumalanga, by addressing socio-economic impacts associated with the shift to a decentralised energy structure and widening access to renewable energy across all income groups.

The clean renewable energy manufacturing sector was identified as a priority sector in South Africa's reimagined industrial strategy (DMRE, 2023). Despite challenges and opportunities in the energy access presenting a complex landscape, the country's renewable energy space has seen substantial investment, driven largely by the need to reduce dependence on coal and address the country's energy crisis. The sector's expansion has been supported through a mix of policy initiatives, infrastructure development, and private sector involvement, particularly in solar and wind energy projects (Makgetla, 2024). One notable development was the launch of the Agro-Energy Fund (AEF) in 2023, with an initial budget of around R2 billion, aimed at supporting farmers in adopting off-grid renewable energy solutions (Nedbank, 2025). The AEF has the potential to transform South Africa's agriculture landscape by harnessing solar energy to empowers farmers nationwide (Nedbank, 2025). This initiative aligns with the broader goal of diversifying South Africa's energy mix and reducing electricity costs for industries and households.

The country's economic policy directives and implementation remain fragmented with multiple government agencies handling different aspects of the sector's growth (Bernstein, 2024). This lack of coordination has slowed the development of local manufacturing in renewable energy technologies, limiting the country's ability to capitalise on global green energy demand (Makgetla, 2024). Data indicates that while the REIPPPP has facilitated investment in large-scale renewable energy projects, South Africa still lacks a comprehensive roadmap to develop a local renewable energy manufacturing industry (Bernstein, 2024). This simply means that while notable strides have been made, the benefits of the transition are not felt equally across society (Ukoba, Jen, & Yusuf, 2025). The lack of policy directives that ensure that there is interconnectedness between energy and social equity, lies at the heart of South Africa's energy transformation, failing to encompass not only access to affordable and reliable

energy but also the fair distribution of opportunities and the social consequences of moving away from a fossil fuel-based economy (Ukoba, Jen, & Yusuf, 2025). We need to understand that the social dimension extends beyond access and affordability as the move from coal production and consumption threatens livelihoods and local communities in coal-mining regions (Pegels, 2010).

Abeka, et al. (2022) and other researchers highlight aspects of the emergence of the renewable energy transition that will further retard prospects of the country ever developing a competitive industrial base. They hold this view as they argue that despite the growing awareness of insistence on the production and use of renewable energy, the country's rather weak political and economic systems may pose a great challenge to a successful energy transition. The first being that the manufacturing sector risks remaining overly reliant on imported solar panels, wind turbines, and battery storage solutions, rather than fostering domestic production capabilities (Pegels, 2010). The second being that addressing the just transition, requires an approach that includes retraining and upskilling programs, new employment pathways in the renewable sector and social protection measures (Tamasiga, 2025). Lastly, effective implementation and governance need to remain a critical piece of the puzzle as issues such as corruption, inefficiency, lack of coordination and transparency in the energy sector will eventually undermine efforts to create an equitable transition (Abeka, et al., 2022).

6. Lessons Learnt

Manufacturing remains central to South Africa's growth prospects, but realising its potential requires heterodox strategies rather than laissez-faire assumptions (Hirschman, 1958). In structuralist terms, industry-led growth creates the linkages and employment needed to modernise the economy (Kaldor, 1966). As noted in the literature review, manufacturing industries have been perceived as backbones of economic development, modernising agriculture and expanded skilled jobs. Yet South Africa has suffered premature deindustrialisation with global production has concentrated in a few low-cost hubs, undercutting traditional industries locally (Kgaloshi & Nyika, 2024). High energy and labour costs, coupled with volatile trade conditions, have eroded once-

competitive sectors despite decades of experience (Prince, 2024). This accentuates the heterodox insight the manufacturing-driven transformation cannot be left to automatic market forces. In the Kaldor tradition, deliberate state coordination of investment, technology and institutions is required to spur structural change (Kaldor, 1966). And in practice, South Africa's stagnating productivity and sectoral decline which occurs despite the country's long-standing industrial base attests to this lesson.

The case studies of sunset industries illustrate the dual role of manufacturing experience. On the one hand, legacy sectors possess invaluable knowledge (Makgetla, 2024). Amsden's famous insight is borne out here pre-existing manufacturing experience makes it far easier to re-establish competence and competitiveness when recovery is pursued (Amsden, 2001). Similar to how Asian post-war booms were built on decades of accumulation of industrial capability and not overnight innovation. In theory, South Africa's old industries could leverage their dormant capabilities. However, the South African experience shows that experience alone is not enough. The steel sector's revival plan has no concrete production targets or technological advancement goal and the policy space has been fragmented. Short-sight measures such as export bans without a clear industrial mission have distorted markets. Competition regulations have prevented large firms from pooling capacity or innovation budgets and domestic production capacities remain retarded and inefficient against global competitors (Hunter, Tsegaye, & Kapingura, 2025). The furniture industry likewise illustrates this failure. Despite a significant skills base, it accounts for a minute portion of formal private employment, held back by steep costs and poor access to finance. In short, South Africa's legacy industries retain some learning-by-doing advantages, but decades of experience have been undermined by outdated capital, weak institutions and underfunded policy directives.

By contrast, newly emerging sectors start from a near-zero experience base making the learning-by-doing paradox especially stark. If we consider the renewable energy, particularly in the South African context, we see that the industry has bid over R200 billion into solar and wind projects and rightly treats clean technology as a priority industry (Weideman, Inglesi-Lotz, & Van Heerden, 2017). These investments have created jobs

and demand, but without a coordinated industrial strategy they have not generated a local manufacturing boom. Multiple agencies issue renewable policy, yet no unified roadmap for building domestic component industries exists. As a result, the country reflects the classic paradox which argues that nascent industries lack the learning curves and supplier networks to improve automatically (Egelman, Epple, Argote, & Fuchs, 2017). Even when the state tries to invest heavily, firms in a new sector face steep initial learning costs and need purposeful support in the form in the form of R&D, training and technology adoption, to achieve efficiencies. In sum, South Africa's clean energy push shows that without deliberate capacity building, a promising sunrise industry flounder just as a sunset one has.

These dual lessons embody the broader learning-by-doing paradox. Orthodox theory would predict that past production translates into future productivity, but the evidence contradicts this (Amsden, 2001). In South Africa, the persistence of low productivity, limited diversification, and stalled upgrading. Both analytics and our case studies confirm that industrial learning is not automatic. Legacy firms often stall because of inertia, outdated technology or missing complementary assets, new firms falter because they lack an embedded knowledge base. In other words, neither decades of experience nor raw entrepreneurial energy can alone overcome South Africa's structural constraints. This insight is consistent with heterodox though argues, productive learning requires active coordination of state and market (Caballero, 2010). Our analysis shows that successful learning-by-doing must be embedded in supportive institutions and policies. When it is not, as in fragmented industries, experience alone does not guarantee growth. Overall, the findings point to the need for a mission-oriented manufacturing ecosystem. Rather than isolated protection or unfettered markets, South Africa needs broad, challenge-driven strategies that align public and private goals. The recent Master Plan approach was a step toward this in which involving government and industry in joint planning (Makgetla, 2024). But experts have criticised these plans for lacking a coherent vision. They tend to focus narrowly on existing firms and immediate fixes, rather than articulating high-level missions or systemic reforms. Going forward, policy should frame manufacturing development as part of large social missions.

This means targeting cross-sectoral challenges and leveraging the strengthens of both sunset and sunrise industries. For instance, a mission to green South Africa industries could mobilise steel firms to produce wind towers while stimulating new battery plants, each supported by R&D and skills training. Such missions provide clear direction, encourage collaboration, and tolerate experimentation. Based on insights, several actionable policy directions emerge. First institutional coordination. South Africa should consolidate industrial policy leadership to avoid the current fragmentation. A single coordinating body should oversee Master Plans, ensuring consistency across trade, competition and education policies. Second, unlock scale through consolidation where needed. Competition, rules should allow strategic mergers and joint ventures in core industries, so firms can share knowledge and achieve economies of scale. Third, commit sustained finance and capability-building. As one analysis notes, industries like furniture have been starved of long-term support. Future programs should offer readily accessible capital, tax incentives and guaranteed procurement to firms that invest in upgrading, R&D and workforce training. Fourth, link incentives to performance and innovation. Procurement and local-content rules should create assured demand for domestic producers but also require quality improvements or joint ventures with new entrants. Fifth, tackle underlying constraints resolving the energy shortfall, improving ports and transportation and stabilising macroeconomic policy will magnify the country's sectoral efforts. Finally, prioritise horizontal as well vertical measures by investing in general education, technology infrastructure so that all sectors benefit from more advanced capabilities.

These recommendations must be calibrated to South Africa's limits. The country's weak institutional capacity, fiscal constraints and legacy inequalities mean that any strategy must be realistic and inclusive. Targets and missions should be modest and co-owned by local stakeholders to account administrative bottlenecks. Likewise, policies must be flexible to global shocks and sensitive to social needs. In framing mission-oriented growth, it is crucial to blend ambition with pragmatism given these constraints.

7. Conclusion

South Africa's industrial trajectory calls for a renewed policy approach grounded in heterodox principles. Manufacturing can still be an engine of structural transformation, but only if learning-by-doing is actively cultivated rather than assumed. The evidence here shows that neither passive markets nor narrow rescue plans suffice. Instead, a state-led yet innovation-friendly strategy. One that sets bold public missions while leveraging private sector agility and offers the best path forward. By integrating the strengths of its legacy industries with support for new ones, South Africa can overcome the paradoxes of industrial decline and pioneer a sustainable, inclusive manufacturing renaissance.

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