How not to industrialise? Industrialisation without Energy, cannot be good for economic growth and employment creation

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Introduction

The recent Russo-Ukraine impasse has catapulted the global energy into a tailspin, and this has led to increased scurrying for alternatives, more so for country's that had previously being supplied by Russia. This Russo-Ukraine impasse as placed question of energy supply on the global development agenda, thus question on the over-reliance on a few countries to supply energy, as well as the energy supplied. In recent times, the global energy discourse revolved around the transition to more green energy – this largely in efforts to quell carbon emissions impact on the environment[1].

In the South African perspective, despite being rallied by the global bodies to transition to more greener energy production, the country' has been overwhelmed with the energy supply challenges, as it as come to be known as loadshedding episodes. This of grave concern, given the relatedness of energy and the growth of the economy (Inglesi-Lotz T. M., 2022). The energy crisis faced by the country and indeed the world poses a serious threat to the attainment of the developmental goals (Sustainable Development Goals-SDGs). Inextricably, the crisis also potentially would thwart the economic developmental trajectory – more instinctively the industrial development[2]. Poignantly, industrial development has had an important role in the economic growth of countries like China, the Republic of Korea (Korea), Taiwan Province of China (Taiwan), and Indonesia (Kniivilä) (Zalk, 2014).

Zalk(2014) the three exceptions are small, single-commodity exporters (Botswana and Oman) and Hong Kong, a small financial offshore centre. Two additional countries are potentially on track to achieve high and sustained growth: India and Vietnam, both of which having recorded rapid industrial growth up to the 2008 global crisis Thus, borrowing from the work of Zalk (2014) manufacturing and by all account's industrialisation, is considerable accumulated evidence that manufacturing still functions as the heart of the economic development process. That said, the Russo-Ukrainian impasse have had significant energy challenges which could inextricably hamper the global growth outlook.

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[1] Across the world, we have seen the devastating impact of climate change particularly on the poorest and most vulnerable. In South Africa, we have experienced the loss of life and destruction of livelihoods from worsening fires, floods and droughts. Unless the entire international community addresses the root cause of climate change by reducing greenhouse gas emissions, our people will increasingly be vulnerable to its effects.

[2] In some countries, this could be the reindustrialisation or could potentially be the beginning of the industrialisation of regions/countries.

In the analysis of the state of the global manufacturing sector's employment ability, the National Development Plan (NDP) acknowledges that, manufacturing sector is gradually becoming a proportionately smaller employer. The NDP states that this phenomenon can be detected in the upper-middle-income and high-income countries, with at least three quarters of new employment found in services. As such, South Africa is no exception (National Planning Commission(NPC) , 2012).

That said, manufacturing sector continues to be a critical employer – as according to the latest StatsSA (2023), Quarterly Labour Force Survey (QLFS) in the first quarter the sector had over 1.6 million people in its employ, accounting for 10.2% of those employed in the country. Moreover, using data from StatsSA (2023) – the Gross Domestic Product (GDP) figures as released in June 2023. The manufacturing sector contributed about 11.4% to the country's GDP in the first quarter of 2023 (StatsSA, 2023).

South Africa has been besieged by the question on the energy supply, and how effective the country can provide energy to its populace, without necessarily breaking the bank. Since 2007, a concept of loadshedding had been colloquially accepted as a concept to the energy supply crisis, wherein scheduled electricity shutdown or staged blackouts are implemented. These, loadshedding/blackout were precipitated by the dearth in the energy supply[3]. As the country's electricity demand began to increase and the supply waned. This was a result in large respect to the failure to invest in new energy generation capacity, whilst also the old power station or grid began to succumb.

The fourth post-Apartheid administration set out to turn the tide, and as such began to invest in the new capacity. This was largely towards the coal-powered fleet, being the Medupi and Kusile power plants. As it is widely-reported there were significant investment required for the development of the two plants, however these were bedevilled by a number of factors causing the delays.

No energy – how about industrialising? are we able to?

As South Africa's economy emerges from the pandemic-induced contraction, it is benefiting from favorable commodity prices, which have raised exports and government revenue. However, a series of shocks is adversely affecting its outlook. The flooding in Durban, uncertainty about the war in Ukraine, tightening of global financial conditions, and China's slowdown pose challenges to growth

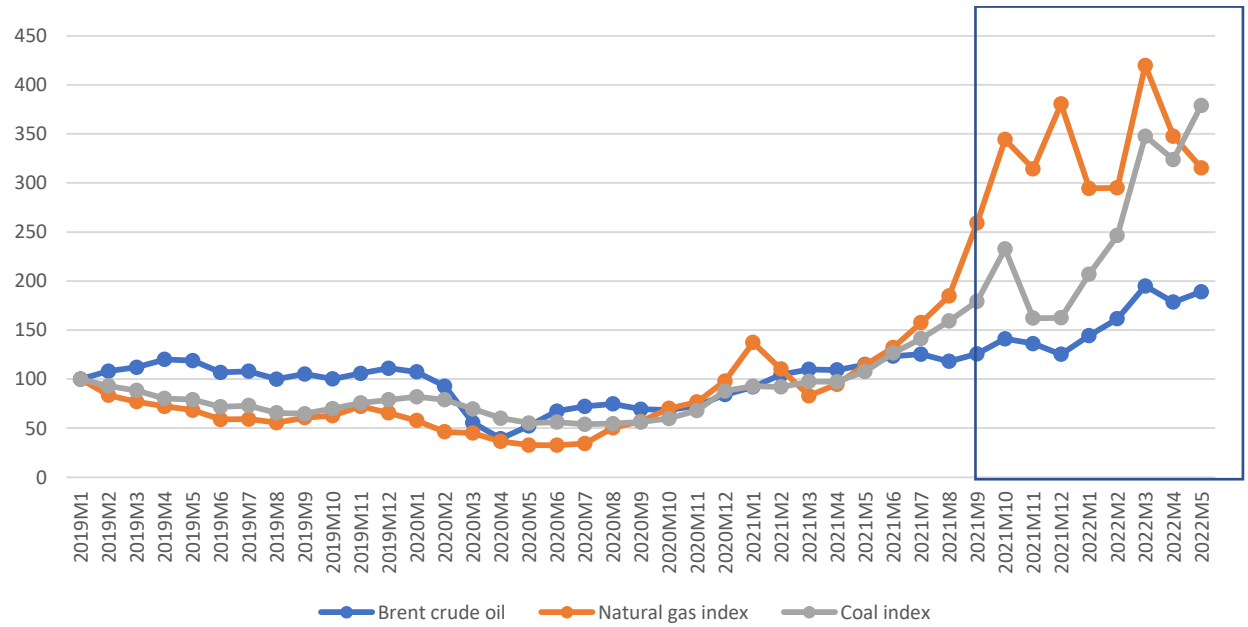
[3] ESKOM, is according to (Hofstatter, 2018) is the giant power utility that continue to drive the South African economy. Moreover, ESKOM and its mandate to provide to ensure holds the key to inclusive growth and shared prosperity in the country.

and price stability. Policy action needs to focus on mitigating the impact of these shocks while addressing longstanding structural economic obstacles to growth (IMF, 2022).

Frequent load shedding is an impediment to conducting business in South Africa. Similarly, failures in the transportation system limit the gains from the commodity price boom. Rising inflation hurts the purchasing power of low-income households and negatively affects the country's competitiveness and financing costs.

According Adhikari and Chen(2012), energy is a critical contributor to global economy, and noting that for over four decades, because of the scarcity of energy resources starting from first and second energy crisis in 1973 and 1979, respectively. In its recent global growth outlook, World Bank (2022) posit that COVID-19 caused the deepest global recession since World War II, the world economy is again in danger. This time it is facing high inflation and slow growth at the same time. Even if a global recession is averted, the pain of stagflation could persist for several years— unless major supply increases are set in motion. Amid the war in Ukraine, surging inflation, and rising interest rates, global economic growth is expected to slump in 2022. Several years of above-average inflation and below-average growth are now likely, with potentially destabilizing consequences for low- and middle-income economies. It's a phenomenon—stagflation—that the world has not seen since the 1970s (World Bank, 2022) (IMF), 2022).

Figure 1: Growth of key energy commodities - Index



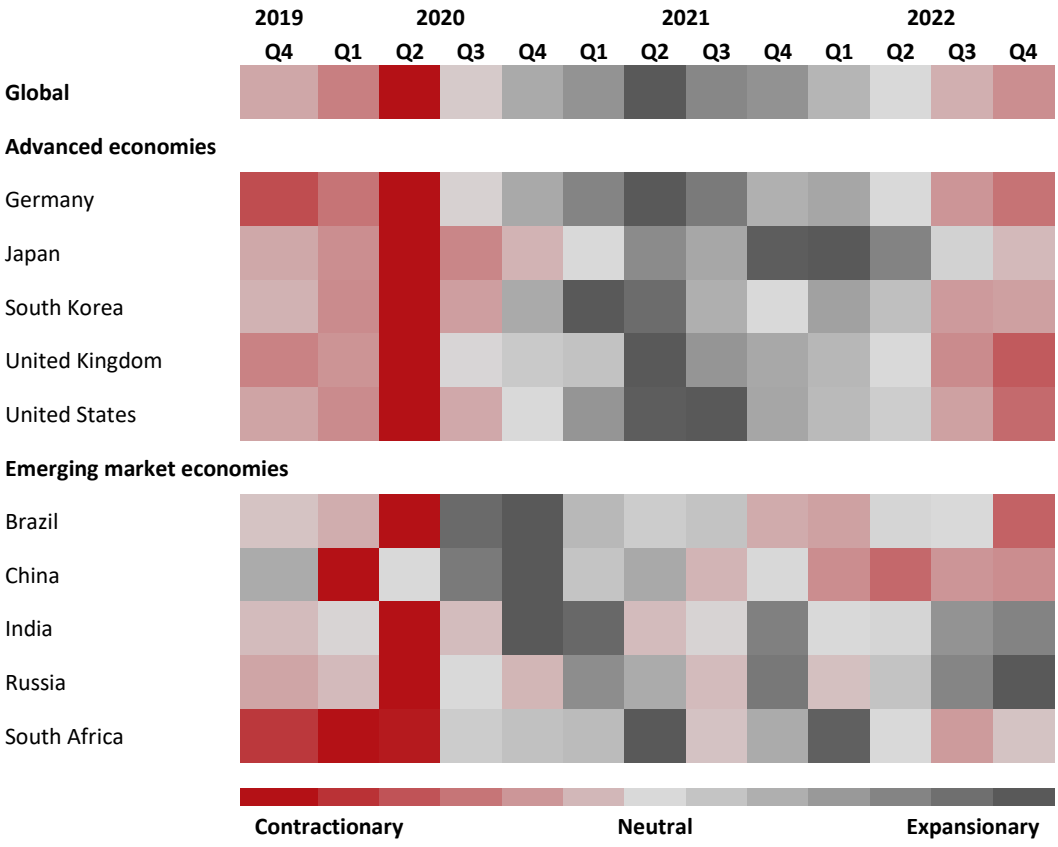
Source: World Bank(2022)

The Russian-Ukrainian impasse has led to a global economic stalemate, with the West imposing sanctions on Russia, to a grave extent to their own economic detriment. The sanctions meted against

Russia has spelt a reduction in the exports of fossil fuel, which in turn have elevated and ultimately led to higher inflation outcome and in all likelihood expectations going forward. Considered tighter financial conditions need to be in place to curtail the economic effect. Thus, it is pertinent to understand the potential sources of risk, which are a key concern for policymakers is to gauge their likely impact on the global economy Modelling the impact highlight the four particularly pertinent and plausible downside risks should materialize:

- Increasingly tight sanctions in response to the Russian invasion of Ukraine cause Russian oil exports to drop by a further 30 percent relative to the baseline, starting in the second half of 2022.
- Russian gas exports to Europe decline to zero by the end of 2022, either because European countries prohibit imports or because Russia curtails supply.
- Inflation expectations remain more persistently elevated.
- Financial conditions tighten, as a result both of policymakers' responses to higher inflation and of investors' concerns, pushing up sovereign and corporate risk and term premiums.

Table 1: Global Manufacturing Purchasing Manager's Index (PMI)[4]

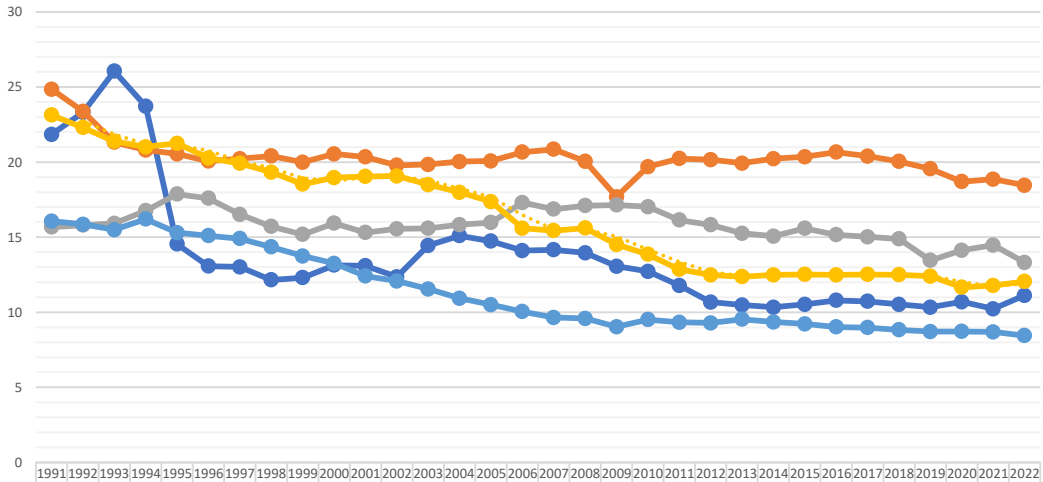


Source: National Treasury (2023)

[4] Grey indicates expansionary and red indicates contractionary manufacturing activity (National Treasury(NT), 2023).

South Africa has benefited from a strong rebound in global economic activity and elevated commodity prices. However, the external support is expected to dissipate in 2023 with the slowdown in global demand and a broad-based easing of commodity prices. Coal prices have eased significantly but remain well above pre-pandemic levels. Near-term demand for coal and iron ore is expected to decline, while easing supply constraints in the automotive industry will support medium-term demand for platinum group metals. Meanwhile, the gold price reflects its "safe-haven" status as global uncertainties persist.

Figure 2: Selected countries - Manufacturing as a percentage of GDP



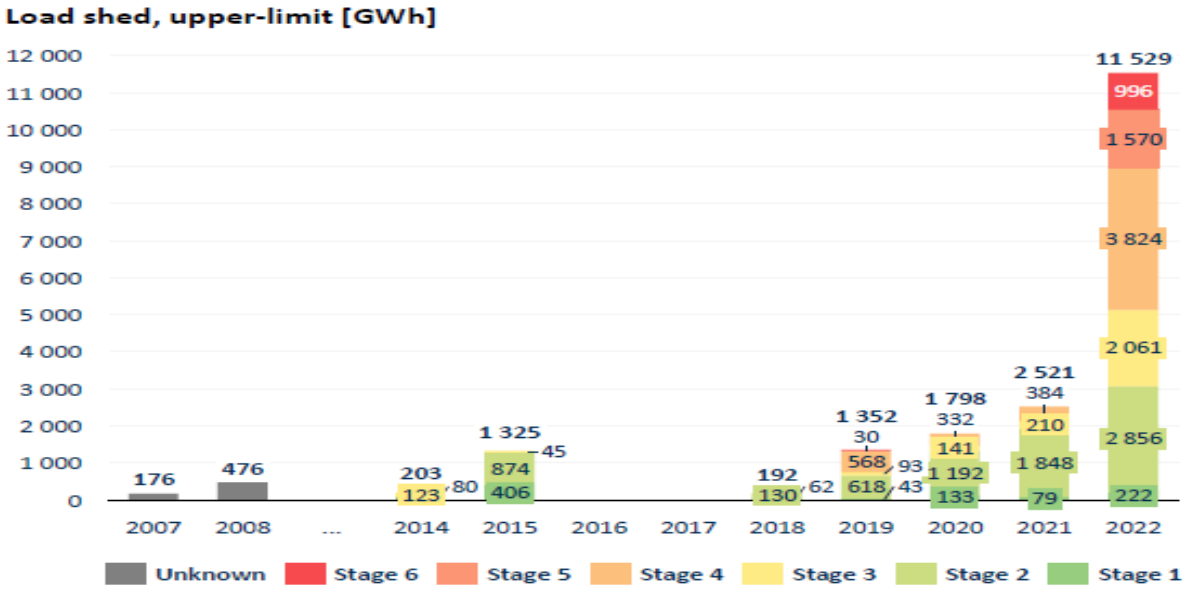
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Brazil	21.8	23.3	26	23.7	14.5	13.1	13	12.2	12.3	13.1	13.1	12.4	14.5	15.1	14.7	14.1	14.2	14	13.1	12.7	11.8	10.7	10.5	10.3	10.5	10.8	10.7	10.5	10.3	10.7	10.2	11.1
Germany	24.8	23.4	21.3	20.8	20.5	20.1	20.2	20.4	20	20.5	20.3	19.8	19.8	20	20.1	20.7	20.9	20	17.7	19.7	20.2	20.2	19.9	20.2	20.3	20.7	20.4	20	19.6	18.7	18.9	18.5
India	15.7	15.8	15.9	16.8	17.9	17.6	16.5	15.7	15.2	15.9	15.3	15.6	15.6	15.8	16	17.3	16.9	17.1	17.1	17	16.1	15.8	15.3	15.1	15.6	15.2	15	14.9	13.5	14.1	14.5	13.3
South Africa	23.1	22.3	21.4	21	21.2	20.3	19.9	19.3	18.5	19	19	19.1	18.5	18	17.4	15.6	15.4	15.6	14.5	13.9	12.9	12.5	12.4	12.5	12.5	12.5	12.5	12.5	12.4	11.7	11.8	12
United Kingdom	16.1	15.9	15.5	16.2	15.3	15.1	14.9	14.4	13.7	13.2	12.4	12.1	11.5	10.9	10.5	10	9.65	9.58	9.03	9.51	9.33	9.29	9.54	9.35	9.22	9.02	8.98	8.83	8.71	8.72	8.69	8.45

Source: World Development Indicators (WDI), 2022

Theres gradual decline in the contribution of the manufacturing sector in the selected countries of interest. Since the beginning of the millennium, India has proved itself as an economic powerhouse. The country has emerged to be one of the world's fastest growing economies, according to the CSO and the IMF (World Atlas, 2019). However, India manufacturing sector has marginally declined for the period of review (i.e. 1990-2022, from 15.7% contribution to the Indian economy to around 13.3% in 2022. Germany is Europe's largest economy and the fourth largest in the world, which is also Europe's largest industrial producer, has seen a 6.1 percentage point decline in its manufacturing sector's contribution. A similar picture is visible for the United Kingdom, which is Europe's second largest industrial producer after Germany, seeing a decline 16.1% contribution in 1990 to around 8.45% (World Atlas, 2019). In the South Africa context, StatsSA(2023) Manufacturing's contribution

to economic activity has declined over the years. The manufacturing industry accounted for 13,2% 13,2% of economic activity in 2021 StatsSA (2023).

Figure 3: Loadshedding experience over time



Source: (CSIR, 2022)

Loadshedding is detrimental to the South African economy, and could potentially thwart the developmental aspiration of the country. According to the Council of Scientific Industrial Research (CSIR), loadshedding could have potentially cost South Africa over R560 billion in 2022. The CSIR (2022), acceded to the fact that 2022 overtook 2021, as the most intensive loadshedding year yet, noting that loadshedding was four (4) times more in 2022.

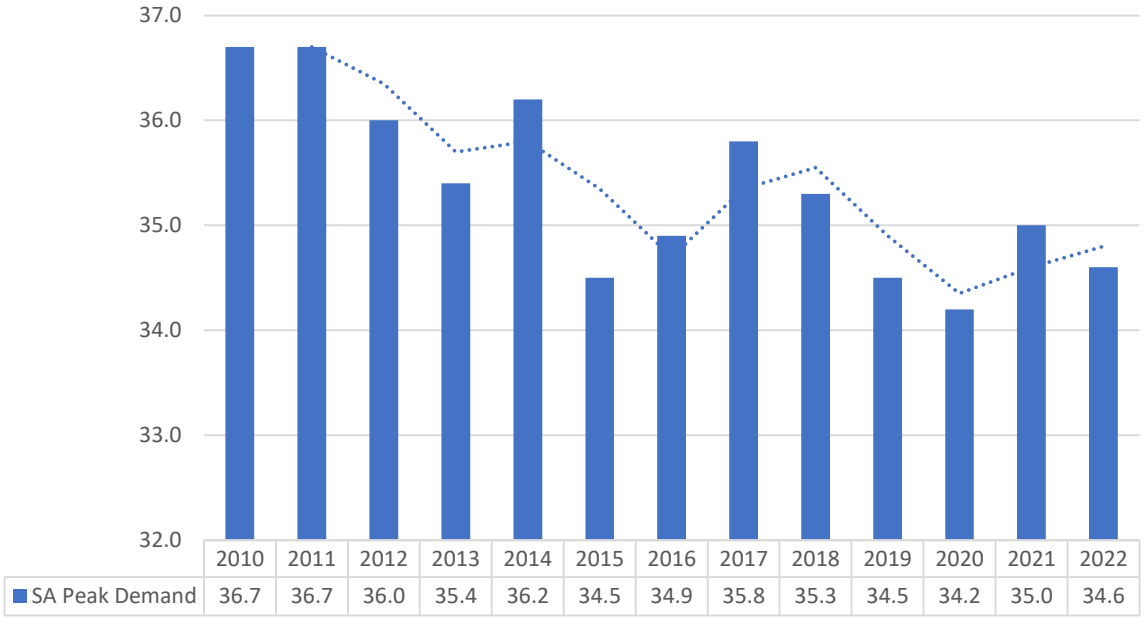
Table 2: Loadshedding - the Duration of outages and Energy Shed

Year	Duration of Outages	Energy shed	DSR
2007	-	176	Not Available
2008	-	476	Not Available
2014	121	203	Not Available
2015	852	1325	Not Available
2018	127	192	392
2019	530	1352	1362
2020	859	1798	1426
2021	1169	2521	1936
2022	3773	11529	8301

Source: (CSIR, 2022)

In 2022, South Africa experienced over 3 773 hours of loadshedding, spelling a 222.75% increase to the previous year (i.e. 2021), and a staggering 339.23%, when compared to 2020. In the actual context, loadshedding occurred for 3 773 hours with an upper limit of 11 529 GWh relative to the actual energy shed of 8 301 GWh (CSIR, 2022). Loadshedding in essence occurred for 43% of the hours, which the CSIR (2022) deems the most intensive loadshedding ever experienced.

Table 3: South Africa Peak Energy Demand - Yearly - 2010-2022



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
SA Peak Demand	36.7	36.7	36.0	35.4	36.2	34.5	34.9	35.8	35.3	34.5	34.2	35.0	34.6

Source: (CSIR, 2022)

In 2022, the South African energy peak demand declined to about 34.6 GWh. This was a marginal decline in comparison to 2021, spelling a 0.4 of a percentage point decline. Overall, the energy peak demand has been on the decline – over a ten-year period of analysis (see figure above).

Purpose

South Africa has been besieged by the question on the energy supply, and how effective the country can provide energy to its populace, without necessarily breaking the bank. Since 2007, a concept of loadshedding had been colloquially accepted as a concept to the energy supply crisis, wherein scheduled electricity shutdown or staged blackouts are implemented. These, loadshedding/blackout were precipitated by the dearth in the energy supply. As the country's electricity demand began to increase and the supply waned. This was a result in large respect to the failure to invest in new energy generation capacity, whilst also the old power station or grid began to succumb.

The envisaged study will employ econometric methods to understand the significance of energy generation to the growth of manufacturing output. A panel data approach, as well as a times series regression analysis will be considered given the literature analysis. Noteworthy, preliminary simplistic regression analysis suggests a negative relationship could exist, between growth in industrial output and energy produced.

Research questions

- Why is the growth of manufacturing sector and electricity provision irresponsive?
- Is there any long-run and/or short-run relationship between the growth of manufacturing sector and electricity provision, as well as economic growth and investment?
- If any, what is the direction of causality between manufacturing sector's growth and electricity provision, invest and the labour market?
- What are the probable causes or the binding constraints undermining the industrialisation trajectory?

Theoretical premise – where art thou manufacturing

This section explores succinctly the literature on the nexus between the manufacturing (i.e. industrialisation) and energy provision. This section inadvertently leads to the contextualisation of the arguments espoused in the research question. Which for all manner of perspective, the long-run relationship between the growth of the manufacturing sector and the provision of constant electricity – energy.

Global industrialisation – Coal-led Industrialisation

This section of the study examines the industrialisation paths in context. Noting that there are scholars of development, that contend that there is a deindustrialisation in the world, whilst there are those that reason the industrialisation has shifted another gear, and thus could still be considered to be a catalytical ingredient to the economic development in the world, more so for countries deemed to be emerging-market and developing economies (EMDEs).

Thus, this section will chiefly aim to synthesize the most notable growths cradled in the strength of the manufacturing sector, whilst also on the converse explore the economic machinations that have

led to a decline in countries where the manufacturing sector has deteriorated, and could intuitively led also to declines in the employment levels in those economies.

In their most recent contribution to the economic literature and more so in economic development and industrial policy, Chang and Andreoni (2016) places emphasis on the fact that there is shift in the industrial policy discourse and intent. Mulling over the realisation that in the last decade, the industrial policy debate has experienced an unexpected turn. After the very heated debate between the late 1970s and the mid-1980s, prompted by the success of Japanese and other East Asian industrial policy practices, the debate on industrial policy had lapsed into three decades of ideologically-motivated wilful neglect – 'industrial policy' became a phrase that one does not utter in polite company. Unexpectedly, however, industrial policy is now back in fashion, both in the academia and in the real world. (Chang A. A.-J., 2016).

Kaldor is accorded the honour of being one of the finest scholars of development, thus lauded with one of those whose earlier work attempted to understand the impact of the manufacturing sector on economic growth. Kaldor (1966) refers to what he terms Verdoorn's Law, the statistical relationship between the rate of growth of labour productivity and the rate of growth of output, as evidence of the pervasive existence in industrial economies of static and dynamic economies of scale (Destefanis, 2002). Thus, Bokosi(2022) accede that the faster growth in the manufacturing output and productivity is often associated with GDP growth. Which in turn leads to the increase in demand for manufactured goods – leading to increased levels of investments and exports in the economy (Bokosi, 2022) (Kaldor, 1966).

African and its quest to industrialise

In his seminal work on the Architects of Poverty, Mbeki (2005) quips that when in Asia and African were unshackled from the colonial rule, between the 1940s and the 1965, the political leaders were confronted with two challenges (short-to-medium and the long term). According to Mbeki, these were questions on consolidating the political rule, whilst also mulling over the need to ensure peace and stability. Moreover, having grappled with those impositions, the question that emanated were how to transform their countries from the colonial enclaves to industrial beacons. It thus acknowledged that the Asian states forged ahead with their development, and persistence to change the structure of their economies from those of the colonial rule. Whilst in the African context, the has been a sustainable development, despite pockets of excellence (Mbeki, 2005).

In an attempt to solicit for industrial development in Africa and profile energy abundance, and Sub-Saharan Africa's readiness to leverage on energy as a catalyst for industrialisation (Hatt, 2018). With the lowest power consumption per capita in the world, sub-Sahara Africa is arguably the darkest section of the global village with investments, social and economic growth and jobs creation hobbled by frequent outages, load shedding and total black outs. Over 645 million Africans lack access to electricity. Yet the continent is rich in energy resources, with well over 10 terawatts of solar potential, 350 gigawatts of hydroelectric potential, 110 gigawatts of wind potential, and an additional 15 gigawatts of geothermal potential. All of these is outside Africa's huge reserves of coal and gas, which can provide some of the continent's cheapest electricity. Surrounded by this energy wealth, most Africans still wonder why their countries are so power poor.

Andreoni, A., Creamer, K., Mazzucato, M and Steyn (2022) in an attempt to provide a green industrial perspective on how South Africa advance its megaproject, notes that the green transition is a 'wicked' problem in that it is complex, systemic, interconnected, and however very urgent. Several middle-income countries face the challenge of replacing carbon-intensive assets with cleaner energy infrastructure. Their energy systems have been built around large-scale investments in carbon-intensive coal-fired power plants. These megaprojects from the past have become increasingly unsustainable in the present— from social, economic, and environmental perspectives (Andreoni, 2022). Therefore, it goes without saying that as South Africa policy makers considers the shift from coal to more green energy provision – estimate the potential loses to the economy – with a waning industrialisation.

Table 4: Possible Growth Outcomes Give Rate of Industrialisation and Level of Capabilities

		Rate of industrialisation
	Slow	**Rapid**
Level of Capabilities		
Low	(1) No or very little growth	(2) Episodic growth
High	(3) Slow growth	(4) Rapid, sustained growth

Source: (Rodrik, 2013)

The table above depicts the analytical framework advanced by (Rodrik, 2013), to present two key forcing variables, which is the rate of industrialisation and the level of capabilities. Premised on the analytical framing of (Rodrik, 2013), the developing countries tend to fall under Cell 1. In the context

of this analysis Cell 1 represents economies that fail to stimulate the industrial employment or accumulate significant human capital and institutional capabilities.

Thus, similar to (Rodrik, 2013) postulation, the situation signifies countries with small contribution to the global economy, with a close inspection suggesting those in the developing world, and a low-income per capita as well. Also, the province is a natural resource exporter by and large[5]. As such the province, experience occasional growth spurts not necessarily because of industrialisation but because of increased demand for its commodities[6].

Context – political economy of industrialisation in an energy resource rich country (MEC)

Supporting industrial development has been a key component of the South African government approach to economic development. It has taken place alongside and has been inextricably linked to the extraction of minerals. During both World Wars, as well as the interwar years, supporting local industrial development was driven by global shortages as well as the need to have local capacity to supply much-needed products for an increasingly prosperous white middle class. Apartheid used the levers of industry to further entrench the economic power of the white population and oversaw the establishment of an Afrikaner industrial class that was more loyal to the apartheid state and the English industrial firms.

TIPS (2016) posits that the post-war apartheid state South Africa was able to draw on the mineral rents and levers of the state to embark on massively ambitious projects in the energy and chemical sector, which saw the establishment and growth of SASOL and MosGas (later PetroSA) as well as significant investment in electricity generation (mainly through coal-fired power stations).

The latter was necessary to unlock the vast mineral resources deep underground, support the energy-intensive synfuels process, and allowed significant capacity to be developed in processing minerals into steel and later aluminium. The term Minerals-Energy Complex (MEC) was used to describe the inter-relationship between the minerals sector and the energy sector that typified South African industry in the decades before democracy in 1994 (TIPS,2016).

Fine et al (2008) contends that the Apartheid South Africa's economy is founded on what they coin as the Mineral and Energy Complex (MEC). The MEC, in brief, is the management of the natural resources that are found in South Africa, which could include all the minerals, as well as the energy

[5] See table 3 in the annexure section.
[6] This is pre-financial crisis and post-financial growth rate of above 3.0%, lead in great extent by the primary sector (i.e. mining and agriculture).

generating source, both environmentally sustainable and otherwise. In their write-up on the MEC, Fine et al lament the inequality that prevails despite the country being blessed with the mineral resources and energy sources.

Furthermore, Fine et al fails short of proffering that the country – has the “Paradox of Plenty”, or simplified as the natural resource curse. This according to Wang (2012), the Paradox of Plenty conundrum, is the manifestation of the failures; of the natural resources to curtail the developmental challenges that continue to proliferate amongst the populace. That is to accrue developmental profits to the majority of the population within the specific region.

In context, this would include the failure to provide the necessary employment opportunities, the mechanisms to fight poverty and inequality. For fear of being nuanced, the South African context provides a typical topographical opportunity to assess the benefits the natural resource found in the country has contributed to the development of the majority of the citizens. Thus, to explicitly detail the political-economic benefits of being a resource-rich country, with the mineral and energy combined contribution to the national economy of around 11.3%[7].

The industrial sector is considered pivotal to the development of the modern-day economy, an industry-based as opposed to ancient agriculture-based economy. Despite some considerable successes in establishing certain critical upstream industries based on natural resource advantages. South Africa's industrial policy under the Apartheid regime was burdened with many objectives that ultimately undermined its viability in the long run - such as the building up of Afrikaner capital, job creation of Afrikaner workers, military objectives, evasion of international sanctions, and the satisfaction of the aspirations of the elite consumers to imitate the consumption patterns of the most advanced economies. However, thanks to its outstanding natural resource wealth, the country was able to sustain such "irrational" industrial policy for a considerable length of time (Chang H.-J. , March 1997).

What is evident is that the manufacturing sector (although growing) has not performed to expectation, compromising key strategic objectives of economic policy in South Africa, especially on the jobs front. With a mandatory review of the NIPF and its core underpinnings now due, and given the drastically altered economic climate, there is a need to revisit and review the NIPF as was formulated initially and IPAP as is being implemented in its current form so as to optimise their

[7] This figure is the combination of the Mining and Utilities sector of the South African economy as reported by Statistics South Africa (StatsSA) in its first quarter 2018 Gross Domestic Product (GDP) figures. Thus, according to the **StatsSA**, the mining sector constituted around 20.0% of the South African economy, whereas the utilities sector contributed around 10%.

implementation and impact on, among other objectives, ensuring inclusive industrial development in South Africa (TIPS, 2015).

Industrial Development Think Tank

"*South Africa's post-apartheid economic transformation project has not generally delivered a "better life for all" as promised at the dawn of democracy. It is not generating prosperity and economic justice for the majority of the population and suffers from long-standing weaknesses*..." (S Roberts, 2018)

- Manufacturing is a key sector of the South African economy. Over and above its direct contribution to overall economic activity (manufacturing accounted for 13.0% of the gross domestic product in 2015), the sector has strong linkages with the rest of the economy.
- The manufacturing sector is a critical supplier of intermediate and final consumption products, as well as an important source of demand for primary products (mineral and agricultural) and various services.
- Importantly, the manufacturing sector employs 1.74 million people and, through its relatively high multiplier effects, sustains a large number of indirect jobs throughout the economy.
- Furthermore, manufactured goods accounted for 60.5% of South Africa's merchandise export basket in 2015(IPAP).

The prospects for meaningful employment creation in the South African economy remain stifled by the fragile and uneven post-pandemic recovery in economic activity (SARB, 2022). As the propensity for the province to absorb new labour market entrants is waning, and thus lower participation rate is experienced. As according to the (ILO,2016), the labour force participation rate is a measure of the proportion of a country's working-age population that engages actively in the labour market, either by working or looking for work; it provides an indication of the size of the supply of labour available to engage in the production of goods and services, relative to the population at working age (ILO, 2016). Thus, in essence, the 52.0 labour participation rate infer that only five out ten persons willing and able to work, is in employment.

Methodological approach and the findings

This study, employs a panel data approach in order to understand the impact of the current energy crisis on manufacturing and its ability on the creation of employment. That is, the study investigates how responsive is the manufacturing growth to the provision of electricity per kilowatt hour. Thus, this section of the analysis aims to unpack the empirical strategy utilised – as such it first provides a conceptual theoretical framework. That us, the econometric methodology employed, as well as the justification.

Panel data models are models that combine cross-section and Time-Series Data. In panel data the same cross-sectional unit (industry, firm, country) is surveyed over time, so we have data which is *pooled* over space as well as time

- Panel data can take explicit account of individual-specific heterogeneity ("individual" here means related to the microunit)
- By combining data in two dimensions, panel data gives more data variation, less collinearity and more degrees of freedom.
- Panel data is better suited than cross-sectional data for studying the *dynamics of change*.

Econometric model for the analysis

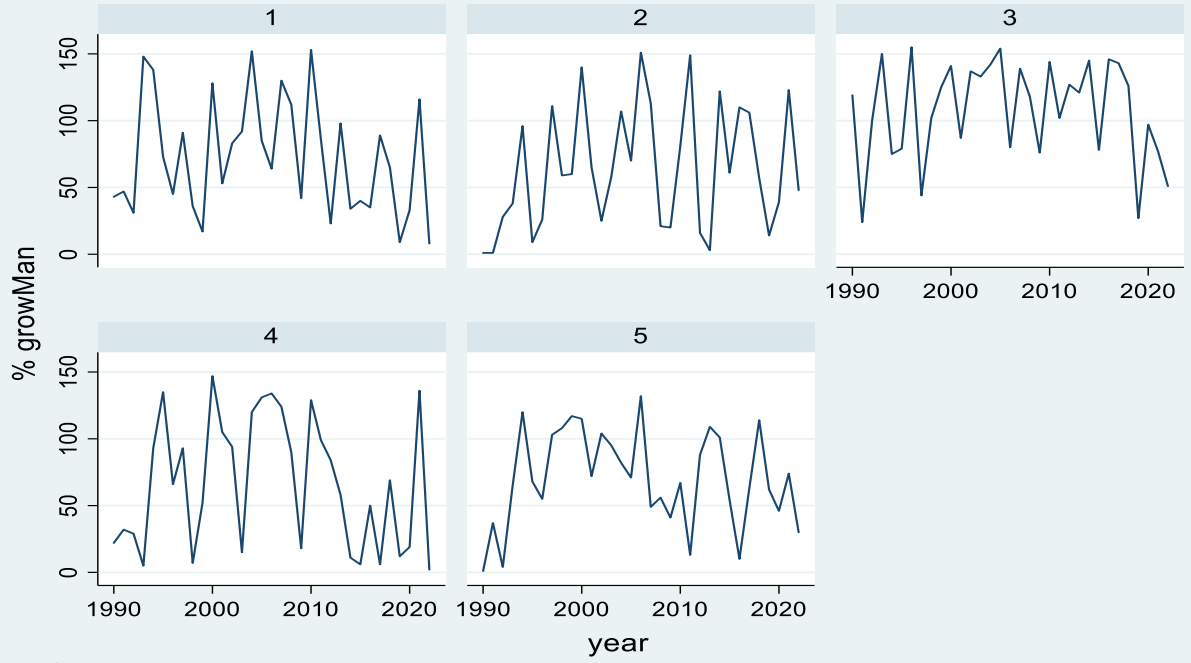
To examine the relationship between manufacturing growth, the provision of electricity, economic growth, invest, and unemployment, the analysis considers the following model. With the control variables in the analysis being invest and unemployment. Equation 1 describes the model's function:

$$Manugrowth = f\,(eleckwh_{it},\ GDPgrowth_{it},\ invest_{it},\ unempl_{it}) \ldots\ldots\ldots\ldots\ldots (1)$$

This is a basic multivariate framework is used to find the link between the variables of interest. A process of smoothing the data by transforming some of the series data into their natural logarithm, with the exception of the major component scores of energy poverty. This conversion, when compared to a basic linear approach, helps to eliminate autocorrelation and heteroscedasticity problems while also providing more accurate and reliable results. Equation 2 shows the model in log-linear form:

$$Manugrowth = \alpha + \beta_1(lneleckwh_{it}) + \beta_2(GDPgrowth_{it}) + \beta_3(lninvest_{it}) + \beta_4(lnunempl_{it}) + \varepsilon_{it} \ldots\ldots (2)$$

Figure 4: Manufacturing sector's growth - for the selected country's



Source: Author's results computation

Advanced econometric methodologies employed in this analysis are geared towards determine the long-run and dynamic causality between manufacturing growth, electricity provision, economic growth, investment, and unemployment. The methodology comprises the following steps. 1) Correlation coefficient analysis testing 2) Panel unit root test 3) Panel cointegration tests, such as the Westerlund and Pedroni as well as the Kao tests 4) Parameter estimation using the pool mean group (PMG) approach (Abu Zar Md. Shafiullaha, 2021), and the Sway estimation.

Table 5: Correlation coefficient matrix - results

Variables	invest	gdpgro~h	mangdp	eleckwh	coalre~s	Co2Emi	AltEn	Manugr~h	unempl
invest	1.0000								
gdpgrowth	0.3556	1.0000							
mangdp	0.2193	0.1509	1.0000						
eleckwh	-0.3299	-0.3810	-0.1491	1.0000					
coalrents	0.1648	0.2585	0.2608	-0.1939	1.0000				
Co2Emi	0.0870	-0.0341	-0.3338	-0.0817	-0.6747	1.0000			
AltEn	-0.1986	-0.4288	-0.1339	0.4115	-0.7504	0.5858	1.0000		
Manugrowth	0.1186	0.6506	0.1641	-0.1959	0.1090	0.0893	-0.2206	1.0000	

unempl	0.3961	0.1426	0.0581	-0.0414	0.0649	0.0740	-0.0447	0.0328	1.0000

Source: Author's own computations

The table above provide the correlation matrix as computed. The correlation coefficient analysis is – manufacturing growth and the electricity provision are key variables of the study and their relationship is paramount. A negative relationship between manufacturing growth and electricity per kilowatt hour, estimated at r=-0.1959, signalling a low and negative relationship. Manufacturing growth and economic growth has a moderate yet positive relationship, with a r=0.6506. This highlights the significance of the growth of the economy as likely conduit for the growth of the manufacturing sector.

Alternative energy has a negative relationship with the manufacturing sector, estimated at r=-0.2206, which suggests a slow uptake in the use of alternative energy source in the industrialisation path. CO2 emissions and manufacturing growth have a positive yet low correlation coefficient of 0.0893, suggesting a positive relationship. Inferentially, is could be suggested that the manufacturing has not had a detrimental impact on the environment.

Unit root test

The panel unit root test is one of the more popular tests in the economic analysis – as it provides higher power in comparison to its use in the time series analysis. In essence, the panel unit root test is to identify the order of integration of each variable. Thus, for the purpose of this report – two panel unit root tests are computed or performed, which is the Levin-Lin-Chiu (LLC) test and the Im-Pesaran-Shin (IPS). Similar to the work by Sehlapelo and Inglesi-Lotz (2022), wherein they were *Examining the determinants of electricity consumption in the nine South African provinces, using a panel data application* method. The LLC test assumes that there is a common unit root process across the cross-sections. Whilst the IPS test assumes that there is individual unit root process across the cross-section. The ultimate test for IPS, to test the null hypothesis of the unit root, whereas the alternative hypothesis of some cross section does not contain a unit root.

Table 6: Panel Unit root test results

Variables	Unit Root test	Statistic	Prob.
GDPgrowth	**IPS**	-4.3341	
		-3.4084	
		-5.5376	0.0000
	LLC	-4.7705	0.0000
		-4.6318	0.0000

Manugrowth	**IPS**	-5.4090	
		-3.8616	
		-6.8166	0.0000
	LLC	-8.0196	0.0000
		-7.7779	0.0000
Eleckwh	**IPS**	-0.9954	
		-0.9563	
		1.3825	0.9166
	LLC	-2.9142	0.0018
		-2.8265	0.0024
Invest	**IPS**	-2.0073	
		-1.8912	
		-1.2559	0.1046
	LLC	-1.1009	0.1355
		-1.0721	0.1418
Unemploy	**IPS**	-3.1684	
		-2.7159	
		-3.5878	0.0002
	LLC		

Source: Author's own computations

The outcomes for test for panel unit root have contrasting result for some variables. In that, for the manufacturing sector's growth and the growth of the economy, the null hypothesis is not rejected at the one percent (1%) level of significance. Thus, implying that the two variables are non-stationary and integrated of the order one process. Whilst the electricity power consumption (electricity per Kilowatt hour), the analysis suggests the null hypothesis is not rejected at the one (1%) significance level, using the Levin-Lin-Chiu (LLC) test. Whereas, with the unemployment variable – the report employs the IPS test, and thus we do not reject the null hypothesis and conclude that the variable is non-stationary and thus integrated of order one process, that is I(1).

Panel Cointegration test

This section of the report provides the panel cointegration tests, three panel cointegration test are explored, namely Westerlund, Pedroni and Kao tests. In context, the panel cointegration test is mainly used to understand or confirm the existence of a long-run equilibrium relationship between

two or more variables. Dipa Adhikari and Chen (2012), notes that for statistical perspective, the long-run equilibrium relationship defines the varibales move in concert over time.

Table 7: Panel Cointegration Test -Westerlund Test

	Statistic	p-value
Variance ratio	-1.8558	0.0317

Source: Author's own computations

The analysis of the Westerlund test suggest that there is an existence of a cointegration relationship for the selected panel, meaning that the variables tend to move together in the long-run. This as the panel variance ratio strongly rejects the null hypothesis of no cointegration for the panel, at a 5% significance level. Thus, it could be asserted that there is a long-run relationship between the growth of manufacturing and the provision of electricity(energy-generation). Moreover, this suggests that the other variables of interest such as economic growth could have a positive outcome for the manufacturing sector's growth.

Table 8: Panel Cointegration Test -Pedroni Test

	Statistic	p-value
Modified Phillips-Perron t	0.8902	0.1867
Phillips-Perron t	-14.7588	0.0000
Augmented Dickey-Fuller t	-10.2169	0.0000

Source: Author's own computations

Pedroni test for cointegration – similar to the Westerlund test suggest the null hypothesis can be rejected for no cointegration in the panel. This infers that there exist a long-run cointegrated relationship amongst the variables in the panel.

Table 9: Panel Cointegration Test -Kao-Test

	Statistic	p-value
Modified Dickey-Fuller t	0.7244	0.2344
Dickey-Fuller t	-1.5532	0.0602
Augmented Dickey-Fuller t	-1.0815	0.1397
Unadjusted modified Dickey-Fuller t	-16.3908	0.0000

Unadjusted Dickey-Fuller t	-11.0887	0.0000

Source: Author's own computations

The Kao Test for cointegration reveals a mixed bag of results. However, in the overall estimation the null hypothesis of no cointegration is rejected. Thus, inferentially there could exist a long-run cointegrated relationship amongst the variables in the panel.

FE Regression Analysis

The fixed-effects (FE) model controls for all time-invariant differences between the individuals, so the estimated coefficients of the fixed-effects models cannot be biased because of omitted time-invariant characteristics. Sehlapelo and Inglesi-Lotz (2022), also contend that the FE regression employed in a panel data set – is chiefly aimed at controlling for the average differences in the unobservable individual aspects associated with the observed explanatory variables for the panel data set.

Table 10: Fixed Effects Regression results (including FE Regression robust method)

Manugrowth	**Coef.**	**Std. Error**	**t**	**P>|t|**	**[95% Conf. Interval]**	
gdpgrowth	7.61422	1.115634	6.83	0.000	5.410298	9.818141
invest	-.2013108	.1260434	-1.60	0.112	-.4503081	.0476865
eleckwh	2.242059	1.038653	2.16	0.032	.1902136	4.293905
unempl	-.1085042	.0854798	-1.27	0.206	-.2773686	.0603602
_cons	66.67073	11.61134	5.74	0.000	43.73267	89.60879
Manugrowth	**Coef.**	**Std. Error**	**t**	**P>|t|**	**[95% Conf. Interval]**	
gdpgrowth	7.61422	1.922299	3.96	0.017	2.277063	12.95138
invest	-.2013108	.132386	-1.52	0.203	-.5688733	.1662517
eleckwh	2.242059	1.031046	2.17	0.095	-.6205825	5.104701
unempl	-.1085042	.0206915	-5.24	0.006	-.165953	-.0510554
_cons	66.67073	15.54758	4.29	0.013	23.50371	109.8377

Source: Author's own computation

It is well documented that electricity provision could be a catalyst to the drive for industrialisation. Thus, employing the Fixed Effect regression, it is notable that the electricity variable has a positive effect on the manufacturing sector's growth. As a one (1) percent increase in the provision of

electricity could relate to a 2.25 increase in the growth of the manufacturing sector. Also, worth pointing out that the variable is statistically significant – on the 5% levels of significance for the FE regression, and on the 10% level of significance on the FE robust regression.

GDP growth is critical to the growth of the manufacturing sector. According to the table above, the GDP growth outcome will result in the manufacturing sector growing by around 7.6%, in the event that the economic growth increases by one (1) percent. In the theoretical underpinnings, invest is expected to be a key that unlocks the growth of the manufacturing sector. However, the results depict a contradictory picture with the expectation. As the result depicts a negative relationship between manufacturing and the investments. An increase in the investment levels by one (1) percent will lead to a decline in the growth of the manufacturing sector by 0.2%

RE Regression Analysis

Random effects assume that the entity's error term is not correlated with the predictors which allows for time-invariant variables to play a role as explanatory variables. In random-effects there's a need to specify those individual characteristics that may or may not influence the predictor variables. The problem with this is that some variables may not be available therefore leading to omitted variable bias in the model. Random effect allows to generalize the inferences beyond the sample used in the model.

Table 11: RE Regression Analysis Results - including the RE Robust regression

Manugrowth	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**	
gdpgrowth	8.299777	1.013692	8.19	0.000	6.312976	10.28658
invest	.0090907	.0721519	0.13	0.900	-.1323246	.1505059
eleckwh	1.416682	.9748867	1.45	0.146	-.4940609	3.327425
unempl	-.0737683	.0836356	-0.88	0.378	-.237691	.0901545
_cons	50.02957	8.536213	5.86	0.000	33.2989	66.76024
Manugrowth	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**	
gdpgrowth	8.299777	1.426784	5.82	0.000	5.503331	11.09622
invest	.0090907	.0835148	0.11	0.913	-.1545953	.1727766
eleckwh	1.416682	.8873024	1.60	0.110	-.3223989	3.155763

unempl		-.0737683	.0401976	-1.84	0.066	-.152554	.0050175
_cons		50.02957	9.187887	5.45	0.000	32.02164	68.0375

Source: Author's own computations

Similar to the Fixed Effect (FE) regression results, the Random Effect (RE) highlight the significance of the GDP growth in relation to the growth of the manufacturing sector. That said, a one (1) percent increase in the growth of the economy would translate into an 8.2% increase in the growth of the manufacturing sector. Noteworthy, the GDP growth satisfies both the theoretical and the statistical basis. Given that the GDP growth has a positive growth relationship with the growth of the manufacturing sector, moreover, it is statistically significant at 1% levels of significance.

However, in terms of the variable of interest, that is the provision of electricity meets *a prior expectation* of having a positive effect on the growth the manufacturing sector, however, it is not statistically significant. Had the statistical significance test been passed – the electricity provision would have had a 14.2% increase in the manufacturing sector with the increase of 10% of energy provision. Of concern, is the levels of investment – given that it satisfies the *prior expectation* of positive effect on the growth of manufacturing however, a one percent increase in investment would have realised a 0.009% significantly minute given the levels of expectation. Noteworthy, the invest fails the statistical test, and thus statistically insignificant.

Table 12: Hausman Test - Results

	Coefficients			
	(b)	(B)	(b-B)	**sqrt(diag(V_b-V_B))**
	fixed	random	Difference	
gdpgrowth	7.61422	8.299777	-.6855571	.4659042
invest	-.2013108	.0090907	-.2104015	.1033491
eleckwh	2.242059	1.416682	.8253775	.3583228
unempl	-.1085042	-.0737683	-.0347359	.0176604

Source: Author's own computations

For the dynamic model specification, the Hausman test result is 6.01, with p value = 0.1982. The test statistic is $\chi 2(4)$ distributed, given that the equation has 4 regressors. This p-value is an indication not to lead to the rejection of the null of exogeneity in favour of endogeneity of the regressors. the estimated Hausman test – the analysis suggests not to reject the null hypothesis. The RE (within)

model would be preferable to the ME model, since the within estimator wipes out the individual effects through demeaning, and as such, the correlation between these effects and the error term will not bias the slope coefficients in the model. Thus, in conclusion the Random Effect regression results will be the most preferred for inferential purpose. That said, a more plausible solution is sought from the work of Sehlapelo and Inglesi-Lotz (2022), wherein they proceeded to compute the Pool Mean Group regression (Inglesi-Lotz T. S., 2022).

Pool Mean Group (PMG) Output

The Pool Mean Group (PMG) technique was utilised to examine the drivers of the manufacturing sector's growth (see the work of Inglesi-Lotz and Sehlapelo (2022)). The PMG can estimate and restrict similar long-run coefficients across the panel – by employing a panel of cross-province and of the time-series observations.

Table 13: PMG Output results

D.Manugrowth		Coef.	Std Err.	z	P>|z|	[95%	Conf.
__ec							
	eleckwh	-.0423204	1.074255	-0.04	0.969	-2.147821	2.06318
	gdpgrowth	12.72932	1.776085	7.17	0.000	9.248253	16.21038
	invest	-.0531062	.1059534	-0.50	0.616	-.260771	.1545585
	unempl	-.0979199	.0748014	-1.31	0.191	-.2445279	.0486882
Short-Run	|						
	__ec	.9652917	.0840929	11.48	0.000	.8004727	1.130111
	|						
	eleckwh						
	D1.	1.150469	2.435366	0.47	0.637	-3.622761	5.923698
	|						
	gdpgrowth						
	D1.	9.141502	.8571467	10.67	0.000	7.461525	10.82148
	|						
	invest						
	D1.	-.2074294	.2084958	-0.99	0.320	-.6160736	.2012149
	|						
	unempl						
	D1.	-.1514255	.1721268	-0.88	0.379	-.4887878	.1859368
	|						
	_cons	-52.71189	4.091474	-12.88	0.000	-60.73103	-44.69274

Source: Author's own computations

When analysing the long-run relationship of the growth of manufacturing, in the long-run economic growth is significant to the growth of the sector. As economic growth is found to be statistically significant, at a 1% (one percent) statistical level, as well as it meets *a prior expectation* that it will positively impact the industrialisation. a percentage increase in the economy could result in the manufacturing sector growing by a staggering 12.7%. In contrast, the electricity provision is not

statistically significant, and does not align to the theoretical expectation of having positive impact on the manufacturing sector.

However, analysis in the short-run relationship, the electricity provision has a positive impact on the manufacturing sector's growth, however it is not statistically significant. Had the electricity provision variable been significant, a one percent in the provision of power would have resulted in the manufacturing sector growing by 1.15%. For both the long-run and short-run relationship, invest has a negative relationship with the manufacturing sector's growth, thus suggesting not sufficient investment has been directed to the sector. As such, the question that beckon, is whether sufficient investment has been able to be sourced towards the industrialisation path or a question of crowding out invest looms.

Table 14: PMG Output results - Dynamic Fixed Effects

			Coef.	Std Err.	z	P>|z|	[95% Conf. Interval]	
__ec								
	eleckwh		.6012192	1.109126	0.54	0.588	-1.572628	2.775066
	gdpgrowth		10.65487	1.835624	5.80	0.000	7.057117	14.25263
	invest		-.1349887	.1310579	-1.03	0.303	-.3918575	.1218801
	unempl		-.0769294	.094155	-0.82	0.414	-.2614698	.107611
SR	|							
	__ec		1.04233	.0834105	12.50	0.000	.8788479	1.205811
	|							
	eleckwh							
	D1.		1.429496	2.423266	0.59	0.555	-3.320017	6.179009
	|							
	gdpgrowth							
	D1.		7.768384	1.165097	6.67	0.000	5.484836	10.05193
	|							
	invest							
	D1.		-.1679904	.2495483	-0.67	0.501	-.6570962	.3211153
	|							
	unempl							
	D1.		-.0670638	.100822	-0.67	0.506	-.2646712	.1305436
	|							
	_cons		-64.83779	13.53058	-4.79	0.000	-91.35723	-38.31835

Source: Author's own computations

Employing the Dynamic Fixed Effect (DFE) on the PMG model provides us with robust results. That sees the electricity provision noting a positive effect for both the short-run and the long-run relationship. The biggest "but" is that it is not statistically significant on both accounts. Had the

electricity been statistically significant, in the short run, a one percent increase in the power supply would have resulted in the manufacturing sector's growth increasing 1.4%, and 0.6% in the long-run.

Economic growth is considerably the conduit for industrialisation – in the short-run the economic growth led to the manufacturing sector growing by 7.7%, with a one (1) percent increase in GDP growth. Unemployment rate and investment have negative relationship with the manufacturing sector, as for both the long-run and short-run the two variables lead to negative declines in the performance of the sector. Worth also noting that the two variables are statistically insignificant. In terms of unemployment rate, the inference that could be draw is that the decline in the number of the unemployed could have a positive bearing on the outcomes of the manufacturing sector.

Swamy

Give the previous result from the other panel econometric modelling techniques, a thorough more nuanced analysis of the cross-section(group) was seemingly necessary. More so, the analysis will be related to the specific coefficient of the variable of interest, in this instance the electricity per kilowatt hour (i.e. eleckwh).

Table 15: Sway Cross-section (Group specific) Modelling results

		Group-specific					
		Coef.	Std.Err.		P>|z|	[95% Conf. Interval]	
Brazil							
gdpgrowth	|	11.01563	2.093772	5.26	0.000	6.911907	15.11934
eleckwh	|	1.25	1.111297	1.12	0.261	-.9281028	3.428103
unempl	|	-.1074219	.1047147	-1.03	0.305	-.312659	.0978153
invest	|	-.015625	.1535092	-0.10	0.919	-.3164975	.2852475
_cons	|	50	13.14502	3.80	0.000	24.23623	75.76377
Germany							
gdpgrowth	|	10.5	2.806441	3.74	0.000	4.999476	16.00052
eleckwh	|	-2.5	1.921663	-1.30	0.193	-6.266391	1.266391
unempl	|	0	.1352688	0.00	1.000	-.2651221	.2651221
invest	|	-.75	.4368702	-1.72	0.086	-1.60625	.1062499
_cons	|	144	48.73517	2.95	0.003	48.48082	239.5192
India							

gdpgrowth	|	11.125	4.603914	2.42	0.016	2.101494	20.14851
eleckwh	|	1	2.237985	0.45	0.655	-3.38637	5.38637
unempl	|	-.125	.1553728	-0.80	0.421	-.4295252	.1795252
invest	|	.25	.4254191	0.59	0.557	-.5838062	1.083806
_cons	|	32	69.58129	0.46	0.646	-104.3768	168.3768

South Africa							
gdpgrowth	|	10.8125	2.624886	4.12	0.000	5.667818	15.95718
eleckwh	|	2.34375	1.216602	1.93	0.054	-.0407453	4.728245
unempl	|	-.109375	.1322236	-0.83	0.408	-.3685284	.1497784
invest	|	-.078125	.1391282	-0.56	0.574	-.3508113	.1945613
_cons	|	40	13.32741	3.00	0.003	13.87876	66.12124

United Kingdom							
gdpgrowth	|	5.125	2.01914	2.54	0.011	1.167559	9.082441
eleckwh	|	2.4375	1.147774	2.12	0.034	.1879039	4.687096
unempl	|	-.1875	.1141041	-1.64	0.100	-.4111399	.0361399
invest	|	-.34375	.1818291	-1.89	0.059	-.7001284	.0126284
_cons	|	84	16.59708	5.06	0.000	51.47032	116.5297

Source: Author's own computations

In a significant number of countries, the economic growth is crucial for the growth the manufacturing sector. In essence, for all five countries of interest, the economic growth does not only satisfy the a priori theoretical expectations, it is also statistically significant on all. Interestingly, of the five, three countries meet the 1% (i.e. one percent) significance level criterion, that is Brazil, Germany and South Africa. Whereas, India and the United Kingdom satisfy the statistical significance level at 5%. This is indicative of the significance of the growth of the economy – in propelling the growth of the manufacturing sector.

On the variable of interest, which is the electricity provision, three of the countries (i.e. Brazil, Germany and India) do not meet the statistical significance test, and as such deemed insignificant. However, despite not meeting the statistical significance criterion, Brazil and India have met the theoretical expectation – on an increase(positive) in the level of the manufacturing sector in the event of an increase in the electricity provision. The results are startling in the case of Germany, given its significance as a manufacturing hub, inferentially suggesting that the provision of electricity could potentially negative relationship with the manufacturing sector.

Zalk (2014) states that the role of manufacturing in South Africa's economic development process should not be ignored, in fact suggest that ignore this at own peril. That said, the results indicates

that indeed economic growth for the country has a significance positive relationship with the manufacturing sector, which is also statistically significant. As such, a one (1) percent growth in South Africa's economic growth, could potentially translate to a ten percent increase in the manufacturing sector. In terms of the variable of interest, electricity provision – positive and statistically significant relationship is apparent. Meaning, a two (2) increase in the provision of electricity could potential spawn a four (4) percent increase in the manufacturing sector. Conversely, the impact of loadshedding could potentially have a detrimental effect on the growth of the manufacturing sector. As per estimate, a one (1) percent decline in the provision of electricity in South Africa could lead to a 2.3 percent decline in the manufacturing sector's efficacy. Worth noting, invest does not meet the statistical significance test, as well as fails the *a priori* theoretical expectation. Thus, this phenomenon requires further careful analysis.

Conclusion and key policy takeaways

There's general consensus that industrial policy is chiefly aimed at realising structural change, in that is aims to develops strategic industries and creates this inclusive economy. Industrial development is essential to self-sustaining development of any economy and there is wide agreement among policymakers on the importance of industrial development as the common factor in which all the advanced economies have been built on. Industrial policy is therefore, according to Gumede, the set of instruments and interventions aimed at industrial development (TIPS,2016). That said, energy supply becomes a necessary conduit in the attainment of the industrial policy, and by extension the structural transformation.

It has been empirically established that electricity serves an important role in both the production and consumption of goods and services within an economy. The availability of electricity has been a major contributor to the technological and scientific advancements that have improved the standard of living across countries (Abdulkadir Abdulrashid Rafndadi, 2022). With population growth, urbanization, and industrialization of economies, the infrastructure for electricity has emerged as an important factor in a country's growth prospects (Payne, 2011). Thus, in the South Africa economy case, ensure the thwarting of the prevailing developmental challenges.

In context, this analysis sought to understand the whether the manufacturing sector's growth would be responsive to the throttling of the energy supply, and moreover, whether the sector could grow further. Zalk (2014) states that the role of manufacturing in South Africa's economic development process should not be ignored, in fact suggest that ignore this at own peril. That said, the results indicates that indeed economic growth for the country has a significance positive relationship with

the manufacturing sector, which is also statistically significant. As such, a one (1) percent growth in South Africa's economic growth, could potentially translate to a ten percent increase in the manufacturing sector. In terms of the variable of interest, electricity provision – positive and statistically significant relationship is apparent. Meaning, a two (2) increase in the provision of electricity could potential spawn a four (4) percent increase in the manufacturing sector. Conversely, the impact of loadshedding could potentially have a detrimental effect on the growth of the manufacturing sector. As per estimate, a one (1) percent decline in the provision of electricity in South Africa could lead to a 2.3 percent decline in the manufacturing sector's efficacy. Worth noting, invest does not meet the statistical significance test, as well as fails the a priori theoretical expectation. Thus, this phenomenon requires further careful analysis.

Moahludi (2021) notes that for development to occur, political decisions will have to be taken to ensure the industrialisation. Thus, the poser for this democratic administration is reindustrialise, industrialise, or continue with deindustrialisation. Through the initiatives by the Department of Trade, Industry and Competition(theDtic), the South African government has been on a drive to reindustrialise the country. however, the current energy crisis that has bedevilled the country has inadvertently halted the progress to industrialise, and ensure the thwarting of the triple challenges.

South Africa has been besieged by the question on the energy supply, and how effective the country can provide energy to its populace, without necessarily breaking the bank. Since 2007, a concept of loadshedding had been colloquially accepted as a concept to the energy supply crisis, wherein scheduled electricity shutdown or staged blackouts are implemented. These, loadshedding/blackout were precipitated by the dearth in the energy supply. As the country's electricity demand began to increase and the supply waned. This was a result in large respect to the failure to invest in new energy generation capacity, whilst also the old power station or grid began to succumb.

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