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EXPLORING THE MODERATING ROLE OF GLOBALISATION ON THE RELATIONSHIP BETWEEN INDUSTRIALISATION AND ECONOMIC DEVELOPMENT IN SOUTH AFRICA

Abstract:

Industrialisation and globalisation are two critical factors that have shaped the economic development of many countries around the world. South Africa has been no exception, as the country has witnessed significant changes in its economy, particularly since the move to a more liberal and democratic orientation. While integration has afforded the country many benefits in this regard, so too have concerns been raised on the causal effects of re-primarisation, rising inequality and even the onset of premature deindustrialisation. The main aim of this study was therefore to explore the moderating role of globalisation on the relationship between industrialisation and economic development in the country. It made use of a quantitative research approach using secondary time-series data from 1980 to 2021. The analysis included the use of the combined cointegration test of Bayer and Hanck, and three different estimation techniques, namely the fully modified ordinary least squares, dynamic ordinary least squares and canonical cointegrating regressions. Moreover, it employed the Toda-Yamamoto Granger causality test to determine the causal links between the variables. The results of the study show that industrialisation has had a significant positive effect on the country's development process. However, it seems that globalisation moderates this relationship, with a negative interaction effect. This suggests that the positive effect of industrialisation on economic development is deterred by the way the country has integrated into the global economy, pointing to adverse consequences concerning its peripheral GVC participation, lack of economic diversification and formation of trade relationships. Based on this, it is recommended that policymakers prioritise the development of IWOSS industries, facilitate broader and deeper regional partnership formation as well as improve the diversification of its export base with adequate support directed towards developing the private sector.

Keywords:

Globalisation, Industrialisation, Economic development, South Africa

JEL Classification: F15, F63, O14

1. Introduction

For the past 40 years, the world has experienced an unprecedented movement towards an integrated global society (Balsa-Barreiro *et al.,* 2020). The influence of globalisation in this respect on modern social and economic life has been pervasive (Shopina *et al.,* 2017). It has evolved from simplistic understandings, involving processes such as trade and financial integration to acknowledging the influence of technological penetration, the movement of people as well as the loss of state sovereignty (Petricevic & Teece, 2019). Given this multidimensional nature, the impact of the process has received notable consideration from various disciplines. For development scholars in particular, the idea of a more interconnected world has been intriguing (Nohlen, 1980; Moyo, 2020). On the one hand, globalisation on the basis of its economic, social and political dimensions has been viewed as a catalyst, driving greater competition and market access, multicultural fluency, technological innovation and the formation of beneficial and multilateral relationships (Ebere *et al.,* 2022). Proponents in this respect believe that countries, which are still transitioning, are afforded noteworthy opportunities towards facilitating higher standards of living on the basis of taking advantage of associated knowledge transfers, and comparative advantages. However, on the other hand, sceptics have raised the potentially deleterious effects of an integrated world (Hartmann *et al.,* 2020). This line of thought has cited the creation of core-peripheral relationships, consistent raises in the inequality of resource distribution, more susceptible global networks, as well as the skills-biased nature of the globalisation process (Lauder & Mayhew, 2020).

Within these debates, the influence that the process has had in particular on the industrialisation process within development discourse similarly has been contentious (Rodrik, 2021). This comes on the back of the key role it has played for the last 40 years towards facilitating more enabling socio-economic conditions. The ability of manufacturing sectors from these perspectives, through facilitating activity across different value chains and inducing capacities for learning and new methods of production, has been central to the body of knowledge towards achieving higher levels of economic development (Kaldor, 1967; Blakeslee *et al.,* 2018). Notwithstanding the importance of these contributions, the influence of a more integrated world has arguably started to challenge this conventional thinking. Lopez and te Velde (2021) reiterate that as the world has become more global, manufacturing sectors' performance has notably declined, with various countries considered to enter what has come to be known as premature deindustrialisation. No more so has this been evident than on the African continent (Wako, 2021). The emergence of concentrated supply chain networks, rapid and intrusive technological processes, as well as debilitating import penetration have all affected the prominence of these sectors to act as meaningful engines of change (Adreoni & Tregenna, 2020). The more recent Covid-19 pandemic and the onset of political tension between Russia and Ukraine too have amplified this notion, showcasing the severe, yet unintended consequences that a more fragmented and volatile interconnected system has brought with it (Guénette *et al.,* 2022).

Considering these dynamics, evidence surrounding the influence of globalisation within the industrial growth and economic development nexus has been scant (Duma, 2023), even more so when one considers the South African case. Much like in other African countries, the prominence of industrial activity has faded over the course of the last three decades (Bowden, 2021). Though considering its unique integration process and idiosyncratic and controversial past, it has made the understanding of these interrelationships significantly intricate (Habiyaremye *et al.,* 2022). Recent literature has emerged that has attempted to understand the impact of one process on the other (Andreoni *et al.,* 2021; de Jongh, 2022). However, while these studies have given meaningful insight, their contributions have been either limited to theoretical contributions or focusing solely on the conventional economic aspects of

globalisation (Bell *et al.,* 2021). More so, these studies have been limited in their acknowledgement of the possible interactive effects that multidimensional integration has had in augmenting the economic development and industrial growth nexus. This has important implications. Considering that the body of knowledge has started to assist in understanding the impact of integration on industrialisation, it has limited support in understanding whether these effects are transmitted into actual progress at development levels. Based on these limitations, pertinent questions remain largely unanswered. This pertains mainly to whether South Africa's integration to global economic, social and political networks has either mitigated or amplified the impact of its industrial process to wider qualitative improvements in its socio-economic landscape. In fact, it is an area of interest in which the empirical evidence, in general, has been limited. On this basis, the study has the primary objective to explore the moderating role of globalisation within the industrial growth-economic development nexus within South Africa.

2.   Literature review

The literature on the relationship between industrial growth and economic development finds itself embedded in a number of scholarly works. Theorists such as Kaldor (1967) and Lewis (1954) have placed the augmenting ability of manufacturing sectors at the centre of economies' structural transformation. According to these views, manufacturing activities hold unique attributes when compared to other sectors. This, according to Mujeri and Mujeri (2021), primarily pertains to both having both notable forward and backward linkages with various economic processes. So too have these economic activities been hailed to embody notable spill-over effects, relating to the adoption of new technologies and the subsequent increase in productivity levels (Blakeslee *et al.,* 2018). Within this context, industrialisation as a process has become best understood as a protracted cumulative change in finding more efficient ways to add value (Sibanda, 2020). Hallward-Driemeier and Nayyar (2017) refer to it as the ability of economies to undergo meaningful quantitative leaps from agrarian-based activities to more advanced secondary and commercialised motions. In this respect, its relation to economic development has been somewhat ambiguous. While moving from one economic stage to the next, as Lewis (1954) and Rostow (1959) would suggest seems to portray a somewhat simplistic view, the complexity surrounding this nexus has been embodied by distinguishing between its contribution to economic growth and alternatively to economic development itself. These two concepts for many scholars have been significantly intertwined, so much so that they have often mistakenly been synonymised (Ivković & Strossmayer, 2016).

In this sense, scholars have largely focused on economic advancement on the basis of purely quantitative progress (Solow, 1957; Vinnychuk *et al.,* 2014). To "develop" in this respect would entail the maximisation of output through ensuring more productive combinations of inputs such as capital and labour. These ideas find relevance in the notion that increasing the size of the economy would ensure greater access to additional goods and services for the general population (Aghion & Bolton, 1997). Ultimately, the creation of wealth was assumed to trickle down to various areas of society, leading to a general increase in living standards. These views though have faded over the course of especially the last two decades (Dynan & Sheiner, 2018). As economic processes have become more complex, the occurrences where noticeable growth has coincided with sub-par living standards (high poverty and unemployment rates) have steadily increased, and the focus of what constitutes true economic development has significantly been augmented (de Jongh, 2023). Modern understandings in this respect have encompassed a more holistic framework (Hryhoruk *et al.,* 2020). As opposed to focusing solely on increasing the quantitative output, the focus has been shifted to include aspects surrounding the improvement in human capabilities, general living conditions,

attainment of education as well as providing an inclusive system characterised by a more equal distribution of resources (Todaro & Smith, 2020).

On the basis of these understandings, the theoretical underpinnings relating to the nexus between industrialisation and economic development have been encapsulated by an inverted U-shape relationship, particularly between manufacturing activity and income levels (Rowthorn & Ramaswamy, 1997). These suppositions are grounded on the fact that, as low-income economies start their transition, manufacturing plays a predominant role in the well-being of their societies. However, as they take advantage of greater specialisation of labour, and transform to predominant tertiary sector systems, economic structures begin to embody not only higher levels of income, but so too, enhanced diversity in production, upskilling and learning as well as notable levels of investment and saving (Cruz, 2015). Consequently, the once predominant agrarian-based economic structures become more diversified, embodying not only higher levels of economic growth but also more enhanced qualitative dimensions within their socio-economic landscapes (Oduola *et al.,* 2022). Following this, economies are set to deindustrialise as higher levels of economic development are attained (Joseph *et al.,* 2021).

Considering this relationship, the influence of globalisation within these dynamics has received noticeable consideration (Chen *et al.,* 2015; Rodrik, 2021). On the one hand, the advent of the adoption of neoliberal and democratic frameworks in much of the world has driven the idea that the process of development through industrialisation should be uniform (Simandan, 2020). That is, given that most developed countries have followed this process of advancement, the beliefs at least from most modernisation and convergence scholars are that the developing world should follow suit. In fact, literature from integration advocates suggests that globalisation offers the ability to accelerate the industrialisation process (Felipe *et al.*, 2019). By increasing a country's economic, social and political ties with the rest of the world, beliefs are directed towards the enlarged advantages that the international exchange of goods and services, technological uptake, migration and membership to international governmental organisations afford the developing world (Aiginger & Handler, 2018). This has been captured by the Stolper-Samuelson theorem, which posits that, as developed countries seek to take advantage of an international division of labour, developing countries have benefitted from their comparative advantage of low-cost labour (Haile *et al.*, 2013). From this perspective, these nations benefit from an increased injection of more mobile capital flows, knowledge spillovers as well as international aid, driving the performance of their manufacturing sectors, consequently increasing their employment levels and general standard of living (Erixon, 2018).

Contrastingly, sceptics, mainly based on the suppositions of world systems and dependency theorists, have argued otherwise (Hartmann *et al.,* 2020). A more integrated global system, from their perspective, has embodied detrimental core-peripheral structures. According to Joseph *et al.* (2021), these structures have impeded the ability of the developing world to adequately transition. Arguments from this perspective highlight that the liberalisation of trade, integration of financial markets and even the loss of skill levels through mass migration, have exposed their underdeveloped markets to significant global shocks (Desai & Rudra, 2019). Likewise, so too have the adoption of specific blanket policies advocated by supranational organisations, largely to the benefit of the Western world, been detrimental to local economic conditions, all of which have acted as barriers to deter the industrial development of these countries. Within this context, these scholars have argued, in fact, that the influence of globalisation has brought about a premature deindustrialisation phase (Andreaoni & Tregenna, 2021). Rheka and Suresh Babu (2022) explain that, compared to the industrial path that most developed countries have undertaken, this decline in manufacturing share to GDP occurs at much lower levels of income. As a result, countries fail to obtain the benefits

associated with the advancement of their industrial sectors, and therefore the inability to adequately undergo sustained levels of economic development.

Relative to these theoretical debates, the South African case seems to present a relatively more complex situation. In contrast to other developing countries, such as the East Asian success stories (including Singapore, Malaysia, South Korea), understanding the influence of a more interconnected world, from social, political, and economic spheres within the industrial growth and economic development nexus, has been somewhat difficult (Deliotte, 2013; de Jongh, 2022). This emanates mostly from the country's unique integration path it initially undertook. Prior to the 1990s, South Africa's ties with the rest of the world were limited (Levy, 1999). The adoption of its racial segregation policies had the consequence of economic sanctions and political isolation from the rest of the globe. Partly, as a result, the country's socio-economic climate up until that point was characterised by a notable concentration of wealth, significant dependence on its natural resources, a lack of economic diversification and modest levels of productivity and investment. (Joffe *et al.,* 1994; Zalk, 2014). With the end of the apartheid regime, though, and a somewhat unique internal adoption of the neoliberal framework that has closely accompanied modern globalisation impulses, both in its political structures and economic policies, much optimism was afforded towards the economic development trajectory of the country (Habanabikize & Mncayi, 2022).

In line with this optimism was the belief that the transition would enable the many benefits that manufacturing sectors have to offer, particularly relating to eradicating widespread levels of poverty, unemployment, and inequality (Fotoyi *et al.,* 2016). Initially, these beliefs were realised. The adoption of Washington Consensus-type reforms within the country's industrial policy landscape entailed the liberalisation of trade and financial markets, the proliferation of technological applications and the formation of new political partnerships, all of which seemed to pay dividends (Green, 2009); at least for the first decade after 1994. During this period, the industrial performance on the basis of manufacturing exports increased by an average growth rate of 6.6 percent per year, a considerable increase from the 2.7 percent for the two decades prior (Manuel, 2007). Likewise, so too did MVA on average increase by 3.1 (up from 1.98 percent) percent (World Bank, 2023). Consequently, this was also considered a strong period for development outcomes. GDP growth averaged 3.46 percent, while unemployment rates dropped from 26 percent to almost below 20 percent (IMF, 2023). Other aspects specifically relating to education levels such as mean years of schooling (from 7.9 to 8.89 years) and expected years of schooling (12.8 to 13.26 years) also experienced substantial improvements (UN, 2023). Despite the signs of meaningful structural transformation taking place, the performance of the manufacturing sector as the engine of change, unfortunately, has faded (Avenyo *et al.,* 2021). Trends suggest a noteworthy decline in the relevance to total economic output especially since the onset of the global financial crisis. Since then, manufacturing MVA as a percentage of GDP has declined from highs of 15.61 percent to 11.79 percent (World Bank, 2023). More concerning has been the decline in the contribution to total employment, declining from the 15 percent threshold, to below eight percent (Stats SA, 2021).

Taking these trends into consideration, it would suggest that the country is moving away from these secondary activities towards a more service-based economy. However, when considering the inverse U-shape relationship with income levels, this decline has occurred at much lower levels than in countries that have successfully industrialised (Bowden, 2021). Rodrik (2016), in this regard, reports the peak of the manufacturing sector's contribution at $5 432 GDP per capita in 2007. When compared to the income levels of other developed nations (US = $14 765; Italy = $18 034; Spain = $13 360), it does point to the fact that the country is undergoing premature deindustrialisation. Even when the performance of the sector itself over the last three decades (1.26% average annual growth of MVA) has been compared to other similar developing countries such as Angola (5.22%), Kenya (2.66%), Egypt (2.85%)

and Argentina (2.07%) (IMF, 2023), it does highlight the challenge the country currently finds itself in. Globalisation, within this context, although initially thought to provide the needed springboard to higher standards of living, seems to have, in some respect, acted as a barrier towards sufficiently utilising the industrialisation process to drive higher economic development levels (Barnes, 2019). Evidence in this regard, although limited, has pointed to various economic, social and political considerations that have contributed to this. From an economic perspective, South Africa, based on its resource dependence, lack of diversification, and lower levels of productivity, has failed to penetrate an ever-concentrating manufacturing network as prominent global value chains have emerged (Engel *et al.,* 2016). Where it has managed to do so, GVC participation has been characterised by low value-added participation (Banga & Balchin, 2019). The country has also been unable to compete internationally and keep pace with rapid technological innovations that have deterred much-needed foreign investment (Adreoni & Tregenna, 2020). Even from a political perspective, it holds a peripheral position to much of its international ties, which has not been very beneficial towards the qualitative improvement of the country's socioeconomic position (Van Aswegen *et al.,* 2021).

While these factors seem to have contributed to the underlining performance, evidence relating to the impact of globalisation within this nexus has been both limited and miscellaneous. For example, from the perspective of the developed world, various studies have largely focused on the relationships between at least two of these processes. Here, Sabi (2007), using a cross-sectional OLS regression, found a positive relationship between globalisation and high-income countries' development trajectory, but not for low-income countries. Aderemi *et al.* (2020), by means of a panel ARDL, also support this finding. By investigating these interrelationships for a group of European countries from 1990 to 2018, the study highlights the importance of both attracting FDI and the formation of beneficial trade partnerships. While evidence in this regard mainly points to positive relationships, results for the developing world have rather been mixed. For example, much like the results reported for the developed world, Olagunju *et al.* (2019), through the use of a system GMM panel model from 1970 to 2015 for 110 developing countries, showed just how political aid and technological and social globalisation positively impact human welfare. However, importantly, it did show that economic globalisation can negatively impact development landscapes based on skills-biased technological change (SBTC) through the capital-labour substitution effects.

From an African perspective, studies, much like the aforementioned, have shown somewhat contradictory findings. Here, Asongu and Nwachukwa (2017) provide interesting findings through the use of fixed effects and Tobit regressions. Their focus on 51 African countries, over the period from 1996 to 2011, revealed that globalisation had a positive impact on human development (proxied for general economic development). These influences seemed to have a higher impact on those countries that were non-landlocked and showed significant levels of political stability. In contrast, by using FDI as a proxy for globalisation, Wanger and Aras (2021), in their analysis of the impact of these economic integration effects on economic growth, revealed notable negative long-run effects. Focusing on the 83 West African states and using both FMOLS and DOLS estimation techniques, the study highlighted the significant crowding-out effects MNCs can induce on local economic conditions based on a lack of competitiveness. Studies that have focused on the impact of globalisation on aspects of development, however, have come to fruition, and the evidence on the process' impact on industrialisation has been much more contentious (Kriaa *et al.,* 2017). In fact, when considering the possible moderating role of the process within the development and industrial growth nexus, the literature has been significantly limited (Oduola *et al.,* 2022). Some studies, in this respect, have focused on the direct effect of economic integration either through proxies or using indices, on the industrialisation process, showcasing both its positive and negative effects within the African context (Oduola *et al.,* 2022; de Jongh, 2022).

3.   Research methodology

3.1   Data description and variable identification

The main objective of the study was to determine the mediating role of globalisation between industrial growth and the levels of economic development landscape within South Africa. The study made use of a quantitative research design and adopted a functional research philosophy. The analysis was carried out using secondary annual time series data ranging from 1980 to 2021, providing a total of 42 observations. This time period was selected based primarily on the availability of the data, but likewise affording insight into this nexus within a timeframe where the country started its initial integration process after the end of the apartheid regime. Data was collected from the World Bank's world development indicators (WDI) database, KOF Swiss Economic Institute, United Nations (UN) Human Development Index (HDI) database, the South African Reserve Bank (SARB) as well as the World Inequality Database (WID). In fulfilling the study's main objective, the following variables were included, as shown in Table 1 below.

Table 1: Variable description and data sources

Variable	Description	Database
Economic development index (EDEVI)	Geometrically aggregated index based on levels of education, health, inequality, income, employment. Values range from 0 to 100 with higher scores indicating higher levels of economic development.	Authors construction with data from UN (2023), World Bank (2023), WID (2023),
Industrial development (IND)	Manufacturing value added (as % of GDP).	SARB (2023)
Globalisation index (GBI)	Composite index based on levels of economic, political, and social globalisation). Values range from 0 to 100 with higher scores indicating higher levels of integration.	KOF Swiss Economic Institute (2023)
Real effective exchange rate (REER)	Real effective exchange rate index. Higher values represent a deterioration in the price competitiveness of a country vis-à-vis its main trading partners.	SARB (2023)
Institutional quality (IQ)	Composite index derived from five constituent variables (corruption, law and order, political stability, democracy, bureaucracy). Ranging from 0 to 100 with higher levels indicative of better institutional structures.	ICRG (2023)

Source: Author's own compilation

For the purpose of the investigation, the study made use of a self-constructed composite index to measure levels of economic development. The index was constructed using five constituent variables, including levels of education, life expectancy, GNI per capita, the Gini index and an employment index all combined using geometric aggregation. This method was chosen over the more general linear (additive) aggregation methods based on several considerations. This

included the restrictive nature emanating from the latter based on assuming preference independence for the construction of reliable composite indicators (Mariani & Ciommi, 2022). On the other hand, geometric methods avoid the full compensability condition by assuming inferior compensability (diminishing returns) for indices with lower scores (Greco *et al.,* 2019). In this regard, weights assigned to the individual indicators are assumed to reflect more reliable measures of importance (Paruolo *et al.,* 2013).

To capture the dynamics of the individual regressors, globalisation levels were estimated using the KOF Swiss Economic Institute's combined globalisation index. The index is based on a combination of three sub-indices comprising levels of economic, social, and political globalisation. It also considers both *de jure* and *de facto* factors. In addition to this, industrial growth was measured using manufacturing value added (as % of GDP). As the general proxy used for a country's industrialisation trajectory in the extant literature, the measure captures the quantitative progress of industrial activity and its contribution to the general economic activity levels in the country. In addition to these main regressors, two control variables were also included in the analysis. These are a composite institutional quality index aggregated, sourced from the Political Risk Services (PRS) group, and the real effective exchange rate. Their inclusion comes on the basis of their use in similar studies and theoretical importance within the subject field this study focuses on. Prior to the analysis being undertaken, all variables were transformed to their natural logarithm This was done with the purpose to engender elasticity relationships as well as avoiding any possibilities of heteroscedasticity.

3.2 Econometric method of analysis

The analysis comprised various steps. The first entailed a descriptive analysis of the data that was utilised including reporting on aspects such as the mean, median, kurtosis, maximum and minimum values. Thereafter, the stationarity properties were assessed. As opposed to using conventional unit root tests such as the augmented Dickey-Fuller (ADF), Phillips-Peron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests, the analysis employed the Zivot and Andrews (1992) test. The latter was preferred as it holds various advantages over conventional unit root procedures. Among these is the ability to provide more robust and reliable results, especially when possibilities of structural break are present in the dataset. Taking into consideration that the current data under investigation spans across the timeframe when South Africa underwent significant political and structural change, this ZA test could circumvent any possible bias and inefficiency in the obtained results. Therefore, based on its utilisation, the test can be expressed as follows:

$$\Delta y_t = \rho + \rho y_{t-1} + \sigma t + \theta DU_t + \sum_{j=1}^{k} d_t \Delta y_{t-j} + \mu_t \tag{1}$$

$$\Delta y_t = \rho + \rho y_{t-1} + \sigma t + \pi DT_t + \sum_{j=1}^{k} d_t \Delta y_{t-j} + \mu_t \tag{2}$$

$$\Delta y_t = \beta + \beta y_{t-1} + \beta t + \tau DU_t + \tau DT_t + \sum_{j=1}^{k} d_t \Delta y_{t-j} + \mu_t \tag{3}$$

From equation 1 to 3, DU_t is indicative of the dummy variable, i.e. a particular shift arises at a point t, and DT_t indicates the trend in shift. Hence:

$$DU_t = \begin{cases} 1 \ldots if\ t > TB \\ 0 \ldots if\ t < TB \end{cases} \text{ and } DT_t \begin{cases} t - TB \ldots if\ t > TB \\ 0 \ldots\ldots\ldots if\ t < TB \end{cases} \tag{4}$$

By utilising these tests, the possibility of confirming stationarity at I(1) for all variables would infer probable cointegration. Therefore, by analysing whether there are any significant long-run relationships between the variables, the study made use of the combined Bayer and Hanck (2013) test for cointegration. Again, the adoption of this method as opposed to conventional cointegration testing procedures was based on its advanced properties. Primary among these is its ability to remove extraneous multiple test methods by integrating a combination of cointegration procedures. These tests include those by Engle and Granger (1987), Johanssen (1991), Boswijk (1995) as well as Banerjee *et al.* (1998). It uses a Fisher-type formula to estimate two test statistics. The first is a combination of only the Engle and Granger and Johanssen tests, while the latter offers a combination of all four aforementioned tests. The equations for these tests can be expressed as shown in both equations 5 and 6 below:

$$EG - JOH = -2\big[\ln(P_{EG}) + \ln(P_{JOH})\big] \tag{5}$$

$$EG - JOH - BO - BDM = -2\big[\ln(P_{EG}) + \ln(P_{JOH}) + \ln(P_{BO}) + \ln(P_{BDM})\big] \tag{6}$$

From these equations, P_{EG}, P_{JOH}, P_{BO} and P_{BDM} are representative of the test probabilities of each of the four cointegration tests inlcuded.

3.3 Model specification

Subsequent to cointegration testing, the long-run elasticity relationships were estimated. Here, the analysis made use of three different estimation techniques to analyse the moderating effect of globalisation within the industrial growth-economic development nexus. This was done with the purpose to ensure the robustness of the results. So too does each of the different techniques offer unique advantages for estimation. The first of the utilised tests was the fully modified ordinary least squares (FMOLS) technique (Phillips & Hansen, 1990). One of the underlining strengths of this technique is the ability to accommodate nuisance parameters, which assists in overcoming possible problems of bias in the estimation, serial correlation as well as endogeneity. The second technique employed pertained to the dynamic ordinary least square (DOLS) estimation (Saikkonen, 1992). Sharing the advantages attributed to the FMOLS procedure, the estimation, uniquely, through the use of both leads and lags, overcomes the problems of small sample bias and simultaneity. In addition to these two estimation techniques, the third technique that was utilised was canonical cointegration regression (CCR) (Park, 1992). In the estimation of the model, the technique has various similarities when compared to the FMOLS procedure. However, it differs with respect to the fact that while FMOLS transmutes only the data, CCR estimation transmutes both the data and parameters, providing a more reliable estimation of the coefficients, while, likewise, mitigating challenges that might be posed due to omitted variables.

By utilising the aforementioned techniques, the study set out to evaluate the moderating role of globalisation on the dynamics between South Africa's industrialisation and the manner in which the country's economy has developed by using the following model:

$$EDEVI_t = \beta_0 + \beta_1 IND_t + \beta_2 GBI_t + \beta_3 (IND * GBI)_t + \beta_4 X_{it} + \varepsilon_T \tag{7}$$

Based on the model shown in equation 7, EDEVI refers to the levels of economic development, GBI represents the degree of globalisation and IND, the level of the industrial sector to total economic activity in the country. Furthermore, X represents a set of control variables, including the real effective exchange rate and levels of institutional quality, while ε and t are representative of the error term and time index, respectively. The inclusion of the interaction

term in equation 7 above allows the study to isolate and determine the mediating effect of GBI on the impact of IND on EDEVI. This is done by estimating the marginal impact of IND on EDEVI, using a partial derivation of equation 7 with respect to industrial sector activity as follows:

$$\frac{\partial EDEVI_t}{\partial IND_t} = \beta_1 + \beta_3 GBI_t \tag{8}$$

In order to understand the mediating effect of globalisation within this nexus, both coefficients β_1 and β_3 from equation 8 need to be interpreted. In line with this, Gazdar and Cheriff (2015) acknowledge that the method allows for four possible outcomes:

1) If $\beta_1 > 0$ and $\beta_3 > 0$ it is indicative of the fact IND contributes positively to the levels of economic development in South Africa and its interaction with the manner in which the country has integrated reinforces this effect.
2) If $\beta_1 > 0$ and $\beta_3 < 0$ it is indicative of the fact IND contributes positively to the levels of economic development in South Africa and its interaction with the manner in which the country has integrated reduces this effect.
3) If $\beta_1 < 0$ and $\beta_3 > 0$ it is indicative of the fact that IND inhibits higher levels of economic development in South Africa and the interaction with the country's level of globalisation mitigates this negative effect.
4) Finally, if $\beta_1 < 0$ and $\beta_3 < 0$ it is indicative of the fact that IND impedes higher levels of economic development in South Africa and its interaction with the country's level of globalisation aggravates this effect.

As the concluding step in the analysis, the study assesses the possibility of any causal relationships between the variables. In doing so, it adopts the Toda-Yamamoto Granger causality test. The test makes use of a modified Wald test and has the ability to accommodate either I(0), I(1) or a mixture of these integrated variables. Based on this, compared to conventional causality tests, it attributes the superior ability to accommodate for the potential effects of both power and size in the estimation.

4. Results and discussion

This section is dedicated to the analysis of the data and the subsequent discussion of the results. It firstly provides a descriptive overview of the variables, whereafter the properties of the data are analysed. This is followed by a cointegration analysis to determine the existence of possible long-run relationships. Subsequent to this, the regression results are presented and discussed in order to understand the elasticity relationships and the moderating role of globalisation within the industrial growth and economic development nexus in South Africa. It then closes off with a causality analysis, where possible causal linkages are examined.

4.1 Descriptive analysis

As the first step in the analysis, the descriptive statistics of the variables included are presented in Table 2. From the results shown, it shows the mean value of economic development based on the five combined variables. Over the course of the study period, South Africa shows a moderate level with a score of 58.97 (out of a possible maximum score of 100). A maximum score of 61.32 was obtained in 2009, showcasing somewhat of a decline in recent years. So too, when considering its progress in industrial development, with an average contribution of 18.21 percent to total economic activity, it has lagged behind most other middle-income economies in the same period (Turkey = 18.99%; Malaysia = 24.44%) (World Bank,

2023). The maximum contribution of the sector was attributed in the early 1990s (1991), though since then it has shown noteworthy declines. The minimum value of 10.94 was recorded in 2020. Considering that declines within industrial activity occur as countries progress from lower to higher income economies, this would suggest a transition to a more developed state (Joseph *et al.*, 2021). Unfortunately, as suggested by Andreoni and Tregenna (2021), the country seems to currently find itself in a middle-income growth trap, with signs of premature deindustrialisation.

Table 2: Descriptive results

	EDEVI	GBI	IND	REER	IQ
Mean	58.97045	44.55745	18.21120	120.0320	54.38558
Median	58.59950	45.93239	19.00261	118.5000	51.51985
Maximum	61.32131	69.93512	24.86451	171.0000	70.29833
Minimum	57.62451	34.452484	10.94398	91.00000	42.09663
Std. Dev.	0.956184	9.587054	4.461135	17.88398	8.434015
Skewness	1.102064	-0.016242	-0.185081	0.789286	0.261126
Kurtosis	3.340172	1.559167	1.551123	3.395715	1.736944
Jarque-Bera	8.704313	3.634847	3.913462	4.634842	3.269098
Probability	0.012879	0.162444	0.141320	0.098527	0.195040
Observations	42	42	42	42	42

Source: Author's own compilation

Further notable results from Table 2, likewise, describe the level of integration considering the various economic, social, and political ties the country has formed over the course of the last four decades. In this respect, the mean score of 44.58 is representative of a somewhat lower level of globalisation when compared to similar developed countries such as Brazil ($\overline{GBI}$ = 47.832), Malaysia ($\overline{GBI}$ = 69.16) and Turkey ($\overline{GBI}$ = 60.18) (KOF Swiss Economic Institute, 2023). This, in part, is explained by subdued levels of international linkages prior to the country's transition to a post-apartheid regime in the early 1990s. During this timeframe, the country was largely isolated based on the sanctions placed against it as part of the international response to its racial segregation policies (Linderson, 2020). However, since then, it has made notable strides, moving from globalisation levels of 35.72 in 1991, to surpassing the 69-score threshold in 2021. Interestingly, from the control variables, based on the standard deviation (std. dev = 17.88) and maximum (171.00) and minimum scores (91.00) for the real effective exchange rate, results do reflect the volatility in price levels for the past 40 years, with the currency considered one of the most volatile in the advanced economic classification (Miyajima, 2019:4). Furthermore, from the IQ index, based on the five institutional factors, much like the country's industrial performance, quality levels have decreased. On average, however, levels have been close to the midpoint threshold, maximum scores of 70.29 were obtained in 1984, with the minimum score of 42.09 being recorded in 2021.

4.2 Unit root tests

Subsequent to the descriptive analysis, the analysis ensued with unit root testing. This was done to ascertain the properties of the data and ensure that the chosen estimation techniques would suffice. Results for the ZA test are shown in Table 3. Testing considered these properties with both intercept and trend and a single structural break. Findings revealed that all variables (at level) attributed unit roots at level. However, at first difference, stationarity was confirmed.

Table 3: Zivot and Andrews unit root test results

Variable	Intercept	Break year	Intercept and trend	Break year	Stationary
EDEVI	-3.568	1998	-2.172	1987	No
GBI	-4.325	1999	-2.313	2009	No
IND	-3.357	2006	-3.371	1990	No
GBI*IND	-4.453	1999	-2.931	2006	No
REER	-4.342	1998	-4.441	1987	No
IQ	-4.425	1998	-3.366	2003	No
ΔEDEVI	-6.739***	1995	-5.840***	1999	Yes
ΔGBI	-5.739***	1995	-5.230***	2000	Yes
ΔIND	-7.114***	1991	-6.633***	2007	Yes
ΔGBI*IND	-6.044***	2003	-5.426***	2000	Yes
ΔREER	-5.336**	2003	-5.144***	1991	Yes
ΔIQ	-6.266***	2004	-5.766***	2000	Yes

*Note: **** shows significance at 1% level and ** significance at 5% level*

Source: Author's own compilation

4.3 Cointegration results

Given that all variables were integrated at I(1), it does suggest that there might be possible long-run relationships between the variables considered. In order to confirm this, the analysis ensued with the BH combined cointegration test for which the results are shown in Table 4. Firstly, when using a combination of the Engle-Granger and Johanssen techniques, the calculated F-statistic of 11.165 exceeded the five percent critical value of 10.352. This would infer the existence of a long-run relationship between the variables under investigation. This was also confirmed when using a combination of all four tests (as alluded to in section 3.2). In fact, in both instances, the tests confirmed the rejection of the null hypothesis (no cointegration) at the five percent significance level. These findings seem to correspond with those reported by Sallam (2021), who also suggested notable long-run relationships between both manufacturing levels and economic growth. Likewise, Chang and Lee (2010) reported long-run relationships between globalisation and economic growth for a panel of 23 OECD countries.

Table 4: Bayer and Hanck cointegration results

Model	Bayer-Hanck test	F-statistic	Critical value	Cointegration
*EDEVI = f (IND, GBI, IND*GBI, REER, IQ)*	EG-J type test	11.165**	10.352	Yes
	EG-J-Ba-Bo type test	67.892**	19.761	Yes

*Note: critical values shown are at a 5% significance level; ** indicates significance at 5% level*

Source: Author's own compilation

4.4 Regression results

In order to determine the interactive effect of globalisation on the industrial growth and economic development nexus in South Africa, three estimation techniques were carried out. Results for the FMOLS, DOLS and CCR regressions in this respect are shown in Table 5. The use of these techniques also assisted in determining further elasticities between the independent and control variables and levels of economic development. From the results as shown, all three estimation techniques seem to confirm the existence of a positive relationship and statistically significant relationship between the industrial performance of the country and its respective levels of development. These results infer that a one percent increase in industrial output would induce between 0.057 to 0.096 percent in higher development levels, *ceteris paribus.* Albeit the declining contribution of the sector, this finding still points to the importance of industrial activity to improve the standards of living. On the one hand, it lends support to the hypotheses of Lewis (1954) and Kaldor (1967), inferring the importance of increasing economic output and bringing about structural change. However, given economic development's more qualitative perspective, it also highlights industrial activities' forward and backward linkages that potentially can improve levels of education, reduce poverty, and bring about higher employment rates in a variety of sectors (Andreoni *et al.*, 2021).

In contrast, findings relating to the impact the country's level of integration into the global processes relating to economic, social, and political features, suggest a negative influence on their developmental outcomes. However, when considering whether these impulses did exert a significant influence, results from the FMOLS, DOLS and CCR regressions (p-values > 0.10) failed to reject the null hypothesis (*coeff. = 0*), even at the 10 percent level of significance.

While the direct impact of the manner in which South Africa has integrated into these global processes did not show any notable considerations, the findings relating to its moderating effect on industrial output and the relationship with developmental outcomes do provide interesting features. From the results in Table 5, it would seem that the three estimation techniques provide evidence of a distorting effect. In fact, from all three estimations all confirmed the rejection of the null hypothesis (*coeff. = 0*) at the five percent significance level. In other words, while the country's declining industrial performance has contributed positively to the wider economic development landscape, it does seem that the effect of a more liberalised industrial policy, involvement in international economic exchanges and its global political and social interactions have deterred this effect. From an economic perspective, this can be associated with a number of factors, including the inability of the sector to compete internationally, mainly through large differentials in wages and productivity (Moyo, 2020). Strongly associated with this is also the more peripheral position the country's industrial sector has taken in ever-emergent and prominent global value chains. In this respect, its lack of economic diversification has severely impacted the ability to be involved in high value adding processes (Miao, 2023).

Table 5: Estimation results from FMOLS, DOLS and CCR regressions

Variable	FMOLS		DOLS		CCR	
	Coeff.	*t-stat. (Prob.)*	*Coeff.*	*t-stat. (Prob.)*	*Coeff.*	*t-stat. (Prob.)*
IND	0.057	[8.087] (0.000***)	0.096	[7.800] (0.000***)	0.071	[7.387] (0.000***)
GBI	-0.073	[-1.579] (0.123)	-0.054	[-0.756] (0.459)	-0.066	[-1.206] (0.236)
IND*GBI	-0.005	[-2.386] (0.023**)	-0.007	[-2.162] (0.044**)	-0.006	[-2.294] (0.028***)
IQ	0.0257	[1.621] (0.114)	0.023	[0.907] (0.376)	0.025	[1.337] (0.189)
REER	-0.027	[-4.713] (0.000***)	-0.025	[-2.364] (0.029**)	-0.026	[-3.895] (0.000***)
C	67.316	[25.929] (0.000***)	66.489	[16.062] (0.000***)	67.062	[21.751] (0.000***)
R^2	0.862		0.968		0.858	
Adjusted R^2	0.842		0.933		0.837	

*Note: **** shows significance at 1% level and ** significance at 5% level; [ ] shows the t-stats.; ( ) shows the p-values*

Source: Author's own compilation

However, when considering the more social and political features, although the study does not individually distinguish between these features of the globalisation process, this distorting effect can also be attributed to several features. From a social perspective, the effect of technology and the lags in advancements within the country have been a pertinent barrier to industrial progress (Andreoni & Tregenna, 2021). Moreover, other social features, such as more recent mass migrations of skilled labour, could also be attributed to this finding. Halstein (2021) explains that the prevalence of high levels of brain drain pose a significant burden for the country's objective of structural change, mainly on the basis of long-term productivity concerns. Alternatively, from a political standpoint, global distortions on the industrial sector's ability to act as meaningful development driver could also be attributed to the adverse influence of international governmental organisations. Reinsberg *et al.* (2019) attest that albeit membership to these organisations increases levels of political stability, their influence in aspects of industrial policy in the form of standardised measures (or blanket approaches) can be detrimental to growth environments. This can be explained by the failure of these policies to not account for specific economic conditions, especially in the case of countries that are transitioning through their development process (de Jongh, 2023).

In light of these findings, the regression results pertaining to both the control variables and their relationship with the country's economic development trajectory also provide noteworthy insight. From Table 5, all three coefficients for the IQ variable from the FMOLS (*coeff. = 0.0257*), DOLS (*coeff. = 0.023*) and CCR (*coeff. = 0.025*) estimations were positive. This would align with the underlining theory that suggests that better institutional environments drive economic development (Hodgson, 2004; Tran *et al.,* 2021). However, based on the p-values from all three regression results (sig. values > 0.10), none of these suggested elasticities were significant, not even at a 10 percent level of significance. In contrast, results relating to the impact of the real effective exchange rate point to a negative and statistically significant (at least at a 5% significance level) effect on levels of economic development. Across the three different estimations, coefficients ranged from -0.025 to -0.027. This would infer that a

deprecation of the currency (against a basket of others), although inducing greater levels of exports, has in fact deterred developmental progress over the course of the last 40 years. This finding supports those presented by Muzekenyi *et al.* (2019). In this respect, being a net importing country, results suggest that as trade competitiveness levels have dropped, these adverse effects have been transmitted to induce higher unemployment rates, lower levels of income per capita and even lower levels of education and health. This mainly links with the aforementioned findings, signifying just how important external features in a more integrated and liberalised economic system have become to local conditions. Astorga *et al.* (2014) explain that, given that developing countries import a significant amount of investment in capital goods, a depreciation would induce higher costs that could offset investment in local environments.

4.5 Causality analysis

As the final step in the analysis, the study ensued with its investigation of causal links between variables under consideration. This was done on the basis of the ability of this type of analysis to provide insight that can guide policymakers, as it better understands how these processes are interlinked. Based on this, the Toda-Yamamoto Granger causality test was undertaken, for which results are reported in Table 6. Notable findings from the analysis point to unidirectional relationships emanating from levels of development to the levels of globalisation, as well as those causal links driven by levels of institutional quality to the latter process. The first finding in this respect does point to the fact that the progress in a country's level of development can play a notable role in the manner in which it integrates. Within the context of the industrial landscape, involvement in key global processes such as GVC activity, the inception of specific trade relationships and the direction of migration (loss and attraction of skills) all hinge on specific developmental characteristics (Gries & Redlin, 2020; Asian Development Bank, 2021; Oliinyik *et al.,* 2021).

Table 6: Toda-Yamamoto Granger causality results

Variable	Dependent variable				
	EDEVI	**IND**	**GBI**	**REER**	**IQ**
EDEVI	------	[2.003] (0.735)	[16.298] (0.003***)	[24.951] (0.000***)	[1.203] (0.877)
IND	[3.442] (0.486)	------	[4.232] (0.376)	[14.722] (0.005***)	[1.784] (0.775)
GBI	[4.735] (0.316)	[6.593] (0.159)	-------	[15.882] (0.003***)	[1.541] (0.819)
REER	[2.898] (0.575)	[4.472] (0.346)	[4.090] (0.394)	------	[0.928] (0.920)
IQ	[0.515] (0.972)	[4.886] (0.299)	[9.665] (0.047**)	[46.272] (0.000***)	------

*Note: *** shows significance at 1% level and ** significance at 5% level; [ ] shows the chi-square values.; ( ) shows the p-values*

Source: Author's own compilation

The second finding also seems to support this feature, though the focus here is exerted towards the importance of sound institutions in determining impulses to the level of international exposure and its subsequent effects. This finding holds special relevance

considering specific policy formulation towards shaping the industrial growth-economic development nexus within the country. The focus here should be directed towards eradicating corruption that diverts resources away from this sector's development. Moreover, unnecessary levels of bureaucracy that induce notable costs of doing business, which have become a key obstacle in the sector's development (Signé & Johnson, 2018), should be minimised.

In addition to these aspects, the causality analysis also seems to exhibit the number of factors responsible for consequential movements in the exchange rate. In this respect, all included variables seem to drive these unidirectional impulses on the country's level of price competitiveness. In fact, based on all the returned p-values, these significant influences were all confirmed at a one percent significance level. In some respects, this does point to the findings of several other studies (Dewing, 2015; Mpofu, 2021), which suggests the sensitivity of South Africa's price competitiveness to both internal and external factors. From this study's findings, it suggests that key determinants in the movements in the value of the local currency relative to others are based on level of economic development, industrial output, the levels of integration as well as institutional quality. In light of the focus between the interactive role globalisation plays in the industrial growth-development nexus, this finding does infer important implications for policymakers. In this respect, as literature has shown, volatile price competitiveness imposes a serious hindrance to the ability of economies to undergo structural transformation (Akinlo, 2018; Ayobami, 2019). Therefore, as the country is increasingly exposed to external factors through its global integration, efforts need to be directed towards aspects such as ensuring a more rapid diversification of economic structures, greater technological advancements within the manufacturing sphere and a continuous focus directed towards enhancing learning capabilities in production.

5. Conclusion and recommendations

As its primary objective, the study had the aim of broadening the knowledge base, specifically relating to the moderating effect of globalisation within the economic development and industrial growth relationship within South Africa. Results in this regard showcased the intricate dynamics between these processes. Even though evidence points to the country currently undergoing a premature deindustrialisation and caught within a middle-income growth trap, the empirical analysis did show that over the course of the last 40 years, this process has contributed positively to the larger development framework. Nonetheless, based on isolating the interactive effects of the globalisation process, the analysis suggests that through the country's economic, social, and political integration, the positive impulses from manufacturing output to the wider qualitative improvement in living standards are distorted. The findings here pointed to several important implications, reverberating many of the concerns in the literature, though too providing novel insight. On the one hand, the study showcases that the integration process has not been experienced similarly by all. While developing countries in the East utilised their participation in a global network to promote industrial development, consequently reducing poverty and unemployment levels, the South African case is indicative of notable dichotomies in the experience of transitioning countries.

For South Africa, in particular, the identified distorting effect within the nexus seems to be driven by both internal and external factors. Considering the latter, evidence from the analysis seems to confirm the struggle to actively advance manufacturing activity on the basis of a more competitive international landscape. Concentrated GVC activity in this regard, which has reflected the conventional global North-South dynamics has made it difficult for the country to make use of these globalisation induced networks. It is important to note the recent possible influences that a more fragmented global landscape has stimulated, as the Covid-19 pandemic

and present geopolitical tensions have disrupted crucial supply chains. Domestically, the adverse effects seem to be evident in the peripheral position that the country has undertaken within this global network. Based on low productivity levels, high production costs and a significant lack of economic diversification, the ability to use the industrial sector to drive the wider development of the country's economic structure has been significantly impeded. On the basis of the social dimension of globalisation, so too has the country failed to benefit from the premiums that the associated SBTC has offered in this pursuit. This is particularly evident on the basis of the large supply of low-skilled labour and lack of technological advancement that have not only affected the industrial sector's competitiveness, but also the wider economic development landscape.

Considering these dynamics, policy recommendations should prioritise the development of the industrial sector itself. On the basis of the findings and identified challenges, this should include, among others, enhanced diversification of activity, innovative industrial financing and the formation of strategic and mutually beneficial private-public partnerships. In addition, given the intrusive nature of the technological and digital applications around the globe, public technological intermediaries should be more responsive to the demands that the global landscape prioritises. To ensure that these actions are successfully transmitted to specific development priorities, including better employment outcomes, health and education levels and more a more inclusive growth trajectory, industrial policy must be aligned with a strategic framework that seeks to enhance learning capabilities, technological uptake, and integrated domestic supply chains with a sustainable technological footprint. Given the noted core-peripheral nuances, so too must regional partnership formation be fostered, all with the prospect of creating notable growth coalitions and beneficial regional value chain activity. Finally, considering the contemporary focus on service led industrialisation, enabling specific industries without smokestacks (IWOSS) can prove significantly valuable. On the basis of these findings and insights, while likewise acknowledging the limitations of the study, there is notable room for future areas of research seeking to advance the body of knowledge within this nexus. This can include a more disaggregated analysis on the specific dimensions of globalisation and their respective influence within this investigated nexus. Moreover, there is a need to compare both the impact of *de jure* and *de facto* globalisation in order to better understand the influence of actual global flows and the policies that induce these impulses.

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