

2026



DBN
Development
Bank of Nigeria

...Financing Sustainable Growth

DBN JOURNAL OF ECONOMICS & SUSTAINABLE GROWTH

**Volume 8
Issue 1**



Effects of Capital Goods Imports on Manufacturing Sector Performance in Nigeria



Effects of Capital Goods Imports on Manufacturing Sector Performance in Nigeria

**Temitope Titus Abodunde,
Nigerian Institute of Social and Economic Research (NISER),
Ibadan, Nigeria**

**Oyewunmi Debo Olowolayemo
Department of Economics, University of Lagos,
Lagos, Nigeria**

**Olabisi Sherifat Raji
Department of Economics, University of Lagos,
Lagos, Nigeria**

Abstract

The study investigated the effects of capital imports on manufacturing sector performance in Nigeria. Data from various sources such as World Integrated Trade System (WITS) database (2024) and Central Bank of Nigeria (2024) were utilized and analysed using descriptive analysis and the Autoregressive Distributive Lag (ARDL) Model. Empirical findings from the study reveal that both the values of capital goods import and its percentage to the GDP have been fluctuating. In fact, the percentage of capital goods import to GDP has not experienced any significant change. This implies that periods of increased capital goods importation experienced increased GDP and increased percentage of Capital goods to GDP. A useful conclusion could be one factor needed to stimulate growth in Nigeria is increased capital goods importation. The study further attempted to investigate the factors that significantly determine capital goods import in Nigeria. The results reveal that exchange rate, inflation, domestic investment and gross domestic product significantly determine capital goods import. Furthermore, the study then proceeded to investigate the effects of capital goods on the performance of the manufacturing sector in Nigeria. The results revealed that capital goods import positively and significantly influence manufacturing sector performance both in the short run and long run. This implies that availability of capital goods in the domestic economy is very vital for the effective and efficient performance of the manufacturing sector in Nigeria. Also, population growth and domestic investment exhibit positive and significant relationship with manufacturing sector performance. This means that population growth which signifies labour supply because in Nigeria, a large proportion of the population falls within the labour force.

1. Introduction

The manufacturing sector is a substantial determinant of growth in any economy and the extent to which the sector grows especially in this era of digitalization and industry 4.0, is basically a function of a whole lot of factors in which the availability of capital goods (technology) is very germane. In order to achieve a high performing manufacturing sector, there has to be massive investment in research and development (R & D) that would translate to high production, and accumulation and utilization of capital goods in the sector. This indeed is the major the reason the industrialized world far outgrows the developing world in terms of growth in gross domestic product (DeLong & Summers 1991). As such, countries such as Nigeria have to depend on capital goods import because they do not invest substantially in R & D. In fact, there is no substantial data on the expenditure in R & D in Nigeria which is a clear indication that the country is a laggard in the domestic production of capital goods. As such, Nigeria needs to rely on the importation of capital goods to achieve maximum productivity in the manufacturing sector.

Meanwhile, the value of capital goods imported into the Nigerian economy has been staggering and this has really hampered the growth of manufacturing sector in recent time. For instance, the total value of capital goods importation in Nigeria decreased by 28.09% in the first quarter of 2022, compared to the preceding quarter. The total value of capital importation into Nigeria in the fourth quarter of 2021 stood at 2,187.63 million dollars, showing an increase of 26.35% from the preceding quarter. When compared to the corresponding quarter of 2020, capital importation increased by 109.28% from 1,045.32 million dollars. However, the total capital importation into Nigeria in fourth Quarter of 2022 stood at 1,060.73 million dollars, representing a 51.5% decrease from the same quarter last year. In the same vein, Nigeria's manufacturing sector has experience infinitesimal growth also within the same period. According to GDP report released by the National Bureau of Statistics (NBS) in 2021, the sector recorded real GDP growth of 3.14% (year-on-year) in quarter two 2021 compared to a decline of 8.78% recorded in the corresponding period of 2020. In quarter two, the sector grew by 5.89% (year-on-year) in real terms. In quarter one 2018, the sector grew by 3.4% year-on-year. Manufacturing output for 2021 was 64.418 billion dollars, a 17.65% increase from 2020.

Comparatively, countries such as China and India have demonstrated how sustained expenditure on research and development (R&D) can facilitate the accumulation and efficient utilisation of capital goods, thereby supporting long-term manufacturing sector growth. China's development trajectory is particularly instructive, as the country has consistently prioritised R&D since the onset of economic reforms in 1978. This long-term commitment has enabled China to build strong domestic technological capabilities and deepen its manufacturing base, positioning it as the world's second-largest economy after the United States (OECD, 2023; World Bank, 2024).

China is currently the second-largest spender on R&D globally, reflecting its strategic emphasis on innovation-driven growth. In 2021, China's expenditure on social research and experimental development reached approximately 2.78 trillion yuan, representing a 14.2 percent increase over the previous year, while the ratio of R&D expenditure to GDP rose to 2.44 percent (National Bureau of Statistics of China, 2022). This performance represents a dramatic transformation from earlier decades, as China's R&D intensity stood at only 0.72 percent of GDP in 1991 (OECD, 2017). By 2015, R&D spending had increased to 2.06 percent of GDP, and by 2016 China's total R&D expenditure accounted for approximately 20.7 percent of global R&D spending, highlighting the scale of its technological catch-up and innovation capacity (UNESCO, 2018).

In a similar vein, India's growth experience illustrates the importance of technology-driven sectors in supporting structural transformation. India's information and communication technology (ICT) sector and broader digital economy have emerged as major contributors to economic growth,

productivity, and export earnings. Empirical evidence shows that ICT-led innovation and digitalisation have strengthened India's manufacturing and services linkages, improved capital utilisation, and positioned the economy as one of the largest and fastest-growing in Asia (World Bank, 2023; OECD, 2024). Although India's overall R&D intensity remains lower than that of China, targeted investments in digital infrastructure, software development, and engineering services have generated substantial spillover effects across manufacturing and industrial activities.

In the case of Nigeria, the manufacturing sector has remained a laggard in terms of its contribution to gross domestic product (GDP) over time. The sector's weak performance has been attributed to several interrelated factors, including the inadequate availability of capital goods, limited technological spillovers from imported machinery, vulnerability to external economic shocks, and frequent policy reversals that have disrupted industrial planning (NBS, 2023; MAN, 2024). These challenges have constrained the sector's ability to modernise production processes and improve competitiveness.

Meanwhile, there appears to be very limited empirical research that directly examines the technology transfer effects of capital goods imports on manufacturing sector productivity in Nigeria. Much of the existing literature tends to focus on related but distinct areas of manufacturing economics, such as export performance or foreign direct investment (FDI), rather than explicitly isolating the technology embodied in imported machinery and equipment. For example, Arawomo (2014) examined the export performance of the manufacturing sector, but did not analyse the role of imported capital goods as channels of technological transfer influencing productivity growth. This gap in the literature has left a critical aspect of Nigeria's industrial development at best under-explored or empirically unresolved. Studies of Nigerian manufacturing firms indicate that technology investment at the firm level is predominantly in imported technologies, yet these investments are not always targeted or harnessed effectively to improve broader sector outcomes (Ojo, Ogunleye & Segun, 2021; evidence from analogous SSA analyses suggests technology leapfrogging can positively affect value added when effectively utilised) .

Therefore, there is a clear research justification for conducting a comprehensive empirical study that utilises up-to-date data and rigorous methodology to examine the technology transfer effects of capital goods imports on Nigeria's manufacturing sector. By analysing a long span of data from 1981 to 2024, this investigation seeks to provide robust evidence on whether and how capital goods imports as carriers of foreign technology have influenced manufacturing performance outcomes in Nigeria. Such research is not only timely but essential, given Nigeria's stated economic goals and the complexity of its industrialisation challenges.

2.0 Literature Review

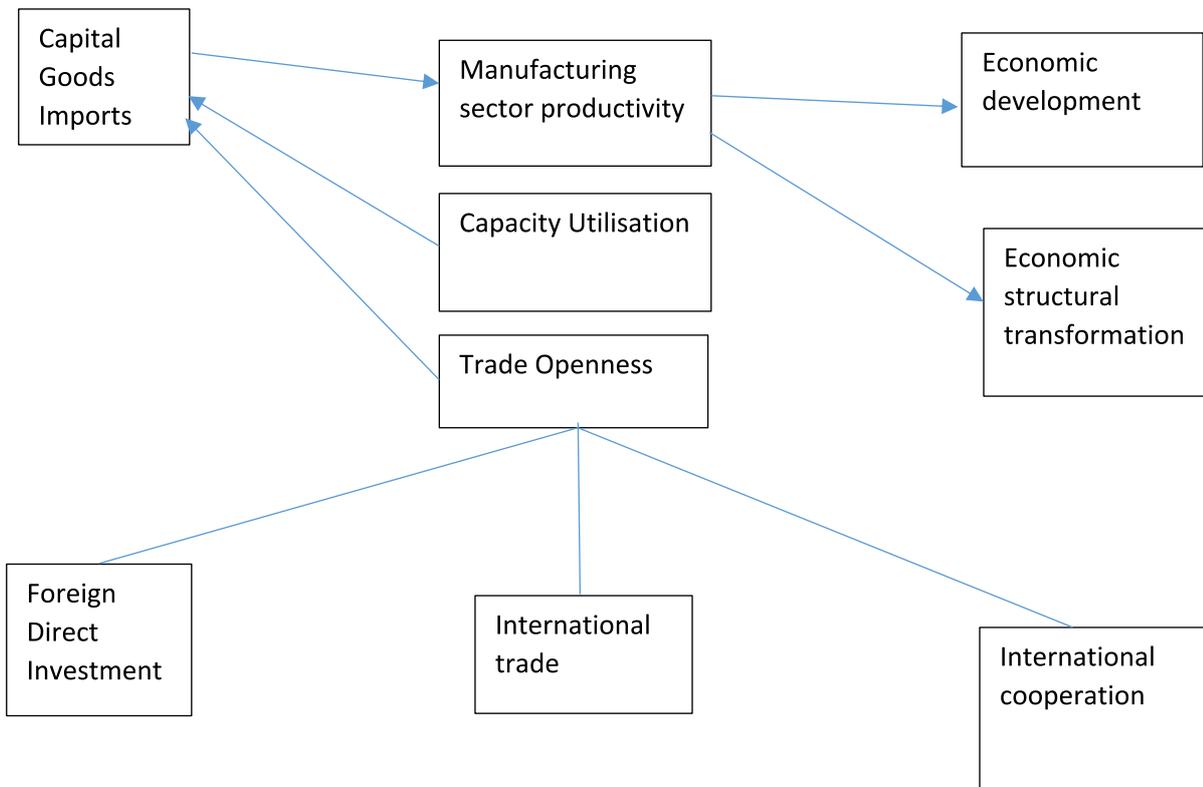
This section discusses the conceptual framework, theoretical framework and empirical review of literature.

2.1 Conceptual framework

The conceptual framework below describes the interactions that occur when technology transfer embodied in capital goods imports drive the performance of the manufacturing sector. Drawing from the extant literature, the framework admits that technology can be exogenous or endogenous. However, this study is hinged on the endogenous growth theory. The framework compares and contrast the effect of both endogenous and exogenous technology in order to clearly see the importance of technology as an input in the production process. Endogenous technology which is capital goods imports in this study interacts with other production inputs such as domestic investment, trade openness and so on to bring about manufacturing sector growth while exogenous technology is not regarded as a factor input and it is usually regarded as part of the unexplained factors that affect growth.

Thus, the conceptual framework illustrates how capital goods imports might interact with other production factors like domestic investment, population growth, trade openness, and so forth to promote growth in the manufacturing sector.

Figure 1: Showing the relationship between capital goods import and manufacturing sector growth.



Source: Author's conceptualization.

2.2 Theoretical framework

The theoretical framework of this study is anchored on endogenous growth theory, which explains long-run economic growth as a function of technological progress generated within the economic system rather than as an exogenous factor. In contrast to the neoclassical growth model, where technological progress is treated as externally determined and diminishing returns to capital ultimately constrain growth, endogenous growth theory regards technology as a core driver of sustained economic expansion (Romer, 1990; Lucas, 1988). In this study, technological know-how is proxied by capital goods imports, which embody advanced foreign technologies that can be internalised within the domestic manufacturing sector.

Endogenous growth theory posits that economic agents' decisions regarding investment in knowledge, technology, and innovation directly influence the pace of long-run growth. Unlike neoclassical models that assume constant returns to scale, endogenous growth models allow for increasing returns to scale, where a proportional increase in inputs leads to a more than proportional increase in output due to knowledge spillovers and technological accumulation (Romer, 1986). The theory therefore explains growth as a cumulative process driven by technological progress, rather than one constrained by diminishing returns to capital accumulation alone.

Central to endogenous growth theory is the relationship between technological progress and productivity, particularly within the manufacturing subsector. The theory emphasises several channels through which technological progress can occur. One such channel is learning by doing, which suggests that productivity increases as workers and firms gain experience through repeated production activities (Arrow, 1962). As labour becomes more specialised in particular tasks, efficiency improves over time, leading to higher output for the same level of inputs. In this context, technological progress can be conceptualised as the productivity differential between pre-learning and post-learning stages of production.

In addition to learning by doing, innovation constitutes a central mechanism of technological progress within the endogenous growth framework and is the primary focus of this study. Innovation arises through the introduction of new product varieties, improvements in production processes, or upgrades in existing technologies. Romer (1990) argues that economic growth is driven by the expansion of specialised intermediate inputs and that innovations generate positive spillovers that enhance productivity across sectors. Consequently, the accumulation and utilisation of technologically advanced capital goods particularly those imported from more industrialised economies facilitate innovation and support sustained manufacturing sector growth.

Succinctly, endogenous growth theory asserts that increases in economic growth stem from greater labour specialisation, intermediate input expansion, and technological transfer, all of which are underpinned by investment in research and development (R&D). Through R&D activities, economies generate new knowledge that leads to the creation of new products or improved versions of existing ones, thereby enhancing productivity and competitiveness (Aghion & Howitt, 1992). In this regard, the growth of the manufacturing sector is intrinsically linked to innovation and invention within the R&D sector, reinforcing the relevance of capital goods-embodied technology transfer as a catalyst for long-run economic growth in developing economies such as Nigeria.

2.3 Empirical review

This section discusses key issues relating to capital goods importation and manufacturing productivity as documented in recent empirical and policy-oriented literature.

2.3.1 Capital Goods Imports and Exports of Primary Products

Recent empirical evidence suggests a strong linkage between exports of primary products and capital goods imports in resource-dependent economies. Foreign exchange earnings from primary commodity exports often constitute the main source of financing for capital goods imports, particularly in developing countries with limited domestic capital goods production capacity, such as Nigeria. These imported capital goods serve as important conduits for embodied technological transfer, which can enhance manufacturing sector performance when effectively utilised (World Bank, 2022; IMF, 2023). However, primary commodity exports are typically characterised by high price volatility, weak value addition, and unstable demand, which constrain the ability of countries to leverage export revenues to build dynamic comparative advantage through sustained capital accumulation (UNCTAD, 2021).

More recent studies on the natural resource curse continue to highlight that resource abundance can undermine capital accumulation and long-term industrial development if not properly managed. Contemporary evidence indicates that resource-rich economies often experience capital flight, weak industrial diversification, and reduced incentives for productive investment, particularly in manufacturing (Frankel, 2019; Venables, 2016). These outcomes are frequently attributed to macroeconomic instability, rent-seeking behaviour, and governance challenges associated with resource revenues (IMF, 2021). As a result, rather than facilitating industrial upgrading, resource rents may crowd out investment in physical and human capital essential for manufacturing growth.

Nevertheless, more recent literature emphasises that the negative effects of natural resource abundance are not inevitable. Studies show that positive shocks to resource rents can support capital accumulation and manufacturing expansion when accompanied by sound institutions and prudent public investment strategies (Cust & Mihalyi, 2022; World Bank, 2020). Evidence from countries such as Botswana demonstrates that strategic investment of resource revenues in education, infrastructure, and productive capital can enhance the effective utilisation of imported capital goods and strengthen manufacturing and other productive sectors (IMF, 2022). This suggests that institutional quality and policy choices play a decisive role in determining whether resource revenues translate into industrial development.

2.3.2 Capital Goods Imports and Innovation

Recent empirical studies identify innovation as a key channel through which capital goods imports influence productivity growth, particularly in developing economies. Imported capital goods embody advanced technologies that can stimulate firm-level innovation by improving production processes, enabling product upgrading, and enhancing learning and absorptive capacity (OECD, 2023). Firm-level evidence from emerging economies indicates that access to foreign machinery significantly increases research and development (R&D) investment, especially when complemented by supportive innovation policies and skills development (Alfaro & Chen, 2020; Hall & Moncada-Paternò-Castello, 2019).

More recent analyses also show that capital goods imports have stronger innovation-inducing effects than intermediate goods imports, particularly in technologically lagging economies.

Studies using firm-level data from Asia and sub-Saharan Africa find that machinery imports are more likely to trigger process innovation, automation, and productivity-enhancing organisational changes than other types of imports (Bahar, Rapoport & Turati, 2022; Cirera, Comin & Cruz, 2021). These findings are especially relevant for developing countries, where imported capital goods often represent the primary source of advanced technological knowledge.

2.3.3 Capital Goods Imports and Productivity

The role of capital goods imports in enhancing productivity is well established in recent international trade and development literature. Contemporary growth models and empirical studies emphasise that imports of machinery and equipment enable countries to access frontier technologies that are otherwise costly or impossible to produce domestically, thereby improving total factor productivity (TFP) (IMF, 2023; World Bank, 2022). Empirical evidence using firm- and sector-level data confirms that reductions in trade barriers on capital goods are associated with significant productivity gains, increased output, and improved competitiveness in manufacturing sectors of developing countries (Amiti & Konings, 2020; Topalova & Khandelwal, 2018).

More recent firm-level studies further demonstrate that access to imported capital goods leads to productivity improvements through learning effects, better quality inputs, and enhanced production efficiency. Evidence from India, Vietnam, and African manufacturing firms shows that firms using imported machinery experience higher productivity growth and stronger export performance compared to non-importing firms (World Bank, 2020; Fernandes et al., 2023). These results reinforce the view that capital goods imports act as vehicles for technology diffusion and productivity enhancement in economies that are technologically disadvantaged in capital goods production.

Overall, the contemporary literature converges on the conclusion that the importation of sophisticated capital goods from technologically advanced economies facilitates technology transfer, innovation, and productivity growth in developing countries. However, the magnitude of these benefits depends critically on domestic absorptive capacity, macroeconomic stability, and complementary investments in skills, infrastructure, and R&D — factors that remain weak in many developing economies, including Nigeria.

2.4 Stylized Facts on Trend of Capital goods import and performance of the manufacturing sector in Nigeria.

The import pattern of capital goods and the manufacturing sector's performance in Nigeria are the primary issues covered in this study.

2.4.1 Trend of capital goods import in Nigeria

According to World Integrated Trade System (WITS) (2024) database, the value of capital goods import has been fluctuating and relatively low in terms of its percentage to the gross domestic product of Nigeria. The value of capital goods imports in 1996 was 1.64 billion dollars accounting for 0.032% of Nigeria's GDP. It later rose to 2.0 billion dollars accounting for 0.036% of Nigeria's GDP

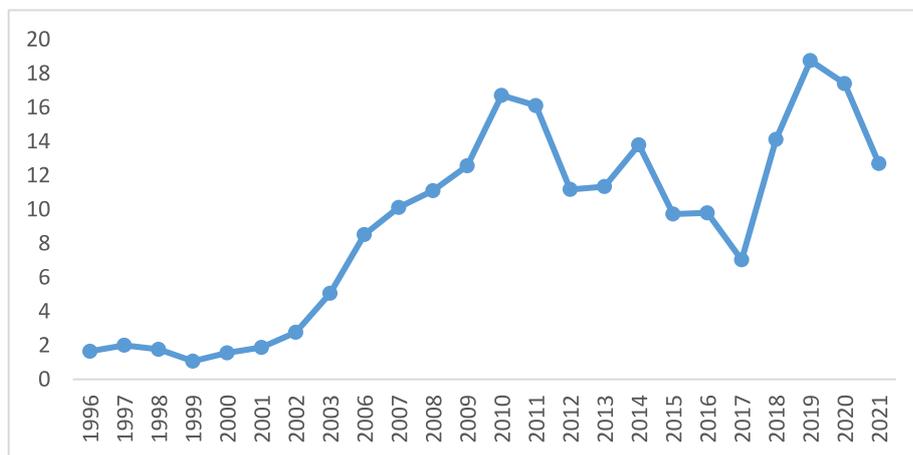
in 1997. Meanwhile, in 1998, the value of capital goods imports fell to 1.76 billion US dollars and further fell to 1.06 billion US dollars in 1999. This implies that in the late 1990's the average value of capital goods import was 1.61 US dollars accounting for 0.029% of Nigeria's GDP.

Furthermore, in the early 2000 that is before 2005, the same trend continued. Although, the value of capital goods imports rose to 1.55 billion dollars in 2000, its percentage to GDP was 0.022%. Meanwhile, the value of capital goods imports later rose to 1.87 billion dollars in 2001 accounting for 0.025% of Nigeria's GDP. It later rose to 2.76 billion dollars in 2002 and 5.05 billion US dollars in 2003. Therefore, the average value for capital goods import in the early 2000's was 2.81 billion US dollars accounting for 0.03% of Nigeria's GDP within that period.

More over in the late 2000's that is between 2016 and 2020, the value capital goods increased tremendously against its 1990 and early 2000 values but its percentage to GDP was still very low. The value of capital goods import was 9.79 billion dollars in 2016 accounting for 0.024% of Nigeria's GDP. It later fell to 7.02 billion dollars accounting for 0.018% in 2017. It later in rose to 14.11 billion dollars and 18.75 billion dollars in 2018 and 2019 respectively. The value then fell to 17.04 billion dollars accounting for about 0.04% of Nigeria's GDP. This implies that in the late 2000's, the average value of capital goods import was 1.34 billion dollars accounting for about 0.03% of Nigeria's GDP.

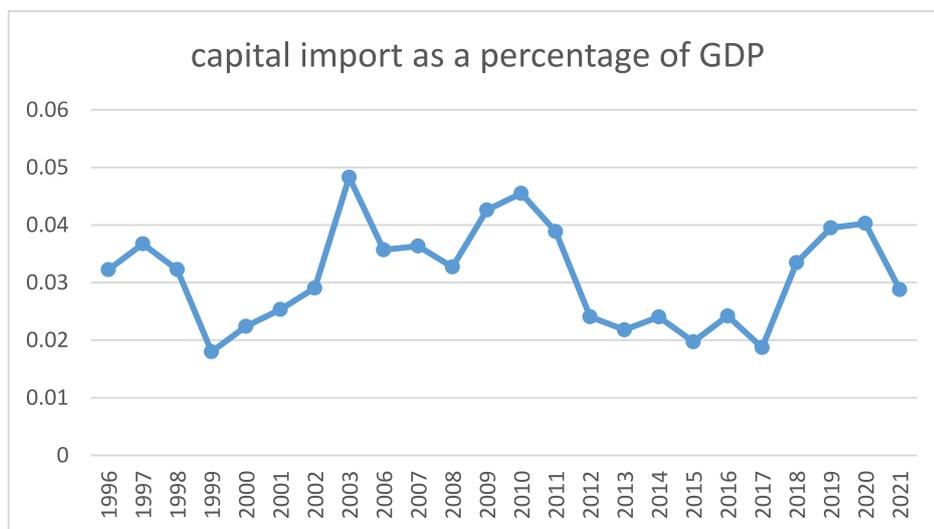
Based on the above analysis, it is clear that both the values of capital goods import and its percentage to the GDP have been fluctuating. In fact, the percentage of capital goods import to GDP has not experienced any significant change. This is also validated from figure 1 and 2 below. Meanwhile, it is also that the trend of figure 1 and figure 2 seem similar. This implies that periods of increased capital goods importation experienced increased GDP and increased percentage of Capital goods to GDP. A useful conclusion could be one factor needed to stimulate growth in Nigeria is increased capital goods importation.

Figure 1: Trend of capital goods imports in Nigeria



Source: World Trade Integrated Database (WITS) (2024) Database.

Figure 2: Capital goods imports as a percentage of GDP



Source: World Trade Integrated Database (WITS) (2024) Database.

2.4.2 Trend of Manufacturing sector value added in Nigeria

Basically, manufacturing involves the different channels through which inputs are transformed into finished products for usage. Examples include recycling of wastes, bakeries and others. Meanwhile, the manufacturing value added (MVA) is difference between all manufactured outputs and productive inputs involved in the production process. It is a scale of productivity that represents the difference between value of goods produced and the value of inputs used in the production process. The trend of the manufacturing sector value added in Nigeria till recent time has shown that the sector has been a laggard in terms of its contribution to GDP. As such, there is no assurance that the country will be able to achieve the Sustainable Development Goal 8 – achieving greater levels of economies of scale through diversification, innovation and value addition in sectors that require more labour.

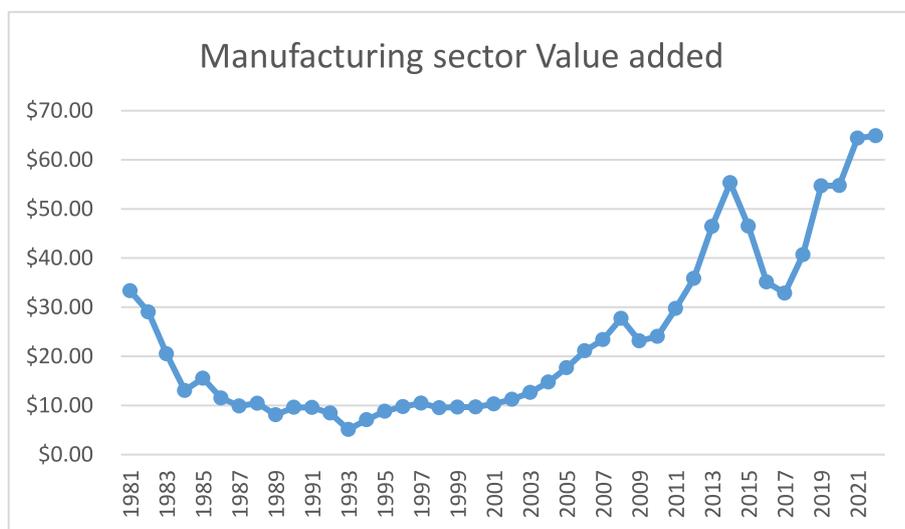
For instance, according to the World Bank, in 1981, Nigeria's MVA was \$33.3 billion. Afterwards, it consistently fell until it reached \$6.1 billion in 1994. Gradually, it rose again till it hit \$28.5 billion in 2007. In 2008, it fell drastically to \$21.9 billion, and later rose to a peak of \$60.8 billion in 2015. Later on it fell and ever since has been on a downward trend. In 2018, the manufacturing value added was \$30.9 billion which was the exact figure for 1982. A close examination of the growth trajectory of the manufacturing value added suggest that periods of rise in MVA coincide with periods in spike in global oil prices and periods of fall in MVA coincide with periods of fall in global oil prices. This portrays the fact that Nigeria heavily relies on proceeds from crude since it gained independence in 1960.

For instance, in 2008, a barrel of crude oil was sold for an average of 141 dollars. However, it dropped significantly to \$41.68 in January 2009. The same trend was seen between July 2014 and January 2015 as well as 1985. Certain scholars have argued in the literature that the structural adjustment programme of 1986 really led to collapse of the real sectors, that is the agricultural sectors and the manufacturing sectors and by implication food insecurity and unemployment. In fact, if value of the MVA is interpreted as a percentage of Gross domestic product, the outlook of the manufacturing sector performance becomes more unpleasant. In 1981, the contribution of the MVA to the gross domestic product was about 20.3% of Nigeria's GDP. Afterwards, in 2010, the sectors contribution to GDP has dropped

drastically to about 6.55% which was an all-time low. It later began to increase gradually until it got to about 9.5% in 2014. Ever since, it has been on a downward trajectory.

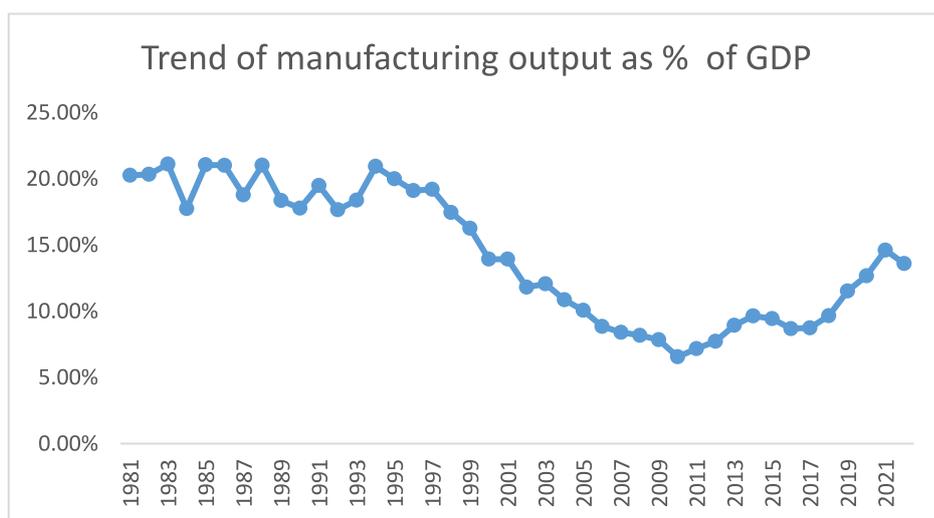
Comparatively, according to world bank data which contains the MVA of over 218 countries including those of 53 African countries, there are 18 African countries with available data from 1960 including Nigeria. It is very unfortunate that Nigeria is the only African country among the 18 African country with data from 1960 that has been experiencing consistent negative growth in the manufacturing sector over the years. For instance, Uganda has the highest rate of over 8.9% with an increment in MVA from 25million dollars to 2.3billion dollars in 2018, Zimbabwe experienced about 5.5 percent while Nigeria has the lowest rate of negative 7.3 percent.

Figure 3: Trend of manufacturing sector output in Nigeria



Source: Central Bank of Nigeria (CBN) 2024 Database.

Figure 4: Trend of manufacturing goods output as a percentage of GDP



Source: Central Bank of Nigeria (CBN) 2024 Database.

3.0 Methodology

3.1 Data Sources and Description

This study adopts quarterly data (1996 to 2024) from the World Trade Integrated Systems (WITS) 2024 database and the Central Bank of Nigeria (CBN) 2024 database. Capital goods import will be gotten from WITS database while other variables such as national income, exchange rate, inflation rate, trade openness and manufacturing output growth will be gotten from Central Bank of Nigeria (CBN) 2024 database.

3.2 Analytical Techniques

The study adopts the Autoregressive Distributive Lag Model (ARDL) model. It is a versatile econometric approach widely used to examine both short-run and long-run dynamics among time series or panel variables, regardless of whether the underlying variables are purely I(0), purely I(1), or a combination of both, provided none are I(2). Developed by Pesaran and Shin (1999), the ARDL framework offers advantages over traditional cointegration techniques by allowing for small sample sizes and incorporating lagged dependent and independent variables to capture dynamic adjustments. This method involves estimating an unrestricted error correction model (UECM), which enables the decomposition of long-term equilibrium relationships and short-term fluctuations, making it particularly suitable for this study.

Therefore, the study models the determinants of capital goods imports using equation 1 below;

Short-run model

$$Y_t = \beta_0 + \sum_{i=1}^p \alpha_i Y_{t-i} + \sum_{j=0}^q \lambda_j X_{t-j} + \varepsilon_t \quad 1$$

p, q = lag lengths for the dependent variable and a set of explanatory variables.

Where Y is (capital goods imports as a percentage of GDP)

X is a set of explanatory variables such as inflation rate, exchange rate, national income and domestic investment

Long-run model

After establishing cointegration, the long-run relationship can be expressed as:

$$Y_t = \pi_0 + \pi_1 X_t + \mu t \quad 2$$

π_1 represent the long run effect of the set of explanatory variables on capital goods import

Furthermore, the manufacturing sector growth is modelled as a function of capital goods imports and other control variables such as domestic investment, GDP, inflation and population growth. This can be expressed as:

Short-run model.

$$Y_t = \beta_0 + \sum_{i=1}^p \alpha_i Y_{t-i} + \sum_{j=0}^q \lambda_j X_{t-j} + \sum_{k=0}^r \gamma_k Z_{t-k} + \varepsilon_t \tag{3}$$

Where

p, q, r = lag lengths for the dependent variable, main independent variable, and the set of control variables, respectively.

Y is (Manufacturing sector performance)

X is capital goods imports

Z is a set of control variables such as inflation rate, exchange rate, GDP and domestic investment

Long-run model

After establishing cointegration, the long-run relationship can also be expressed as:

$$Y_t = \pi_0 + \pi_1 X_t + \pi_2 Z_t + \mu_t \tag{4}$$

π_1, π_2 represent the long-run effect of capital goods import and control variables.

The main goal of using the Autoregressive Distributive Lag Model in equation 3 and 4 is to determine if capital goods imports and the expansion of Nigeria's manufacturing sector are related over the long term.

Table 1: Variable Description

Variable	Description	Role of the Variable	Unit of measurement	Expected Sign	Source
Capital goods import	The value of capital goods imported into Nigeria	Dependent variable/Independent Variable	US dollars	+ as an independent variable	World Integrated Trade System (WITS) data base (2024)
Manufacturing sector Value added	percentage of Nigeria's GDP that comes from the manufacturing sector	Dependent Variable	Percentages		CBN data base (2024)
Domestic investment	Private sector investment as a percentage of GDP	Control variable	Percentages	+	CBN data base (2024)
Population growth	Annual percentage change in population growth of Nigeria	Control variable	Percentages	+	World data.info database (2021)
Inflation rate	Percentage growth rate of CPI	Control variable	Percentage	-/+	CBN data base (2024)
Exchange rate	Domestic currency per foreign currency	Control variable	Log of domestic currency per unit of foreign	-/+	CBN data base (2024)
Gross domestic product	Total value of goods and services produced in the country	Control variable	Log of billions of dollars	+	CBN data base (2024)

Source: Author's conceptualization

4.0 Results and Discussions

This section discusses the unit roots, Cointegration test and ARDL results of the determinants of capital goods imports in Nigeria and the effects of capital goods imports on manufacturing sector performance in Nigeria.

4.1 Unit Root Test

The Augmented Dickey Fuller unit root tests were used to examine the degree of stationarity of the variables. The results revealed that the inflation rate, exchange rate, and capital goods import are not stationary at level that is, the series are integrated of order 1. Meanwhile gross domestic product, manufacturing sector productivity and domestic investment are stationary at level implying that the series are a combination of stationary and non-stationary series.

Table 2: Stationarity Tests

Variables	Probability value	Level of stationarity
Inflation rate	0.17	I(1)
Exchange rate	0.18	I(1)
Gross domestic product	0.04	I(0)
Domestic investment	0.02	I(0)
Capital goods import	0.2	I(1)
Manufacturing Sector Performance	0.03	I(0)

Source: Author's Computation

The study first examined the degree of stationarity among the variables, and then it performed the ARDL bound test for co integration to ascertain whether the variables display a long-term relationship. The findings in table 3 below demonstrate that, when capital goods import is utilized as the dependent variable, the F-statistics is lower than the lower bound I (0) implying that the variables do not exhibit a long-term relationship, which validates the choice of the linear ARDL model estimation.

Table 3: ARDL Bound Test

Dependent variable: Capital goods import				
Test statistic	Value	Significance	I(0)	I(1)
F-statistic	1.513	10%	1.87	3.04
K	7	5%	2.48	2.83
		2.5%	2.92	3.32
		1%	2.97	3.97

Source: Author's Computation

4.2 Determinants of Capital goods import in Nigeria

The sub section made an effort to look into the variables that have a major impact on Nigerian imports of capital goods. Initially,

4.2.1 ARDL Results

The ARDL model was estimated in order to empirically examine the factors that significantly determine the importation of capital goods in Nigeria. The results of the Linear ARDL model reveal that domestic investment positively and significantly determines the importation of capital goods into Nigeria both in the long run and short run. This implies that when there is an increase in the level of domestic investment in the country, firms will have available funds to import capital goods into Nigeria. Furthermore, exchange rate negatively and significantly determines the importation of capital goods into Nigeria. Since exchange rate is quoted as domestic currency per foreign unit, a depreciation in exchange rate means an increase in domestic currency per unit of a foreign currency. By implication, when exchange rate increases, the amount of naira needed to purchase forex for capital goods importation increases thus negatively affecting the quantity of capital goods to be imported other things being equal. Meanwhile, inflation determines the importation of capital goods in the short run. However, inflation does not significantly determine capital goods import in the long run. A likely explanation could be that in the short run, the immediate effects of inflation would affect the revenue base of the domestic firms as such reduce the available funds being budgeted for capital goods importation. However, in the long run, the firms will have adjusted by either increasing the prices of their commodities or any other variable. If such decisions are taken in the long run, the firm can then adjust and thus have available funds to import capital goods. This is the reason inflation does not affect firms' capital goods importation in the long run.

Table 4: ARDL Results of factors that determine capital goods import

Dependent variable: Capital goods import	
Variables	Coefficients
Lag of capital goods import	0.418*** (0.003)
Log Exchange rate	-0.319*** (0.01)
Log of Exchange rate (-1)	-0.47*** (0.013)
Inflation	0.561 (0.444)
Inflation (-1)	0.561*** (0.144)
Domestic investment	0.421*** (0.117)
Domestic investment (-1)	0.418*** (0.121)
Log of Gross domestic product	0.555*** (0.061)
Log of Gross domestic product (-1)	0.945 (0.333)
Constant	0.312*** (0.011)

Note: ***, **, * represent 1%, 5% and 10% respectively.

Source: Author's Computation

4.3 Imports of capital goods' effects on the productivity of the industrial sector

The results of the stationary test of the variables are displayed in table 2 above. The ARDL bound test was used in the study to evaluate if the variables to be estimated show a long-term link after examining the degree of stationarity of the variables. Table 6 below shows the results. When productivity in the manufacturing sector is employed as the dependent variable, the F-statistics is less than the lower bound I (0), suggesting that there is no long-term association between the variables that need to be looked into. This demonstrates why the linear ARDL model was selected, and as a result, the error correction parameter will not be included in the results estimation.

Table 5: ARDL Bound Test

Dependent variable: manufacturing sector productivity				
Test statistic	Value	Significance	I(0)	I(1)
F-statistic	1.513	10%	1.87	3.04
K	7	5%	2.48	2.83
		2.5%	2.92	3.32
		1%	2.97	3.97

Source: Author's Computation

4.3.1 ARDL Results

The study then proceeds to investigate the effects of capital goods imports. The results in table 6 below reveals that capital goods import positively and significantly influence manufacturing sector performance. This suggests that capital goods availability in the domestic economy is essential to the productive and successful operation of Nigeria's manufacturing sector. Furthermore, a nation should promote the importation of capital goods if it hopes to boost the growth of the manufacturing sector, which is essential for overall economic expansion.

Meanwhile, population growth and domestic investment exhibit positive and significant relationship with manufacturing sector performance. This means that population growth which signifies labour supply because in Nigeria, a large proportion of the population falls within the labour force. Therefore, this increased labour supply will lead to increased growth in the manufacturing sector. Although, availability of capital goods especially sophisticated leads to reduced labour, however, Nigeria has not been proactive in the importation of capital goods and as such labour supply still significantly affected manufacturing sector performance.

In the same vein, domestic investment positively and significantly manufacturing sector performance in the long run. This suggests that higher levels of domestic investment result in higher levels of performance in the manufacturing sector. Increased domestic investment by businesses imply that money will be available to buy capital goods for the economy, which will inevitably improve the manufacturing sector's performance. Similarly, the performance of Nigeria's manufacturing sector is favorably and considerably influenced by the country's gross domestic output. This implies that as the gross domestic product increases, there is available national income to provide support for manufacturing firms in Nigeria. In addition, an increased GDP signifies an increase in the total value of goods and services produced which also implies improvement in the availability of funds availability in the economy as a whole. This will invariably stimulate domestic demand for domestic products and lead to improved manufacturing sector performance. However, inflation exhibits a negative and significant relationship with manufacturing sector performance in Nigeria. This implies that as inflation increases, manufacturing sector performance decreases. This could be as a result of the fact that when inflation, purchasing power of consumers reduce and as such there is a decrease in the amount

of manufactured goods that can be bought. By implication, there will be decrease in the amount of sales of the manufacturing firms and their profits and as such there will be a decline the overall performance of the manufacturing sector.

Table 6: ARDL Results of determinants of manufacturing sector performance

Dependent variable: manufacturing sector productivity	
Variables	Coefficients
Lag of manufacturing sector productivity	0.418*** (0.003)
Capital goods import	0.319*** (0.01)
of Capital goods import (-1)	0.47*** (0.013)
Log of Gross domestic product	0.512** (0.201)
Log of Gross domestic product (-1)	0.421 (0.117)
Inflation	-0.418*** (0.121)
Inflation (-1)	-0.555 (0.061)
Domestic investment	0.654*** (0.111)
Population growth	0.414*** (0.123)
C	0.525* (0.333)

Note: ***, **, * represent 1%, 5% and 10% respectively.
Author's Computation

5.0 Conclusion and Policy Recommendations

This section discusses the conclusion and policy recommendations of this study.

5.1 Conclusion

The study investigated the effects of capital goods import on the performance of the manufacturing sector in Nigeria. Data from several sources such as World Integrated Trade Solution (WITS), Central bank of Nigeria database and World dat.info database. The study adopted the Autoregressive distributive lag model to investigate the factors that influence capital goods import in Nigeria.

First of all, the study explored the trend analysis of capital goods import. The results reveal that both the values of capital goods import and its percentage to the GDP have been fluctuating. In fact, the percentage of capital goods import to GDP has not experienced any significant change. This implies that periods of increased capital goods importation experienced increased GDP and increased percentage of Capital goods to GDP. A useful conclusion could be a major factor needed to stimulate growth in Nigeria is increased capital goods importation. Also, a close examination of the growth trajectory of the manufacturing value added suggest that periods of rise in MVA coincide with periods in spike in global oil prices and periods of fall in MVA coincide with periods of fall in global oil prices. This portrays the fact that Nigeria heavily relies on proceeds from crude since it gained independence in 1960. As such, there is no assurance that the country will be able to achieve the Sustainable Development Goal 8 – achieving greater levels of economies of scale through diversification, innovation and value addition in sectors that require more labour.

Meanwhile, the study further explored how those factors also affect the manufacturing sector performance in Nigeria. The results reveal that capital goods import positively and significantly influence manufacturing sector performance both in the long run and short run. In the same vein, In the same vein, domestic investment positively and significantly manufacturing sector performance in the long run. This implies that increase in domestic investment leads to an increase in manufacturing sector performance. Similarly, the gross domestic product positively and significantly influences the performance of the manufacturing sector in Nigeria. This implies that as the gross domestic product increases, there is available national income to provide support for manufacturing firms in Nigeria. However, inflation exhibits a negative and significant relationship with manufacturing sector performance in Nigeria. This implies that as inflation increases, manufacturing sector performance decreases. Also, exchange rate negatively and significantly determines the importation of capital goods into Nigeria. Since exchange rate is quoted as domestic currency per foreign unit, a depreciation in exchange rate means an increase in domestic currency per unit of a foreign currency.

In addition, the factors that determine capital goods import itself are exchange rate, domestic investment and gross domestic product. Exchange rate depreciation negatively affects the importation of capital goods in Nigeria. Furthermore, domestic investment and gross domestic products positively and significantly influences capital goods import in Nigeria. This implies that if capital goods import will be increased, exchange rate should be managed appropriately since Nigeria is highly disadvantaged in the production of capital goods.

5.2 Policy Recommendations

The following are the policy recommendations that are derived from the findings of this study

- The central bank of Nigeria should ensure proper management of the exchange market so as to stabilize the domestic currency against the foreign currency especially foreign currencies of countries Nigeria imports from since Nigeria has comparative disadvantage in production of capital goods. This is because it is clear from the study that exchange rate depreciation of the domestic currency against the foreign currency negatively affects the performance of the manufacturing sector in Nigeria
- The central bank of Nigeria, National bureau of statistics and ministry of finance should ensure that inflation rate is properly managed because an increase in inflation adversely affects the performance of the manufacturing sector.
- The federal government through the Central bank of Nigeria, Ministry of Finance and Customs should ensure that policies that encourage the importation of capital goods are implemented. Policies such as removing or reducing duties on capital goods imports, providing grants for firms that need capital goods and so on.
- The Central bank of Nigeria, Development bank of Nigeria and other financial institutions should create policies such as reducing interest rate so that firms can have access to funds to boost domestic investment. This is because increase in domestic investments will boost the revenue of domestic firms which will in turn make funds available for capital goods import. As capital goods import increases, other things being equal, performance of the manufacturing sector will increase.
- Overall, policies that can boost economic growth should be encourage as it is clear that increased gross domestic product implies increase in national income which in turn will translate to increase in domestic demand for manufactured products. Policies such as expansionary monetary and fiscal policies should be encouraged while inflation should be managed concurrently.

References

- Aghion, P. and P. Howitt. (1992). A model of growth through creative destruction. *Econometrica*, 60(3): 23–51
- Aghion, P., & Howitt, P. (1988). Growth and Cycles Through Creative Destruction. Mimeo, MIT.
- Alfaro, L., & Chen, M. (2020). Selection and market reallocation: Productivity gains from multinational production. *American Economic Journal: Economic Policy*, 12(2), 1–38. <https://doi.org/10.1257/pol.20170664>
- Amiti, M., & Konings, J. (2020). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *American Economic Review*, 110(12), 3570–3606. <https://doi.org/10.1257/aer.20190735>
- Arawomo, D. F. (2014). Export performance and economic growth in Nigeria's manufacturing sector. *Journal of Economics and Sustainable Development*, 5(4), 12–23.
- Arrow, K. J. (1962). The economic implications of learning by doing. *Review of Economic Studies*, 29(3), 155–173. <https://doi.org/10.2307/2295952>
- Bahar, D., Rapoport, H., & Turati, R. (2022). Migration, knowledge diffusion, and the comparative advantage of nations. *Economic Journal*, 132(647), 1–28. <https://doi.org/10.1093/ej/ueab058>
- Central Bank of Nigeria (CBN). (2023). *Annual economic report*. Abuja: CBN.
- Cirera, X., Comin, D., & Cruz, M. (2021). Bridging the technology gap in developing countries. *World Bank Research Observer*, 36(2), 1–29. <https://doi.org/10.1093/wbro/lkab002>
- Cust, J., & Mihalyi, D. (2022). Evidence for a presource curse? *Energy Policy*, 107, 427–437. <https://doi.org/10.1016/j.enpol.2017.04.025>
- DeLong B., & Summers, T. (1991). Equipment Investment and Economic Growth. *Quarterly journal of economics*. 106(2):445-502.
- Fernandes, A. M., Freund, C., Pierola, M. D., & Denisse, P. (2023). Importing, innovation, and firm productivity in developing countries. *World Economy*, 46(5), 1357–1386. <https://doi.org/10.1111/twec.13322>
- Frankel, J. A. (2019). The natural resource curse: A survey. *Oxford Review of Economic Policy*, 35(2), 205–230. <https://doi.org/10.1093/oxrep/grz014>
- International Monetary Fund (IMF). (2021). *Macroeconomic Policy Frameworks for Resource-Rich Developing Countries*. IMF.
- International Monetary Fund (IMF). (2022). *Botswana: Selected Issues Paper*. IMF.
- International Monetary Fund (IMF). (2023). *World Economic Outlook: Navigating Global Divergences*. IMF.

- Lucas, R. E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22(1), 3–42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7)
- Manufacturers Association of Nigeria (MAN). (2024). *Manufacturing Performance Report*. Lagos: MAN.
- National Bureau of Statistics (NBS). (2022). *Research and Development Expenditure Statistical Bulletin*. Abuja: NBS.
- National Bureau of Statistics (NBS). (2023). *Nigerian Gross Domestic Product Report (Q4 2023)*. Abuja: NBS.
- National Bureau of Statistics of China. (2022). *Statistical Communiqué on National R&D Expenditure*. Beijing.
- National Planning Commission. (2021). *National Development Plan 2021–2025*. Abuja: Federal Government of Nigeria.
- OECD. (2017). *OECD Science, Technology and Industry Scoreboard 2017: The Digital Transformation*. OECD Publishing. <https://doi.org/10.1787/9789264268821-en>
- OECD. (2022). *Digital Economy Outlook 2022*. OECD Publishing. <https://doi.org/10.1787/b2d99612-en>
- OECD. (2023). *OECD Science, Technology and Innovation Outlook 2023*. OECD Publishing. <https://doi.org/10.1787/0bb305e0-en>
- Ojo, O. E., Ogunleye, E. O., & Segun, A. A. (2021). Technology Adoption and Productivity Growth in Nigeria's manufacturing firms. *African Development Review*, 33(4), 563–578. <https://doi.org/10.1111/1467-8268.12512>
- Romer, P. M. (1986). Increasing Returns and long-Run Growth. *Journal of Political Economy*, 94(5), 1002–1037. <https://doi.org/10.1086/261420>
- Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy*, 98(5), S71–S102. <https://doi.org/10.1086/261725>
- Topalova, P., & Khandelwal, A. (2018). Trade liberalization and Firm Productivity: The Case of India. *Review of Economics and Statistics*, 100(2), 1–15. https://doi.org/10.1162/rest_a_00677
- UNCTAD. (2021). *State of Commodity Dependence 2021*. United Nations.
- UNESCO Institute for Statistics. (2018). *Global Investments in R&D*. Montreal: UNESCO.
- World Bank. (1993). *The East Asian miracle: Economic Growth and Public Policy*. Oxford University Press.
- World Bank. (2020). *Productivity Growth in Developing Countries: The Role of Technology Diffusion*. World Bank.

World Bank. (2022). *World Development Report 2022: Finance for an Equitable Recovery*. World Bank.

World Bank. (2023). *Digital Economy for Development: India Country Diagnostic*. World Bank Group.

World Bank. (2024). *World Development Indicators*. Washington, DC.