

Trade Policy and Productivity Growth: Why Do Sudanese Manufacturing Firms Export Less

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Abstract: This paper aims to study the role of trade policy on industrial development and productivity growth. We analyze the relationship between trade policy and productivity growth of manufacturing firms in Sudan. For this work, we evaluate the previous trade policy instruments that implemented between 2000 and 2022. The study finds that Sudan's trade policy has significant positive effects on manufacturing firms' productivity. The study reveals that manufacturing firms offer the largest scope for productivity gains through trade policies aiming at enhancing economic growth. The study also found there was a weak support for investment promotion and tariff protection. This study recommends that building a proper trade policy to support manufacturing firms and adopt new technologies and focusing on labor intensive industries are the key success to sustain productivity growth and enable manufacturing firms' export.

Keywords: productivity growth; trade policy; manufacturing firms

1. Introduction

Increasing the participation of manufacturing firms in trade is one of the main concerns globally. It is considered the most challenging policy-making face in developing countries particularly after adopting the conventional economic policies known as the Washington Consensus, which disappointed the countries that implement these policies. As a result, many developing countries including Sudan tried to restructure its production capacities in a way to explore sectors offer better prospects for economic growth.

In this paper we argue that properly govern industrial policy, in particular trade policy may enhance productivity growth. We explore how trade policy tools affect the productivity growth in manufacturing firms in Sudan during the last two decades. We also evaluate a number of trade policy instruments and its effectiveness in sustaining productivity and stimulating economic growth.

Many theoretically and empirical studies on Sudan's economy did not count for productivity in manufacturing firms, including [1,2]. Yet, some of the empirical findings conclude that Sudanese agro-industries firm's lack of innovation capabilities and misallocation resources. For example [3] find that there is absence of linkages among manufacturing firms to knowledge and research and development (R&D) organizations and the volume of exports by manufacturing firms are relatively small to agricultural firms [4] pointed out that the relationship between productivity growth and export performance should be based on two hypotheses when it comes to compare the productivity growth between exporters and non-exporters firms. The first hypothesis was Self-selection, where firms chose to export and engage in international markets [4]. The second hypothesis was

adopted by many firms, learning by exporting as a source of growth and enabling firms to become more productive [3,5] This suggests that some manufacturing firms may have venerable to international markets and spillover effect.

We view the productivity of manufacturing firms as potentially support economic growth. We also illustrate that with available data productivity of manufacturing firms can be readily taken into account in the estimation. We assess the trade policies in Sudan and its effectiveness on productivity growth for manufacturing firms to be able to engage in international trade. Our focus is on total exports of manufacturing firms after stagnant of manufacturing exports since 2012 started to grow in 2020s. The role of government is to facilitate and correct policy failure such as business environment; real exchange rate changes, poor infrastructure services, high transaction costs that face most of manufacturing firms particularly exports.

A large body of literature has sought to identify the main causes of declining of Sudanese economic growth trends, the impacts of the independence of South Sudan, agro-industries development, and economic sanctions on Sudanese macroeconomic performance [3,6] promoting bilateral trade between Sudan and South Sudan [7]. The size of the manufacturing sector in Sudan is relatively small and production is highly concentrated in a few sub-sectors, where there are 90% of all registered businesses are in the capital Khartoum. The Sudanese manufacturing sector can be classified as a low degree of linkages, very few manufacturing firms have entered foreign markets and most of the intermediates and raw materials are exporting from abroad.

To document the potential complimentary between trade policy and productivity growth, we use descriptive dataset to analyze data on manufacturing firms, its exports to show productivity growth, good and lack of trade policy instruments and institutions. We first show at firm level that manufacturing firms are export less relevant to their production growth. Then, drawing upon the sartorial level we can use regulations and government subsidies, growth, export ratios variables to identify the casual effect of trade policy on productivity. We interpret the results as evidence that the development status, economic relations with rest of the world may cause economic to decline. We also show that good institutions, firms' experience in international markets affect its productivity and growth.

Most closely related to our analysis is the paper by [8,9] using cross-country industry-level panel date. They investigate whether international trade could enhance countries' economic growth and productivity growth in long-run. They found that productivity growth is positively affected by tariff protection and skills intensive. An important yet unexplored question lies at the intersection between these two literatures: why Sudanese manufacturing firms export less. Is it due to degree of the influence of trade policy? Is it due to the commodities that Sudan specializes in, which manufacturing firms tend to be a capital-intensive sector? Or is it some other challenges within manufacturing firms, particularly management or lower quality of products. This paper sets out to increase our understanding of productivity growth of Sudanese manufacturing firms by examining the effectiveness of trade policy in productivity and economic growth. This study seeks to answer the fundamental question why do Sudanese manufacturing firms export less? (1) What relationship do exports have on productivity growth? (2) What trade policy is needed to achieve economic growth? Based on these questions, this study contributes to the literature especially from Sudan's context.

This paper aims to make several contributions. First, whereas previous research has focused on agricultural exports and growth, we argue that researchers and policymakers should also consider the impacts of trade policy on manufacturing exports. There is a lack of literature in analyzing the effect of trade policy instruments in productivity. We focus on the link between productivity growth and trade policy. Second, this study contributes to literature by providing the first evidence on the role of Sudanese manufacturing firms and productivity growth in enhancing the economic growth. Third, we investigate why Sudanese manufacturing firms export less? And understand the impact of policy interventions on manufacturing firms' success and growth. Previous research has focused on explaining the progress of economic development [6,10] protection and productivity growth [4, 11, 12] exporting agricultural commodities [13] the impacts of elimination trade flows on Sudanese economy analysis of trade policies, external shocks, and economic sanctions [2]. However, we argue that these studies are narrowly focused and limited; research on the impacts of trade policy on productivity growth and exports need to consider a more comprehensive aspect that helps manufacturing firms increase the exports volume and

compete in international markets.

Drawing on a vast theoretical and empirical literature, we adopt the view that in order for manufacturing firms to engage in international trade, it needs to engage in both explorative and exploitative learning in the means that, besides the frequently experimenting research and development (R&D) functions, firms need to reduce variability, increase efficiency and control in their process management efforts through strengthening manufacturing capabilities. However, this view is not a position shared by many researchers [2,13].

The study results show that Sudan's trade policy has a significant effect on productivity growth and enhancing economic growth. Moreover, there was a weak support for investment promotion and tariff protection on manufacturing firms' productivity.

This paper attempts to investigate the impacts of trade policy on productivity growth and determinants exports of manufacturing firms in Sudan. This study is structured as follows. Section two interrogates earlier literature on industrial and trade policies. Section three clarifies research methodology. Section four presents the historical background on industrialization in Sudan. An empirical analysis and interpretations are presented in section five. Section six draws conclusion and some implications.

2. Related Literature

Since eighteen century there has been debating over trade policy practices between by [14,15] a debate that supports taken measures to protect new industries in Germany and the United States against more competitive industries from the United Kingdom. Since then, there have been mix theoretical and empirical evidences on success and the failure of industrial policy practices. For instance, neoclassical economic theory argues that selective industrial policies caused distortion the market efficiency, where firms find some difficulties in competing in the market. Undertaking innovation become the main drivers for productivity and economic growth. However, in the late 1960s and early 1970s many developing countries adapted import substitution policies were failed to create competitiveness environment after trade liberalization and most of these industries were inefficient [16,17] claimed that import substitution did not work well in the Latin American countries. The failure of these policies can be justified to the lack of economies of scale and the selected industries which were not suitable to their development stages.

The debate over the role of trade in enhancing national economy dates back to the 18th century between Adam Smith and David Ricardo. After the much heard debate after the Second World War two, the debate on building international organization that governs and regulates trade has emerged and many countries started to trade each other under the World Trade Organization (WTO). However, many countries benefit from this organization and initiate export-oriented policy by pursuing a liberation trade known as the Washington Consensus [18–20] This has led the governments of many countries to step in and try to alter the structure of production in favor of sectors that are expected to offer better prospects for economic growth in a way that would not occur if they operated under market forces.

Economic development theories emphasis there is debates on the role of trade policy in achieving the expected development. For instance, the Ricardian model of international trade has long been considered as a useful tool to stimulate growth and national welfare. The model ignores the role of economies of scale and took in account the gain from trade through specialization in a particular product, which allows a country to allocate its scarce resources to more efficient sectors. (2003) argue that only through exports countries may reach the relatively high productivity. The neoclassical growth model, which consider technological change as exogenous variable often argue that trade policies do not have impacts on economic growth [21]. However, the new economic growth theories opposite the neoclassical growth models in the fact that technological change is associated with trade policies.

On one hand the endogenous growth theory argues that production capability of firms heavily depends on amount of knowledge stock in the economy. On the other hand trade theory suggests by investing in R&D and upgrading skills, firm will be able to achieve economies of scale and compete internationally [6]. Economic growth can be sustained in the long run if a country expands the promising sectors [22]. Through engaging in the international trade, the technological spillovers can be achieved. When a country having access to forging's

intermediate and capital goods, firms will be able to transfer technology by adopting from the best practices from foreign competitors [11].

For the Least Development Countries (LDCs) like Sudan often have constraints in finance and technology, trade may affect growth in a country has a dynamic comparative advantage in specific sectors, it will affect the productivity growth in the long-run [21,23,24]. Similarly, [25] argue that international trade enhances economic growth in long-run depending on the level of economic development in a country. The impacts of trade on growth are found to be positive in advanced economies and have negative effects on LDCs ones [26].

What are the effects of trade policy on productivity growth in the Sudanese manufacturing firms? Previous work on the link between trade and growth is recognized by international trade theory, which suggests that there could be both dynamic and static effect from trade. It also identified from macroeconomic level (exports and imports) and microeconomic level (firm productivity). Different channels can trade impacts productivity, the economies of scale, market competition, allocation of resources, and technical spillovers.

International trade removes the constraints that arise from the size of the domestic market, which allows firms to produce large scales and improve labor productivity [27]. One of the issues arise here through trade liberalization there will be changes in the relative prices, which may constraint firms less efficient and have a lower investments in technology [12].

The endowment structure and comparative advantages enable countries to specialize in commodities that produce by lower cost relative to the foreign countries. Therefore, a country could allocate its resources in the sectors that use higher skills, capital intensity that create a dynamic benefit [2,28,29]. This will enforce firms use its resource efficiently to survive and the firms are less efficient would exit from the market. Firms can enter foreign markets if they have greater technological capabilities. Foreign firms with lower prices will displace domestic firms with high prices; the resources will be allocated to firms having higher efficiency and technological opportunities.

In addressing the issue of trade and productivity growth in Sudan, researchers and policymakers have found a positive association exists between productivity growth and import penetration [29, 30]. Similarly, [31] affirmed that most of the manufacturing countries experienced high economic growth due to accumulation of knowledge. Besides, other researchers argue that the hysteresis exports are strongly correlated with the sunk costs for firms to enter the foreign markets [32].

There is a growing body of literature on assessment of international trade and growth. [31] Argue that trade could enhance growth through access to imports, where firms depend on variety and quantity of intermediate goods. It often argues that increasing international competition accelerates productivity growth.

Why should we pay attention to the export performance of Sudanese manufacturing firms? Productivity growth and trade policy are arguably the most fundamental determinants of economic growth. The sustainable economic growth can be attained through accumulation of physical capital, which characterizes by diminishing returns. [30] Argue that by removing trade barriers advance productive firms increase their market shares and become more competitive.

Numerous studies employed Solow residual method to examine the relationship between productivity and exporting, this approach assumes that firms operate efficiently and have constant returns to scale [33]. In this study, we visit learning by exporting and self-selection hypotheses to examine the productivity growth and trade for Sudanese manufacturing firms for the period 1985–2018.

Nonetheless, our analysis seeks to complement with existing literature of the impacts of trade policy measures on productivity growth in Sudan. [6] attempt to investigate the impacts of economic sanctions on Sudanese economy found that Sudanese trade has been gaining a competitive advantage in Asia, Common Markets of Eastern and Southern Africa (COMESA) and Middle East and North African region (MENA), and more recently, [13,34] analyses the impacts of trade policies on agricultural exports, they used gravity model to examine the determinants of Sudanese agricultural exports. They found that population size and the importer's gross domestic product (GDP) have impacts on agricultural exports. [2] claim that the outward-oriented trade strategy does not create a clear improvement in price incentives for exports. Our approach differs from these studies in two important ways. As [6,13] focus on the trade relationship between Sudan and regional markets of

agricultural exports, while we used to extend the analysis the manufacturing exports.

3. Methods

3.1. Data

This study uses panel data from different sources. Some data were drawn from a new micro data of from manufacturing firms over the 2000, 2005, 2010, 2016, 2020) which produced by the Ministry of Industry and the Ministry of Trade in collaboration with Industrial Chambers Union and the Industrial Research and Consultancy Center (IRCC). The inherent advantages of the dataset are as follows. It is a rich dataset surveyed and covered over 860 enterprises represented 1720 observations. After carefully cleaning these dataset, we consider only 584 observations in our model. It covered all the major manufacturing sectors namely food processing, minerals, Gum Arabic and other commodities. The dataset contains the main information on exports, number of labors, capital, location, financial and economic indicators that allow to test the relationship among trade policy, productivity and export.

3.2. Empirical strategy

In this study, the standard equation of productivity determinants is used calculated by total factors productivity. This includes firm-specific factors to capture the ability of firm to participate in international trade (through exports). It also includes the uses of foreign contents, the firm's ownership, productivity improvement through Research and Development (R&D), and the skills intensity. These factors positively affected firm's productivity. Furthermore, export ratio and import penetration are used to show the impact of competition on ability of firm's production. These factors are expected to have a positive relation with firm's productivity.

Often governments used industrial policy to protect their industries. Subsidy is used as a zero-one binary dummy with equal to 1 when industry subject to subsidy charges and to capture the effect of trade policy on productivity and exports. The following equation shows our main model used in this study.

$$TFP_{it} = a_0 + a_1EXPORT_{it} + a_2OWN_{it} + a_3FORcontents_{it} + a_4RD_{it} + a_5subsidy_{it} + a_6EXPratio_{it} + a_7SKILL_{it} + u_{it}$$

Where:

TFP: Total Factor Productivity for

OWN: foreign share

FORcontents: Foreign contents

RD: Research & Development

Subsidy: Subsidy

EXPratio: export–output ratio

Skill: qualifications of employees

i^{th} represents the industry and time t .

4. Historical Background on Industrialization in Sudan

4.1. Industrial Policy

The arise of industrial revolution in Western Europe in the late nineteen century had created a new world features that divided the world nations into two parts, modern advanced (the first world) and traditional (the third world). Most of African countries including Sudan belong to the third world, which found itself after get its political independence in how to overcome this gap and thereby catching up the first world specially with a high demographic growth. Therefore, industrialization was only option of the third world to overcome economic development gap.

Sudan's industrial sector has witnessed substantial changes since independence in 1956, from import substitution industrialization, to oil industry boom and to de-industrialization. Most of the development efforts have brought industrial development among the policy priorities. For example, from 1960 Sudan started a series of strategic plans, where many industries were established such as vegetable oil, food processing. In the late

1970s, the trade policy turns toward producing Sugar. Oil industries started in late 1990s. In this section, first we show the performance of manufacturing sector for the last three decades. Then, we present key trade policy tools implemented by government. Finally, we show our understanding for these policies.

Since it is independence, Sudan has adopted different industrial policy, from import substitution industries in early 1960s, includes textiles, leather, food processing, consumer products, cement, sugar and steel industries. These industries enhanced the contribution of industrial sector in the total GDP from 25 to 8%. As a result, Ministry of industry and minerals is established in 1966. In 1967 the government issued the second investment encouragement, where the first industrial comprehensive survey was carried-out in 1970–1971 to provide policymakers in designing policies. However, during 1969 and 1985, many strategic industries were established. This includes Sugar industries and textiles industries. The years from 1986 to 1989 witnessed industrial policies stability, the productivity of sugar industries were decline from 498 thousand tons in season of 1984/1985 to 395 thousand tons in season of 1988/1989. In the years from 1992-2002, the comprehensive national strategic plan was formulated to achieve inclusive economic development. The objectives of 1997 industrial policy are as follows.

- Increase the contribution of industrial transformation in total GDP from 8 percent to 18 percent.
- Increase the contribution of industrial transformation in government revenues from 29 percent to 36 percent in 2002.
- Achieve high levels from employment in industrial sector.
- Increase the value added for all sub-sector.
- Comply with the standardization and specifications and quality assurance for industrial products.
- Attract FDI for promising industries.
- Distribute industrial firms in terms of location, sectors to achieve balance development and contribute in creating new jobs and give priority for women participation in labor market.

One of the most importance achievements for the 2002–2007 industrial policy was providing industrial sector with adequate investment climate and infrastructure, which help in gaining a competitive advantages in the domestic and international markets. More attention was given to industrial and manufacturing sector relevant to other economic sectors. There are many institutions were established to support industrialization, for instance, government attracted grants under the Ministry of Industry to provide industrial sector with finance and equipment (Industrial Financial Fund), besides developing the Sudanese Development Foundation into Industrial Development Bank and increase the capital to USD250.

Government escalates the corporate tax from 70 percent to 10 percent. The efforts also made in transfer technologies in 2000 to modernize the industrial sector. Attached all research institutes to the Ministry of Science and Technology and establishing the Industrial Training Center by collaboration with the UNIDO. These efforts were not effective due to the fragmented political parties and instability. However, since the early 2000s, which witnessed a political priority to build and initiate trade policy to transform Sudan economy by discovering oil in 1999 which considered is an only exception did over the last decades has been experiencing deindustrialization. Figure 1 illustrates the percentage of exports of the top 8th products in 2021.

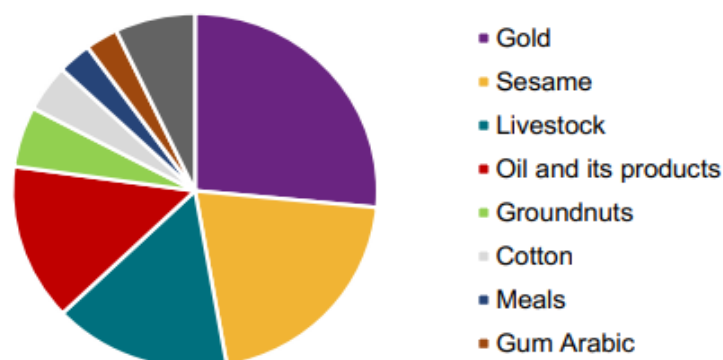


Figure 1. Percentage of exports of the top 8th products in 2021. Source: The Growth Lab at Harvard University

(2020). The Atlas of Economic Complexity.

The figure shows that livestock are the largest for Sudan's exports, followed by sesame, Gum Arabic, cotton, hides and skins, vegetables oil, hibiscus follower among other top exports in 2015. These products have potential for improving exports in the Sudan if the government supports these products. Industrial sector contains oil, minerals and extraction manufacturing, electricity, water and gas. The sector contribution to the GDP was 21.8% in 2020 and 22.2% in 2021 respectively. The industrial sector has registered a negatively growth from 2.7% in 2020 to -0.3% in 2021.

Table 1. Oil and non-oil Exports 2018–2021.

	2018	2019	2020	2021	2022
Export (FOB) US\$	3,484.7	3,734.7	3,802.6	4,379.0	3,521.1
Oil exports US\$	519.6	532.2	65.4	36.6	28.3
Non-oil exports US\$	2,965.1	3,202.5	3,737.0	4,353.4	3,492.8
Exports as % of GDP	6.5	8.8	4.3	23.9	19.2

Source: Sudanese customs Authority and Ministry Oil and Gas Data, July, 2022

Table 1 presents the oil and non-oil exports for the recent period from 2018 to 2021. It can be noted that oil exports declining from US\$519.6 in 2018 to US\$36.6 in 2021. While non-oil exports are increased dramatically from US\$2,965.1 to US\$4,353.4. As a result, the contribution of exports to the GDP increased from 6.5% in 2018 to 23.9% in 2021. Table 2 illustrates the leading manufacturing commodities exports over the period from 2018 until 2021. It can be noted that oil vegetables oil represents the top exports in terms of quantity and value as well as contribution to the GDP among export finished goods. Molasses considered as the second largest exports, followed by ethanol, cement and soft drinks.

Table 2. Leading manufacturing commodities exports 2018–2021.

	2018			2019			2020			2021			2022		
	QTY	Value	% GDP	QTY	Value	% GDP	QTY	Value	% GDP	QTY	Value	% GDP	QTY	Value	% GDP
Vegetable Oil (MT)	9,812.6	12.0	0.3	23,365.7	26.0	0.7	54,104.8	59.7	1.6	13,75.8	15.2	0.4	18,201.2	16.8	0.03
Molasses (MT)	74,558.5	7.3	0.2	11,568.2	1.2	0.0	9,416.2	0.4	0.002	851.6	0.9	0.002	881.2	0.8	0.002
Sugar (MT)	1,205.5	2.0	0.1	6,472.6	2.7	0.1	2,808.5	1.3	0.03	4,734.2	16.1	0.09	5,029.3	17.0	0.1
Ethanol, soft drinks and cement	-	11.7	0.5	-	5.3	0.1	-	14.1	0.4	64.5	4.0	0.1	69.3	0.5	0.4
Other exports (Value)	-	15.3	0.4	-	19.9	0.5	-	14.6	0.4	-	64.5	1.5	-	66.1	1.6

Sources: Sudan Central Bank, annual reports, January 10th, 2023. * includes coal, electricity and other.

It is worth examining the contribution of industrial and manufacturing sector in GDP. The manufacturing sector in Sudan has changed substantially over the three decades from 1991 until 2019. The index of Manufacturing is now close to returning to its level at the start of 2008, although many manufacturing industries have still not recovered from the recession. Instead, the recovery of the manufacturing industry has been built on the strong performance oil and petrochemical industries.

Figure 2 shows growth of manufacturing sector in the GDP and employment. The contribution of industrial sector in GDP is declined since 2008 from 27% to 22% in 2019. While the employment growth in staidly increased from 11% in 1991 to reach 17% before it declined to 16% in 2019 (The Central Bank of Sudan, 2022, the World Bank). Figure 2 illustrates the structure of Sudanese economy in terms of employment. The share of agriculture in total employment started to decrease and experienced fluctuations. For example, in 1991, the share of agricultural sector in total employment was 2.7 million workers and 2022 was 4.2 million from total workforce. The contribution of service sector in total employment was significantly increased from 1.8 million workers in 1991 to 4.8 million in 2022. The contribution of industrial sector to total employment was steadily increased from 5.8 million in 1991 to 1.4 million in 2022.

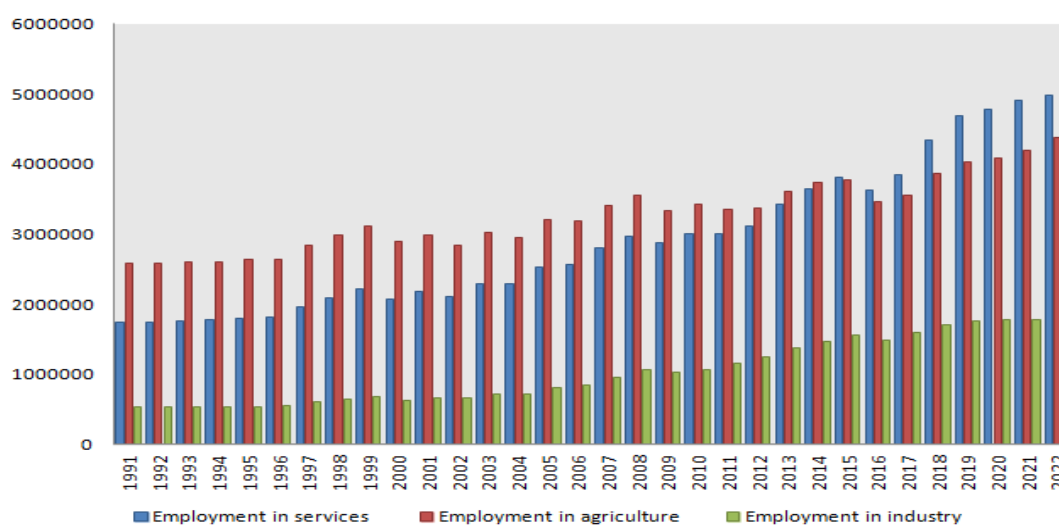


Figure 2. Structure of Sudanese Economy, 1991–2022. Source: collected by author from the World Bank and International Monetary Fund database, Aug. 2023.

It can be noted that the productivity takes similar pattern across the sector from 1992 until 2017. Since then, labor productivity in industrial sector increased by multiplier than in other sectors. However, labor productivity in service sector during the last five years was on rising, while labor productivity in agriculture and industry witnessed declined same level of 2019. Moreover, agriculture contributes to other activities in transportation, agro-industries, and general commerce across the various sectors – industrial, trade, and service – which account for a large share of the GDP. Nonetheless, the contribution to the GDP of agriculture has started to deteriorate in recent years. For instance, it fell from 48% of GDP in 1997 to 26% in 2019 (Central Bank of Sudan). During the past decade, employment in service sector increased by higher than industrial and agricultural sector.

Sudan is an agricultural country endowed with enormous resources such as arable land, animal resources, freshwater sources, and an accommodating climate that qualify the country to contribute significantly to food security in the Arab world. Petroleum extraction began in 1999, and the 20-year civil war came to an end in 2005 with the signing of the Comprehensive Peace Agreement (CPA). These factors have created a climate that is conducive to foreign investment, and there has been a considerable increase in the volume of that investment, particularly from Arab countries according to 2018 investment Act [33]. Therefore, agriculture remains an important sector in the Sudanese economy, despite its share of total exports having decreased, because of increased oil exports, from 73% in 1998 to 5% in 2008. The sector contributed an annual average of 45% to total GDP during the last ten years and, together with agriculture-related activities, employed approximately 80% of

the total labor force [6].

Figure 3 shows the contribution of economic sectors in value added. It can be noted that agricultural sector started to decline since 1998 as a result of changing the structure of the economy towards industry and service. This pattern of development encouraged many people to move towards more income sectors like service and manufacturing. During the last three years, the contribution of agricultural sector to value added was stagnant at 20 percent, while the contribution of service sector to value added decreased to 39 percent. The contribution of industry to value added was increased from 20 percent in 2018 to 24.5 percent in 2020. The figure also shows that it is largely sustained by the tertiary sector (services) which accounted for 40% of the country’s GDP in 2021.

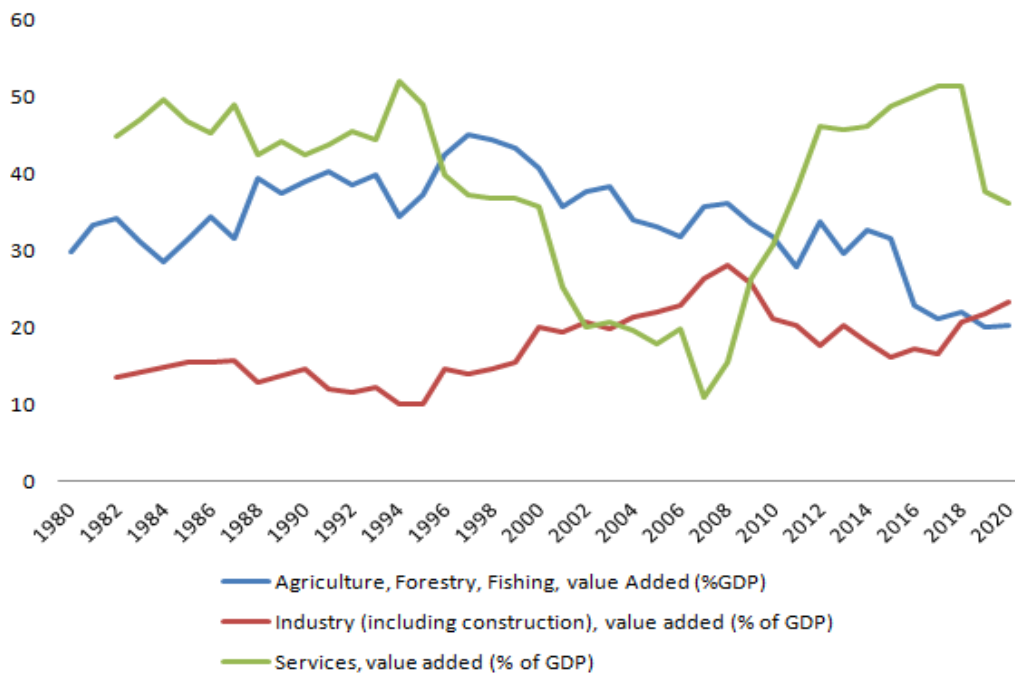


Figure 3. Value Added across economic sectors 1980–2020. Source: collected by author from the World Bank and International Monetary Fund database, Aug. 2023.

However, during the same period of analysis (2000–2022), the industry value added, which contains manufacturing but also construction and mining, has grown by 3% p.a and contribute with 32% to GDP.

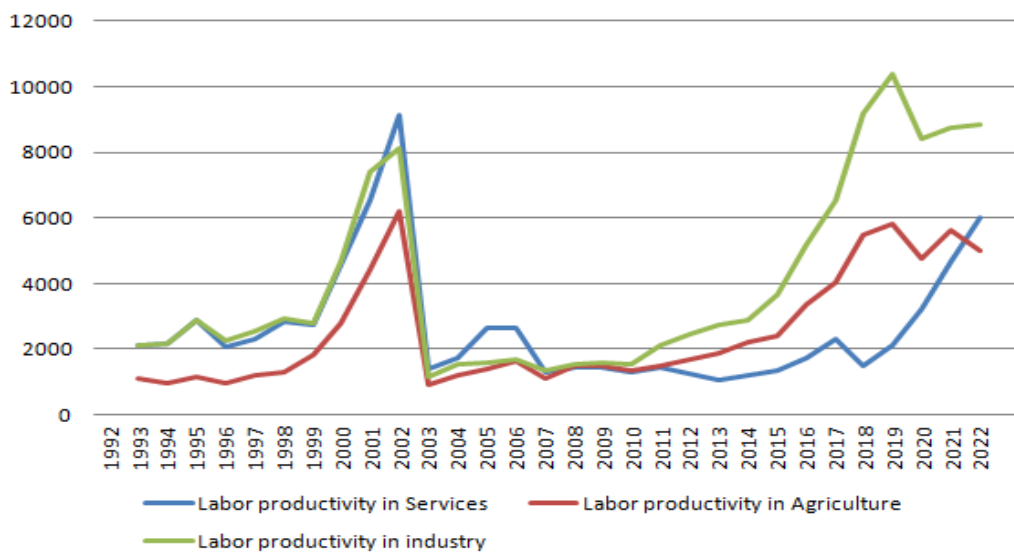


Figure 4. Sectorial Labor productivity 1992 –2022. Source: collected by author from the World Bank and International Monetary Fund database, Aug. 2023.

Figure 4 shows the sectorial labor productivity. It can be noted that the productivity takes similar pattern across the sector from 1992 until 2017. Since then, labor productivity in industrial sector increased by multiplier than in other sectors. Nonetheless, the contribution to the GDP of agriculture has started to deteriorate in recent years. For instance, it fell from 48% of GDP in 1997 to 26% in 2019 (Central Bank of Sudan).

Concerns have been raised recently about the emphasis on natural oil resources and the relative neglect of the agricultural sector – a situation reminiscent of the famous Dutch Disease. This situation results in increased pressure to import food from abroad, given the dramatic increase in food prices. The industrial sector in Sudan has been confined to its manufacturing industries, whose contribution to the economy is weak. The focus of the economy has moved clearly to the mining sector following the secession of the south from the budget due to the secession of the south, the removal of oil from Sudan's economy, and the decline of the agricultural sector. Figure 5 illustrates the exports of goods and services as percentage of the total GDP over the period from 1982 to 2020. In 1982 the total exports represent 10 percent from total GDP, then started to decline until reach its peak in 1992 3.6 percent of total GDP.

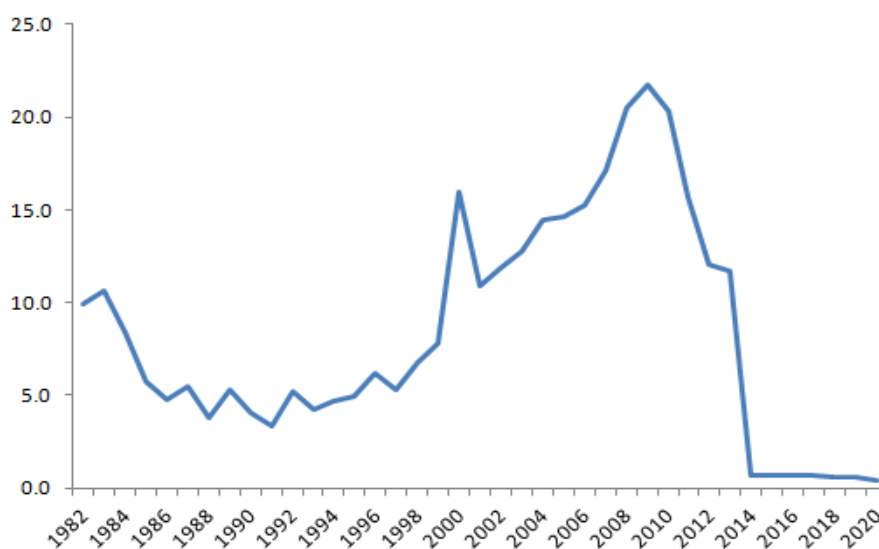


Figure 5. Exports of goods and services (% of GDP), 1982–2020. Source: collected by author from the World Bank and International Monetary Fund database, Aug. 2023.

It can be noted that from 1992 the share of exports in total GDP started to improve, it increased from 3.6 percent in 1992 to reach 22 percent in 2012 before it declined to 1.2 percent in 2014. However, since 2014, the share of exports in total GDP was stagnant at 1.2 percent.

Trade policies in Sudan have been based on import substitution for more than four decades. For example, it is now well known and documented that exporting to the foreign markets has improved the efficiency of firms through two channels: it does help exploit the economies of scale and it fosters a learning process through technology and knowledge spillover.

Trade policy in Sudan is conducted through tariff measures. Since the early 1990s, Sudanese government implements a comprehensive tariff reform to increase tariff rates from 30 percent in 1994 to 60 percent in 2001 and to 300 percent in 2012 as tariff protection granted to industries producing raw materials and intermediate goods particularly for chemicals, fertilizer, construction materials) higher than for finished goods such as food processing, pharmaceuticals). However, since the early of 2000s Sudanese government designed policy instruments promotion of exports and productive investment for state-owned enterprises to be produced locally. This includes automobile, food processing, textiles, meat process, cement and steel industries. In 2022, gold represents 70 percent of Sudan total exports up from 25 percent in 2018; livestock was 25 percent up from 13.3 percent besides sesame, oil, Gum Arabic and cotton.

5. Empirical Results and Interpretation

The main aim of this study was to investigate the impacts of trade policy in productivity growth for manufacturing firms in Sudan, discuss the source of manufacturing export and illustrate a historical background of industrial policy implemented by policymakers over the past decades. In this section, the main findings are presented to show the factors influencing productivity growth in manufacturing firms and trade policy in Sudan for the period from 1990 to 2022. First, we present the factors influence productivity and trade policy of Sudanese manufacturing. Then, we present a brief interpretation of statistical analysis on factors influence productivity and dynamic economies of Sudanese manufacturing firms. Finally, the results of econometric analysis presented, this include findings on factors influence productivity and the effect of subsidies of Sudanese manufacturing firms.

5.1. Factors Influencing Productivity and Trade Policy of Sudanese Manufacturing

The results in Table 3 show the significant at 5% indicated by t-statistics. All the coefficients are statistically significant except R&D and skill, which could be explained by the narrow definition of R&D and skill. Besides this, and often manufacturing firms tend to lower their true efforts on R&D expenditures.

Table 3. Factors influence productivity and trade policy of Sudanese manufacturing.

	Coefficient	t-stat
Intercept	9.82***	86.2
OWN	0.26*	1.84
FORcontents	0.003*	1.76
RD	0.18**	4.64
ExPratio	0.005*	1.51
Skill	-0.19***	-4.6
FDI	0.000261	1.5
No. Obs.	584	
Chi-sq (p-value)	7.96 (0.00)	

OWN: foreign share, FORcontents: Foreign raw materials, RD: Research & Development, Subsidy: Subsidy, ExPratio: export–output ratio, and Skill: labor qualifications. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance of one tail test; t-stat is derived from the robustness SE.

It can be noted that the productivity (using value added) has a positive and statistically significant effect on export at (0.005). Foreign contents and foreign direct investment have significantly impact on productivity.

5.2. Factors Influencing Productivity and Dynamic Economies of Sudanese Manufacturing

Table 4. Factors influence productivity and Dynamic Economies of Sudanese manufacturing.

	Coefficient	t-stat
Intercept	9.8154***	86.2
OWN	0.025*	1.76
FORcontents	0.003*	1.65
RD	0.175**	4.55
ExPratio	0.005*	1.53
Skill	-0.187***	-4.58
No. Obs.	584	

Cont.		
	Coefficient	t-stat
Chi-sq (p-value)	7.26 (0.00)	

OWN: foreign share, FORcontents: Foreign raw materials, RD: Research & Development, Subsidy: Subsidy, ExPratio: export–output ratio, and Skill: labor qualifications. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance of one tail test; t-stat is derived from the robustness SE.

The results in Table 4 show that the skill was negative and statistically was insignificant. This can be explained by the dynamic gain may be because the benefit obtained by firms from hiring skilled workers.

5.3. Testing the Factors Influencing Productivity and the Effect of Subsidies of Sudanese Manufacturing

Table 5 illustrates the coefficients and z-statistics of the impacts of trade policy on productivity growth and ability of manufacturing firms to export. Firms with more connected to the international markets exhibit higher productivity through exports, imports and outsourcing. The export ratio was positively and significant at 10%, this is consistent with firm heterogeneity literature.

Table 5. Factors influence productivity and the effect of subsidies of Sudanese manufacturing.

	Coefficient	Z-stat
Intercept	13.82***	73.4
OWN	0.25***	3.18
FORcontents	0.003***	3.46
RD	0.175***	8.93
ExPratio	-0.103*	1.02
Skill	-0.12***	-0.74
Subsidy	-0.215***	-4.56
No. Obs.	584	
Chi-sq (p-value)	354611.5 (0.00)	

OWN: foreign share, FORcontents: Foreign raw materials, RD: Research & Development, Subsidy: Subsidy, ExPratio: export–output ratio, and Skill: labor qualifications. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance; trade-specific dummy is introduced.

It can be noted that the coefficient of skill was negative and significant at 1% level. This can be explained by the fact that when firm is spending on R&D and hiring knowable and experienced workers tend to gain high productivity than others. The coefficient of export ratio and subsidies were negative and statistically insignificant. This imply that Sudanese trade policy has no effective on exports and productivity of manufacturing firms.

In terms of the role of trade and productivity and export relationships, manufacturing firms are maintaining a long-term relationship with foreign customers gain a higher probability of exporting than firms. Obviously, Sudanese manufacturing firms that have sufficient resources may take advantage of their networking relationship to overcome entry costs when taking part in foreign markets. Besides this, manufacturing firms that comply with technical and regulations of the target markets are expected to have a higher exporting probability than the other firms. These evidences are not appropriate for Sudanese context when the majority of exported commodities come from low efficient industries. It can be concluded that the influence of subsidies on productivity and exports is insignificant. This implies Sudanese trade policy has no effective on exports and productivity of manufacturing firms.

6. Conclusion and Policy Implications

This study has sought to address the following question – why do Sudanese manufacturing firms export less – by looking in details at industrial policies, productivity growth, labor productivity, and export behavior of manufacturing firms and ability of manufacturing firms to export. The results show Sudanese manufacturing firms are classified as a capital intensive, where Sudan has a potential cost advantage in labor and manufacturing firms enjoy with cheap labor. We have also investigated the effect of trade policy on productivity and economic growth. Our results suggest that the manufacturing firms offer the largest scope for productivity gains through industrial policies aiming at enhancing economic growth.

As a sound trade policy instruments are important of productivity, they are facilitated for as well. The results show that trade policy tools used during the period from 1999 – 2015, are an important determinant of productivity development of Sudan. Secondly, a high level of GDP per worker enhanced economic growth and is found to increase productivity of industrial sector.

Our results have three broader implications. Firstly, a policy oriented to increasing the exports by manufacturing firm can set the economy on a positive path towards economic recovery. We argue that enabling manufacturing firms for sustainable exports particularly using institutional, incentive and partnership measures to promote productive transformation and diversification in sectors with high growth and job creation potential. Sudanese manufacturing firms are classified as a capital intensive, where Sudan has a potential cost advantage in labor. However, building industrial strategy to support manufacturing firms adapting the new technologies and focusing on labor intensive industries are the key success to sustaining exports and enable them learn by export. Besides that Sudan needs an alternative development strategy, where the government playing a big role in maintaining macroeconomic stability, promoting market efficiency, and providing infrastructure.

Secondly and for time been for the trade policy options, there is a need for implementing collective action to target adopted specific industries that have linkage effect. This includes developing sound industrial policies (taxes, tax expenditures, and subsidies) that efficiently enable growth and production for foreign markets.

Finally, a fully support to the current and potential exporters across sub-sectors is needed to overcome challenges manufacturing firms face. Moreover direct and indirect taxation policies should not discourage the growth of Sudanese exports. In some export sectors, tax incentives may be beneficial or subsidies through the credit system.

Overall our analysis confirms the necessity to take into account the harmonization of trade openness as well as and R&D effort when estimating the effectiveness of trade policy and productivity growth. Since the increasing technology adoption in small firms is a challenging task, governments could provide financial support to acquire more technology-intensive equipment. This can be done through either indirect interventions such as loan guarantees or direct provision of funding for acquiring new technologies, such as cash or grants.

Based on the above, we present our suggestions for the upcoming Sudanese governments to adopt these objectives when it comes to create a competitive industrial sector that enjoy with high income stimulate economic growth, reduce the unemployment and turns the deficits into surplus. There is a need to building trade policy capacity, improve trade institutions to enhance productivity, reducing the fragmentation in the trade policy-making process and thereby boost exports and reduce poverty. This can be done by collaboration with international donors programs, technical and financial assistance (e.g., ITC, UNCTAD, and WTO).

As general known that a good investment climate, focusing on exports particularly processing goods are the key success for industrial sector contribution. Besides this, policymakers should make sure that the inclusiveness of linkage and supporting sectors and develop a partnership between public private sector to facilitate and provide supports. In Sudan, many progress in achieving objectives of industrial sector. For instance, great efforts have been made to attract foreign direct investment (FDI) in different sectors such oil and gas, electricity and telecommunications, agriculture and food processing.

Regarding the skills development, many educational and technical training programs towards science, technology and innovation (STI) have been established. Besides the attaching R&D research institutes under ministries to provide policymakers and productive sectors with consultancies and supports. Even though there

are many graduates students in STI programs, there is still gap needs be narrowed by link the labor market requirements by education output, besides developing learning curriculums in universities, schools, technical institutes to meet industrial sector requirements.

Enhancing innovation and added value to Sudan products cannot be achieved unless government provides financial and technical supports by establishing fund supporting industrial development. Manufacturing firms could increase the productivity and adopt innovation system that allows the ability to compete internationally. Each manufacturing firms has a different capital and technological capabilities. Lack of domestic technological capabilities was a key constraint to the success of industrial policies. This can be addressed by science and innovation policies, which include research and development (R&D) incentives, science parks, and support to collaborative projects with universities and research institutes

Regarding the standardization and metrologies, improve the quality of Sudanese commodities by supporting laboratories and manufacturing firms with guidance and regulations, technical rules for the priority sectors to meet the international standardization, besides granting the quality certificates for exporting firms.

No progress has been made towards friendly-industrial environment. For this, we proposed creating an excellence prize for the firms that show friendly environmental practices. Besides supporting inclusive environmental management systems to provide labor with a better environment and supporting sustainable development. Government may implement and increase the penalties to unwelcome practices. For this purpose, government should enhance technical support for manufacturing firms that look forward to develop cleaner production system and environmental management by supporting the recycling of industrial and agricultural wastes and support the collaboration among universities, R&D organizations, and manufacturing firms.

The Industrial Research and Consultancy Center could incentivize technology upgrading such as information provision—consultancy services and trainings. Other institutions could facilitate communication infrastructure such as technology diffusion. The government should develop laws to create an enabling environment for upgrading by allowing a wider set of labor contracts to facilitate technology adoption inside the firm or reforming lending policies.

Most of the manufacturing firms in Sudan have limited access to specific inputs that are necessary to upgrade their outputs. Participating in international trade is the key to import these inputs from international markets. Besides this, the challenges in energy access, manufacturing firms in Sudan experiencing power cuts, which hinder firms to increase their productivity and growth. Most of manufacturing firms have lack of international marketing capacity to increase sales.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions

Y.E. and A.S. critically revised the research paper and approved it prior to submission. Data that reported in the figures and tables were collected from different sources and modified by Y.E. and A.S. and provided input and content-related to tables and figures interpretation, which provide an explanation related to export performance. All authors read and approved the final research paper.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

Conflicts of Interest

The authors declare that she has no relevant or material financial interests that relate to the research described in this paper.

Abbreviations

COMESA Common Markets of Eastern and Southern Africa
 FDI Foreign direct investment
 GDP Gross domestic product
 LDCs Least Development Countries
 MENA Middle East and North African region
 R&D Research and Development
 STI Science, technology and innovation

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