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EVALUATING THE EFFECTIVENESS OF INDUSTRIAL POLICIES ON AGRO-PROCESSING IN SUDAN: EVIDENCE FROM SUGAR INDUSTRY

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Abstract: Industrial policies have become the mainstream of achieving sustainable development. In the past few years, evaluating the effectiveness of industrial policy and their determining factors have been at the core of debate among policymakers. Sudan's industrial sector has evolved through various stages, from import substitution industrialization to economic reforms to technology adoption and de-industrialization. This study aims at evaluating the effectiveness of industrial policy and attains Sugar self-sufficiency over the period from 1970 - 2022. This study combines between the descriptive and statistical methods. Data were collected from different sources. Some data were gathered from the Sudan central bank and the sugar companies. Other data were collected from the World Bank and Food and Agricultural Organization. This paper found that Sudan has the opportunity to expand sugar production benefiting from fertile land and abundant water resource from the Nile. The paper reveals that by liberalizing Sugar imports and eliminates using customs duties on sugar to allow sugar companies gain competitive advantages. The study recommends that there is a need to reduce government involvement on state-sugar companies by privatizes these factories to increase efficiency.

Keywords: Industrialization; industrial policy; sugar processing

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1. INTRODUCTION

Industrial development in Sudan continues to play an important role in contributing to economic growth and employment. In the early 1970's, Sudan's economic structure underwent a change which took the form of an industrial revolution. There was extensive development in building the industrial sector focused on sugar and textiles industries. Subsequently, the energy sector also made rapid progress.

It widely recognized the importance of industrial sector in achieving economic development (e.g., Rostow 1958; and Kaldor 1966). Szirmai and Verspagen (2015) pointed out that manufacturing sector considered as the sector capable sustaining economic growth and there was a significant correlation between Gross Domestic Product (GDP) per capita and the share of the sector in GDP. Besides this it has spillover of technology effects to other productive sectors (Hirschman, 1958).

In recent years, there has been a revival of interest and growing political concerns about globalization, industrial policy, the benefits from free trade, and the role of the government in a market economy. There has been significant controversial argument among development economist (e. g. Hirschman, 1958; Nurkse 1953; Rosenstein-Rodan 1943) about big push policy in promoting industrialization and generating growth and prosperity. However, one of the central issues that Sudan trying to overcome the series of conflicts that hinder the benefits from endowment structure towards developmental government and economic prosperity. Besides this, Sudan is facing a dilemma of lack of information, market failure, and lower of public institution-building, ranking low on the average in international governance indicators, the favoritism of political systems and absence of proactive governments to cope with market failures.

Manufacturing sector is a promising sector and considered as an engine for economic growth. For the past few years, there are many initiatives to develop key industries including sugar, food processing and oil industries to diversify the economy. In this context, agro-processing sector in Sudan has witnessed a significant progress in terms of quality, productivity and export volumes over the last two centuries, which results in enhancing revenues and has been improving social development. This study aims to identify the effectiveness of industrial policy on agro-processing in Sudan. Sudan's export

sector depends on a few primary agricultural commodities mainly sesame, ground nuts, and livestock. Since the prices and productivity volumes of these commodities are largely unstable and less competitive on the global markets, therefore depending on exporting agricultural commodities would not support economic development.

Sudan's sugar sector has long held strategic importance within the country's agro-industrial economy serving as a vital source of employment, food security, and industrial output. Sugar industry in Sudan is well established with proven track records on production efficiency and technological advancements (Adam Ahmed and Amna Alam-Eldin, 2013). However, since the late 1970s, the sector has undergone several structural transformations, beginning with the establishment of large-scale irrigation and factory projects most notably Kenana and Assalaya which aimed to reduce reliance on imports and enhance production self-sufficiency (Sudanese Economic Development Journal, 1985). These efforts marked a shift toward industrial modernization in agricultural policy.

Over the following decades, sugar industrial policies evolved in response to changing national priorities and global dynamics. Structural adjustment programs in the 1990s introduced partial privatization and export-driven reforms, laying the groundwork for value-added production and trade engagement (Economic Reform Studies Institute, 1999). However, these reforms lacked long-term consistency, leaving the sector vulnerable to institutional fragility and external disruptions.

This paper analyzes and evaluates the effectiveness of Sudan's sugar industrial policy landscape between 1970 and 2022. Its main objectives are to identify the sector's most influential policy interventions and institutional arrangements, and to critically assess their impact over time. By tracing the transition from centralized planning to public-private partnerships, the study offers a nuanced understanding of the sector's evolution what has succeeded, what has faltered, and what strategic directions could foster resilience and sustainable growth in the future.

There are number of reasons that allow us choose to focus on sugar industry in this study. First, the industry received less attention from policy makers over the last decade. Second, sugar prices are volatile and the industry needs supports from government. Third, Sugar industry remains among the

top of government priorities, it does secure energy by producing ethanol and support green energy policy efforts, which has less impact on environment and lower greenhouse gas emissions. Finally, sugar factories considered as a value chain for food processing industries.

From this perspective, the paper tried to answer the fundamental question, how effective are industrial policies in achieving Sudan's agro-processing development? Based on this question, the following sub-questions can be posed: what are the most important industrial policies on sugar manufacturing adopted by Sudan over the past decades? What are the components of Sudan's economic structure? Which industrial policy tools are most powerful in enhancing sugar manufacturing and how they should be designed and how they can be implemented more effectively? The remainder of this study is structured as follows. The next section presents an overview of the conceptual framework, the theoretical foundations and the main concepts and proposed hypotheses. Section three illustrates our research methodology including research design and data analysis. Section four presents results. Section five is conclusion.

2. LITERATURE AND CONCEPTUAL FRAMEWORK

2.1. Conceptual Framework

Before proceeding further, it is necessary to define clearly the key terminologies referred we use in this study. In particular, it is imperative to clarify what we mean when we talk about "industrial policy", industrial policies are considered an effective means use by the state to support and develop economic sectors in general and manufacturing sector in particular, as they contain many tools to support and allocate resources in particular industries to accelerate economic development. Industrial policies vary from one country to another, and scholars have long treated them as a tool to help develop economies to catch up with competitors, as they involve government intervention in markets in terms of effectively adapting to changes in comparative advantages (Justin Lin and Chang, H. J. 2009) that can stimulate the formation of economic activities in various sectors and areas of the economy and institutional cohesion. From a neutral point of view, industrial policy appears to be like any other policy designed to influence the development of industry, particularly manufacturing, and it also concerns other sectors such as mining and electricity. For the purpose of this study "policy effectiveness", this describes the extent to which a policy achieves its intended

benefits (Nagel, 1986). For the purpose of this study, agro-industry refers to the process in which agricultural products are transformed to intermediary or final goods by using modern equipment (Yagoub Elryah, 2019).

2.2. Literature Review

This section briefly presents three different approaches related to industrial policy. At first, we present neoclassical approach where the market failures are central issue. Then, we give an overview of structural approach and new structural economics. Finally, we show pragmatic approach, the collaboration of public and private actors.

Neoclassical theory stands on the role of government intervention in correcting the market failures due to asymmetric information, externalities, and increasing returns to scale. Companies do not have an equal access to information, where competition cannot be achieved. Besides this, negative externality arises showing the market failures, which allows government intervenes in the market. Economies of scale can lead to monopoly and thus dominate the market intervention is the key success to correct market failures.

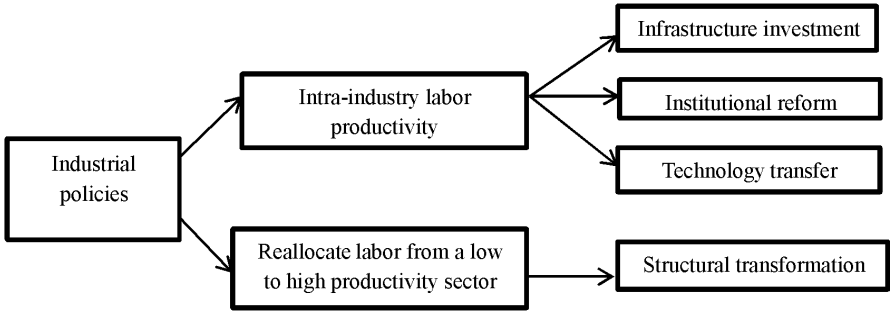


Figure 1: Conceptual Framework

Source: Developed by authors

Figure 1 illustrates how industrial policy can contribute to economic growth by enhancing labor productivity in across industries and reallocating labor from low productivity to high productivity industries. Sudan could achieve a tremendous economic growth by developing its agro-process, which focuses on labor-intensive sectors, supported by large investments in infrastructure, building and developing institutional reform, transferring technology to achieve structural transformation.

3. LITERATURE REVIEW

While many studies explain the importance of sugar industries, productivity and technical efficiency of key sugar factories, a few studies find evidence of effectiveness of industrial policy on sugar industry.

Recently, there is now a very large literature assessing and evaluating There is also a rapidly growing literature on industrial policy, economic reforms, and institution, including its impact of productivity. Studies include World Bank (2014), Curtis (2016), Lin & Chang (2009)

In recent years, economic industrial policy has attracted considerable attention (Réka Juhász et al. 2024; Loanna Kastelli, 2023; Kyunghoon Kim and Andy Sumner, 2021). In particular, scholarship has focused on the relationship between strong governance and industrialization. For example, David Havrlant & Abdulelah Darandary (2021) suggests that governments should develop policies directed at reducing corruption and improving government effectiveness to foster economic diversification.

To bridge the gap in existing literatures, this paper aims to examine is the long-term effects of industrial policies in Sudan. It often argued that government intervention is central role in economic transformation. There are several reasons why we choose to focus on the effectiveness of industrial policy on sugar industry in Sudan for this study. On one hand, Sudan is one of the few studies that have on the effectiveness of industrial policy on agro-processing sector. Therefore, the future potential of agro-processing requires improvement in productivity and economic efficiency, which is vary among sugar factories. On the other hand, the sugar factories employ over 20,000 workers; more than 40% of them are seasonal workers (about 12,000 workers in 9 the harvest processing) (Sudanese Sugar Company, 2022). The value chain market is huge with immense potential of unlocking value across sugar factories purposes and reducing unemployment rates.

This study is expected to add several primary contributions to the existing literature. First, it intends theoretically evaluating the effectiveness of industrial policy on sugar industry. Starting from 1970, Sudan entered a novel era with new import substituting industrialization and attracting Foreign Direct Investment (FDI) policy, and undergone significant structural changes from 2000 to 2011. There is a lack of empirical works evaluating the effect of industrial policy using economy wide simulation models to address industrial

policy issues. To the best of our knowledge, the only study so far is (Siddig Ahmed, and Raouf 2024), which used a data set of trade policy instruments and found that sugar is one of the most vulnerable commodities due to its reliance on centralized processing infrastructure and stable transport networks. Similarly, Ibrahim & Workneh (2020) and Siddig et al. (2024) pointed out that fuel shortages and operational inefficiencies have significant effect on sugar industry. Besides absence of institutional frameworks and persistent logistical bottlenecks limited the effectiveness of these policies.

Second, this study applies two different approaches, which expected to provide insight for the existing literature is the analysis is sensitive to the employed methods. Third, whereas previous research has focused on assessing mechanical and manual harvesting of the sugarcane in Sudan (Adam Ahmed and Amna Alam-Eldin, 2013), investment challenges in Sudan's agro-industries (Abuelnuor Elzebair, & Ibrahim, A., 2024), the resilience of sugar sector in Sudan (Ibrahim, A., & Workneh, T. 2020), the health and safety sugarcane agro-Industrial in Sudan (Rasha Abdelrahim1 and Abdelmotalab Kheiralla, 2023), we argue that policymakers and researcher should consider the effectiveness of industrial policy on agro-industries. However, we argue that these approaches are narrowed focused and limited, studies on the effectiveness of industrial policy on productive sector such as sugar industry needs to consider a more comprehensive approach that will be abdicable to development stage of the country. Thus far, this paper has argued that following a well-designed economic incentive for sugar factories, R&D support, trade policy and sustainability are effective and might help a country to achieve structural transformation.

4. EVALUATING MACROECONOMIC POLICIES IN SUDAN: HISTORICAL BACKGROUND

Historically, Sudan like other developing countries kept its industrial policy in promoting specific sectors through subsidizing and protecting the infant industries. In this section, we discuss industrial policy efforts over the period from 1970 up to 2022.

For decades, Sudan started exporting primary agricultural commodities as raw materials and is still lagging behind, unable to benefit from the availability of resources including human and natural, besides the good climate location. The economic reform policy provided the framework to concentrate on agro-

based industries, which becomes one of the alternatives to diversify Sudan's economy. In the early 1960s, Sudanese government began a series of ten-year plans to develop the productive sectors. One of the major programs was the establishing of textiles factories, edible oil processing industries, flour Industry, and other food-processing industries. As part of broader structural adjustment programs in the late 1970s, Sudan has attracted the Arabic financial resources and mobilized domestic savings to build the national economy, where many sugar companies were established.

For instance, from 1970's until 1990, different industrial policies were adopted, from government-led development and import substituting industrialization to technological progress and join regional and bilateral trade arrangements. These policies failed to promote industrial development because these policies lacked linkages with markets and ignored the comparative advantage of the economy (Newman et al. 2016).

In this context, Sudan is considered an agricultural country with nearly 70% of the population working in this sector. However, during the past two decades the share of agriculture in total employment has declined to 31.7% (World Bank, 2024). For instance, since 1980s until the late1990s, Sudan has become one of the first largest exporters of Cotton and livestock, and it has emerged leading exporters for Gum Arabic with 80% of global market share (Chikamai, 1996; Macrae & Merlin, 2002)

Over the years from 1970's and 1980's Sudan had been hit by severe drought and famine and civil war between the North and South Sudan. Many economic problems started to arise such as high inflation rates, high external debts, deficit in government budget and balance of payments. Sudanese economy had entered into deep structural problems by the end of the 1980s prominent among them was the major budgetary imbalance represented in excessive expenditure, growing at a much higher rate than revenues, This had resulted in escalation of the budget deficit with increased borrowing from the banking system.

From 1990 to 2000, industrial policies in Sudan adopted market liberalization, privatization, and deregulation (known as Washington consensus) by the World Bank and International Monetary Fund. These measures allow government intervenes in the economy through horizontal industrial policies (e.g. macroeconomic stability and human capital development) are adopted by

different countries including Sudan, resulting in job losses and increase income inequality.

In this context, Sudan has liberalized prices of goods, services and factors of production, corrected cost and price distortions including those of exchange rate and cost of financial services, reforming and liberalizing trade and financial sector including financial restraint to moderate pressure on imports and the balance of payments. A major reform of tax system taking into consideration the whole tax structure and particular taxes to relative prices and incentives, broadening the tax base, and adoption of value added tax. Revising cost sharing of services deliveries and that all contributes to tax reform has been implemented, and modernization of expansionary monetary policies to reduce inflation and attain sustainability. The economy has responded positively to these reform measures despite the sharp slowdown of foreign financial aid that was timed with outside political pressures and hostilities.

The government had adopted free-trade policies to promote the economic growth, raising the efficiency of the economic performance and increasing the contribution of the private sector in the economic activities and allocated the additional resources for development and improved services. These policies were, however, accompanied by some policies which affected agricultural and industrial sectors negatively like exchange rate, credit in addition to the other effects of the market economy and the removal of production subsidies.

The privatization policies adopted by the government failed to realize its objectives which reflected on reduction of cultivated lands by crops and low performance of institutions in irrigated sector as whole. This is because of the lack of integrated macro policies which provide the appropriate policies including improved markets, adequate infrastructure, sound fiscal and monetary policies.

From 2000s to 2010 industrial policies considered as an important policy for economic development. However, in early 2000, the Sudanese government attracted China's foreign direct investment (FDI) to discover and produce oil products. Since then until 2011, the economic policies have focused on producing and exporting crude oil and ignored the other productive sectors such as agriculture and manufacturing. However, these policies have longer support the process of economic development, especially after Sudan lost 75% of its oil revenues due to the secession of South Sudan. Sudan is rich in other

natural resources and considered as one of the best agricultural countries in the world that hold reserves of fishing, forestry and some of the underexploited sectors that have huge economic development potential.

As a result, two economic reform plans were successfully implemented to return the economy to normal. In recent years, the economic shock created by the independence of South Sudan has been decreasing the Sudan's economic growth. Therefore, the declining of economic growth of Sudan has been a common phenomenon in recent years. However, the concentration on oil industry has weakened the economic structure, which missed the opportunity to develop other productive sectors such as agriculture and manufacturing.

From 2010-2022, new industrial policy issues such as governance, climate change, national security, and supply chain resilience. Industrial policy instruments were adopted such as subsidies, tax incentives, trade measures, and public procurement, to promote specific industries and support R&D particularly in high-growth sectors to address coordination failures.

5. EVALUATING INDUSTRIAL POLICY FOR SUGAR INDUSTRY SUDAN (1970–2022)

This section presents the industrial policy for sugar industry in Sudan over 1970 and 2022. Sudan's sugar sector underwent significant transformations, progressing through foundational industrialization, expansion via foreign-backed investments, partial liberalization, and later diversification into value-added by-products. Sudan starts growing and planting sugarcane in early 1960's, since then the sugar industries expanded across the country. Sudan is considered among the top five countries in sugarcane production in Sub—Saharan Africa nations (Ahmed Alam-Eldin 2015). According to the Food Agricultural Organization (FAO), in 2020 Sudan is ranked 31 in producing sugarcane in the world with a total value of $233,062 (FAO, 2020). In Sudan, there are six sugarcane factories, in which five factories are owned by government, Al Guneid sugar mill is established in 1962 with capacity 60,000 tons, where the land is owned by farmers and the government owned the mill. Followed by New-Halfa sugar factory in 1965 with capacity of 75,000 tons, West Sennar Sugar factory in 1976 with 110,000 tons, Assalaya in 1980, with 110,000 tons, Kenana Sugar Company in 1981 with 300,000 tons and the White Nilee Sugar in 2004 with production capacity of 450 tons.

The first phase (1970–1979) was characterized by state-led development, focusing on rehabilitating old factories and building new ones like Assalaya, supported by Eastern Bloc assistance (Elamin & Goutier, 1977; Maitah et al., 2020). However, poor extraction technology and managerial inefficiencies limited the sector's performance, exposing the flaws of centralized planning models (Osman, 1989; Gaitskell, 1982). In the 1980s, the commissioning of Kenana Sugar Company marked a pivotal shift. With Arab funding and international collaboration, Kenana introduced an integrated agro-industrial model and consistently outperformed state-run factories in productivity and cost-efficiency (Osman, 2023; Ibrahim et al., 2019).

Meanwhile, the Sudanese Sugar Company attempted to centralize management but was plagued by persistent technical and organizational weaknesses. From 1990 to 2005, investment-driven reforms helped modernize irrigation systems and attract Arab capital. Kenana's adoption of surge irrigation and partial privatization led to improved efficiency and a tripling of national output (Ali et al., 2025; Ibrahim, 2020).

From 2005 to 2012, the policy focus shifted toward industrial diversification, particularly ethanol and feed production, with Kenana pioneering bioethanol exports (Ali et al., 2016). However, comparative efficiency analyses revealed a widening gap between Kenana and older public factories (Onour, 2015). Between 2012 and 2018, the White Nile Sugar Company was launched to offset oil revenue losses, contributing to a short-lived export recovery. Yet, institutional weaknesses, political instability, and logistical bottlenecks curtailed long-term gains (Ibrahim, 2020; Awasthi, 2019). From 2018 to 2022, the sector experienced a sharp output decline of over 43%, driven by machinery depreciation, soil salinity, and economic shocks. Despite policy attempts to decentralize operations and attract private investment, structural vulnerabilities and weak governance remained the main barriers to sustained recovery (Siddig et al., 2024; Ibrahim & Workneh, 2020).

Over the period from 1970 and 1979, Sudan's sugar sector embarked on its foundational phase of state-led development, characterized by rehabilitation of colonial-era factories and expansion of irrigated agriculture. The government adopted centralized planning approaches aimed at increasing domestic sugar production to meet growing consumption and reduce import dependence (Elamin & Goutier, 1977; FAO, 1975). Key interventions during this period

included the upgrading of Guneid Sugar Estate and the establishment of Assalaya Sugar Factory in 1975 with support from Eastern Bloc technical assistance (Maitah et al., 2020; Ibrahim et al., 2019). Despite political volatility and shifting economic ideologies, the sugar industry received prioritized investment through state-owned enterprises under the Ministry of Industry. Production increased modestly, with national output rising from approximately 80,000 metric tons in 1970 to 230,000 metric tons by the end of the decade (FAO, 1981). However, the sector faced persistent constraints, including outdated extraction technology, low recovery rates, and weak managerial systems (Gaitskell, 1982; Osman, 1989). These challenges underscored the limitations of state-centric industrial models and laid the groundwork for more capital-intensive and commercially oriented reforms in the 1980s.

Over the period from 1980 to 1989, Sudan's sugar sector underwent a pivotal transformation characterized by large-scale investment and institutional restructuring. The commissioning of Kenana Sugar Company in 1980 marked a strategic shift from rehabilitation to agro-industrial expansion, with a design capacity exceeding 300,000 tons annually. The project was supported by Arab investors and international partners, and it introduced an integrated model encompassing sugar refining, power generation, and by-product utilization (Mofadel et al., 2025; Kenana Sugar Company, 1999). In 1985, the Sudanese Sugar Company (SSC) was formally established to consolidate operations across public factories—Guneid, Halfa, Sennar, and Assalaya—and improve managerial coordination (Onour, 2015). Policy objectives during this period emphasized self-sufficiency, expansion of irrigated cane cultivation, and enhanced export capacity, particularly through Kenana's access to regional markets (Osman, 1989). Despite these reforms, significant challenges persisted. Older SSC factories suffered from low extraction rates (often below 70%), inefficient irrigation systems, and limited varietal diversification, which constrained productivity (Ibrahim & Workneh, 2020; Onour, 2015). In contrast, Kenana demonstrated superior performance due to its modern infrastructure, advanced irrigation techniques, and centralized management. Comparative assessments revealed that Kenana consistently outperformed state-run estates in yield, cost efficiency, and benefit–cost ratios (Ibrahim et al., 2019; Osman, 2023). These disparities underscored the need for commercial farming models and decentralized input supply chains to improve productivity across the sector.

Between 1990 and 2005, Sudan implemented investment-led reforms to enhance the efficiency of sugar manufacturing and expand domestic production. These reforms included partial privatization of state-owned enterprises, modernization of irrigation systems—most notably the adoption of long-furrow and gated-pipe techniques at Kenana Sugar Estate—and strategic partnerships with Arab investors such as the Arab Authority for Agricultural Investment and Development (Maitah et al., 2020; Mofadel et al., 2025). These interventions significantly improved production efficiency and resource utilization. For instance, Kenana's adoption of surge irrigation systems led to water application efficiencies exceeding 74% and distribution efficiencies up to 94% (Ali et al., 2025; Elsheikh et al., 2002). As a result of these reforms, Sudan's national sugar output increased from approximately 290,000 metric tons in 1990 to over 750,000 metric tons by 2004, marking a transition from net importer to net exporter status (Ibrahim, 2020). Kenana Sugar Company emerged as the most efficient estate, contributing over 50% of national output and achieving the highest benefit-cost ratio among both public and private factories (Elzebair et al., 2015). Comparative studies of Sudanese sugar estates revealed that Kenana consistently outperformed others in yield, cost control, and economic returns (Elzebair et al., 2015; Osman et al., 2023).

Between 2005 and 2012, Sudan's sugar industry underwent a strategic transformation aimed at industrial diversification and resource optimization. A key policy focus during this period was the integration of value-added by-products—such as ethanol, animal feed, and energy recovery—into the production cycle. Kenana Sugar Company led this shift by commissioning a bioethanol facility in 2009 with an initial capacity of 65 million liters per year, utilizing molasses as feedstock and targeting both domestic and international markets (Ali et al., 2016; Ibrahim & Workneh, 2020). This initiative aligned with Sudan's broader agro-industrial strategy to reduce dependence on raw commodity exports and promote innovation. The diversification strategy improved resource efficiency and opened new export channels, particularly for ethanol and molasses-based products. However, productivity disparities persisted across sugar estates. A data envelopment analysis by Onour (2015) revealed that Kenana and Al-Genied operated under constant returns to scale, indicating optimal input utilization. In contrast, Assalaya, Sennar, and New Halfa exhibited increasing returns to scale, reflecting underutilization

of inputs and managerial inefficiencies. The average output loss due to scale inefficiency in state-owned factories ranged from 6% to 16% between 2009 and 2012 (Onour, 2015; Ibrahim et al., 2019). To address these gaps, policy recommendations emphasized the adoption of commercial farming models, such as leasing agricultural land to private producers. This approach was successfully implemented in Al-Genied, where private cane growers achieved higher productivity than state-managed farms. Government support for public-private partnerships and investment in irrigation modernization further reinforced the sector's resilience and competitiveness (Maitah et al., 2020; Abuelnuor et al., 2024).

Between 2012 and 2018, Sudan's sugar sector experienced a temporary revival in export performance, largely driven by the commissioning of the White Nile Sugar Company (WNSC). Designed with a processing capacity of 24,000 tons of cane per day, WNSC was established to offset the economic impact of South Sudan's secession and the subsequent loss of oil revenues (Awasthi, 2019; Ibrahim & Workneh, 2020). The factory's integrated model—encompassing sugar refining, ethanol production, animal feed, and power generation—positioned it among Africa's most advanced sugar complexes. By utilizing molasses as feedstock, Sudan entered new export markets, with ethanol exports peaking at USD 20 million in 2013 and sugar-related exports reaching USD 13.8 million in 2018, primarily driven by molasses (Trend Economy, 2024). Despite initial success, the sector's momentum waned. A productivity analysis (e.g. Ibrahim, 2020; and Onour ,2015) highlighted systemic challenges including political instability, infrastructure deterioration, and inefficient land preparation.

As a result, sugar outputs declined by 32% between 2010 and 2020, with Kenana Sugar Company alone dropping from 391,000 to 299,000 tons. Soil salinity, monoculture practices, and aging machinery were identified as key constraints (Ibrahim et al., 2019). Policy-wise, the period saw a shift toward public-private partnerships and capital-intensive agro-industrial models. However, the absence of robust institutional frameworks and macroeconomic volatility undermined the sustainability of these reforms. Even WNSC, despite its technical sophistication, struggled to maintain consistent output due to external shocks and internal governance limitations (Maitah et al., 2020; Abuelnuor et al., 2024).

Between 2018 and 2022, Sudan's sugar industry experienced a pronounced decline in output, falling from approximately 750,000 metric tons to 427,000 metric tons—a contraction of over 43% (Ibrahim, 2020; Index Box, 2025). This downturn reflects deep-rooted structural vulnerabilities, including aging machinery, deteriorating infrastructure, and disruptions in agricultural input supply chains. Despite government-led recovery initiatives—such as infrastructure rehabilitation programs and input subsidies—production levels remained unstable and below historical averages (Ibrahim & Workneh, 2020). Technical assessments revealed that key factories, including Kenana and the White Nile Sugar Company, suffered from reduced milling efficiency, with extraction rates dropping to 78% due to mechanical depreciation and lack of spare parts (Ibrahim, 2020). Additionally, soil salinity, poor land preparation, and limited varietal diversification contributed to declining sugarcane yields across estates (Ibrahim & Workneh, 2020).

Sudan's sugar sector has undergone five decades of intermittent transformation—often marked by ambitious industrial development but undermined by systemic fragility. While the commissioning of modern complexes like Kenana Sugar Co. Ltd and White Nile Sugar Company signified the sector's potential for agro-industrial excellence (*Trade and Industry Review*, 2017), the inability to sustain progress through periods of political instability revealed deep vulnerabilities in governance and strategic planning.

This study sees the industrial policies have a significant effect on sugar production in Sudan. We evaluate the effectiveness of the industrial policies since 1970s; next section presents research strategy, methods and research design.

6. METHODOLOGY

6.1. Measuring Industrial Policy effectiveness

In the course of the study, we use a mixed methodology, which combines the quantitative with qualitative approaches. At first, we first analyze the effectiveness of industrial policy on macroeconomics. Finally, we analyze industrial policy on sugar companies over the period from 1970 to 2022.

In this paper, a logic model is used to see whether the industrial policy achieves its intended objectives. We analyze the influence of industrial policy on macroeconomics. Then, we conduct benchmarking analysis to compares

policy performance against best industrial policy practices. Finally, we use cost-benefit analysis to analysis the monetary costs and benefits of a policy.

6.2. Data Sources

Data were collected from different sources. Some data were gathered from the Sudan Central Bank, sugar companies, the World Bank, Food and Agricultural Organization.

7. RESULTS DISCUSSION

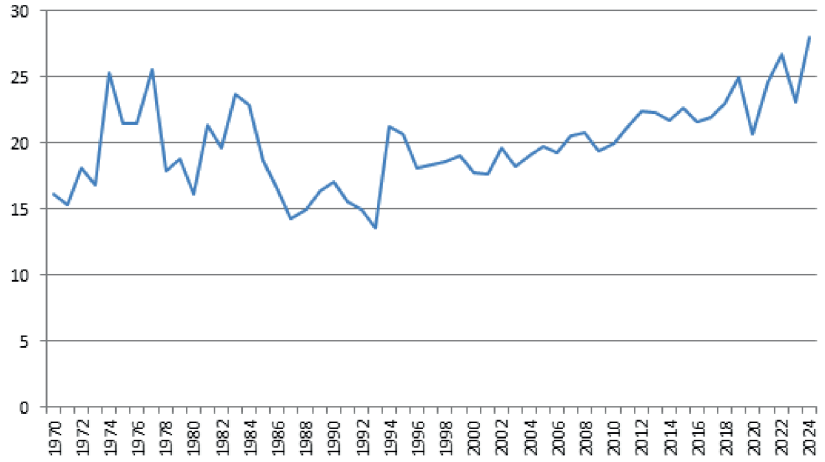


Figure 1: Exports of goods and services (% of GDP)

Source: The World Bank Data, 2025

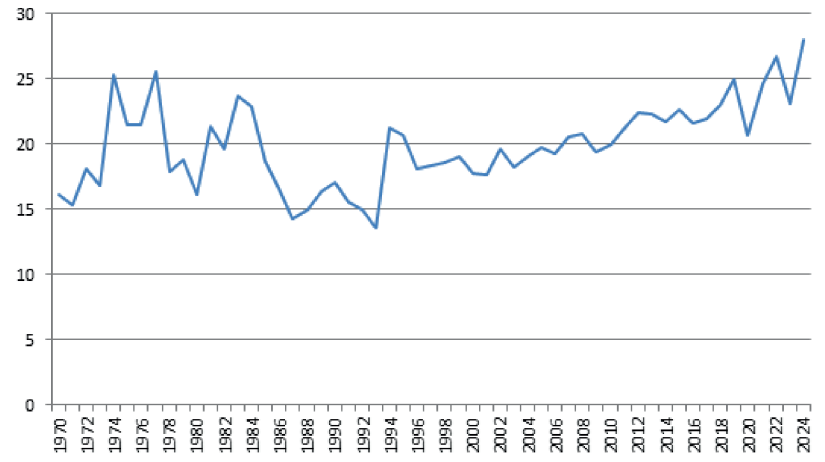
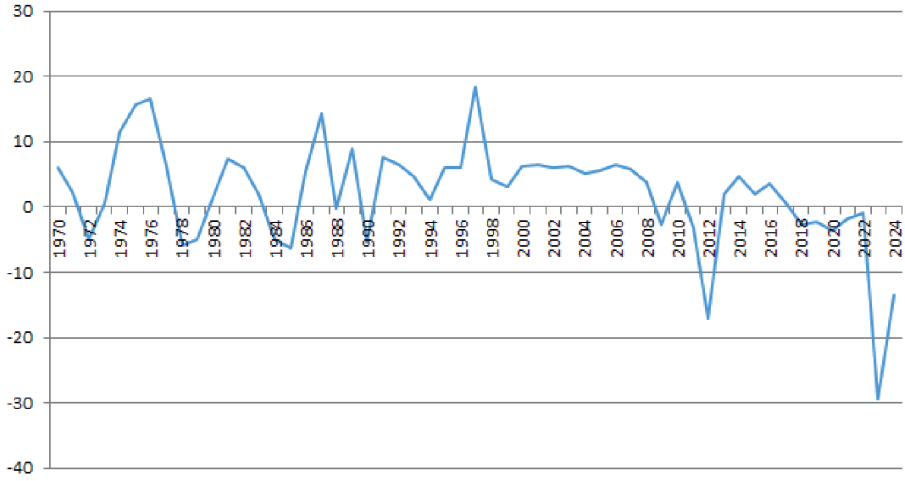


Figure 2: Sudan's GDP Growth (%) 1970-2024

Source: The World Bank Data, 2025



Fgure 3: Domestic credit to private sector (% of GDP)

Source: The World Bank Data, 2025

It has enjoyed some export success in recent years (Figure 3-3), and has potential to expand production considerably. At present, the industry is regulated through controls on both imports and domestic sales. Sudan has a unique opportunity to create a more export-oriented industry because of opportunities offered by EU preferences and due to changes that are occurring in the regional and world sugar markets. Exploiting these opportunities would require policy changes, including those to address social costs of industry adjustment, but these would greatly increase in export earnings, as well as reduce prices for domestic consumers and sugar using industries, who currently pay among the highest sugar prices in the world. Government protection for producers would no longer be necessary, and the government's direct involvement in the industry could be reduced.

Industry Overview

The sugar industry in Sudan is comprised of four medium-sized government owned and operated companies (Assalaya, Gunied, New Halfa, and Sennar) managed by the government's Sudanese Sugar Company, and one large company, Kenana, which is operated as a private sector company even though it is 35 percent owned by the government. A new company, White Nile, is being developed with a production potential of 350 thousand tons and is expected

to begin operation in 2008. Several other sites are being considered for new sugar companies but none have yet been approved. Kenana produces about 55 percent of Sudan's sugar and is the most efficient of the five companies with reported production costs of $254/ton while the four government companies have higher costs. The White Nile sugar company is projected to have production costs of $166/ton and will be among the lowest cost producers in the world.

Producer prices have been determined by a cost-plus formula since 1993, which provides for very high prices to protect the profits of the least efficient government companies. In 2006/07, the producer prices were SD 140,062 per ton ($673/ton). The government also restricts imports and levies federal taxes and duties that totaled 34.8 percent of the factory selling price in 2006/07 and resulted in an ex-factory price of SD 188,760 per ton ($908/ton). By comparison, the world's lowest cost sugar producer is Brazil with production costs of approximately $150/ton and the international price of raw cane sugar averaged $326/ton in 2006. Thus, Sudan has producer prices which are about double the world market price.

Thus, Sudan has a number of attractive sugar export opportunities and it should use them to develop an efficient and profitable export-oriented sugar industry, which can provide strong export earnings, employment and other benefits to the country without heavily burdening domestic consumers. However, even with preferential access to the EU and COMESA markets, sugar exporters are not likely to obtain prices which are as high as those currently available in the protected domestic market. This should not be a burden to the efficient producers such as Kenana and the new White Nile company, but could be a burden to the four government-owned companies. Therefore, it is important to improve their efficiency and trade competitiveness by reducing the level of government involvement by either privatizing them or allowing them greater financial and management autonomy

Sugar Market Policies

The sugar industry is an important source of tax revenue for the government (seeTable 3.5), and tax revenues totaled an estimated SD 42 billion ($200 million) in 2006/07 based on domestic sales of 860 thousand tons of domestically produced and imported sugar, the factory selling price of SDD140,062/ton, and

the federal tax rate of 34.8 percent. Sugar imports face the maximum customs duty of 40 percent. If imports were liberalized, the import price would be about half of the current domestic price and tax revenues would fall. However, a revenue-neutral policy could be designed that would still allow imports to be liberalized and domestic sugar prices to fall. This could be done in several ways using a combination of taxes on domestic sales and an export tax to capture a portion of the benefit from sales to the EU.56 Lower domestic prices would not only benefit consumers but also increase the competitiveness of sugar-using industries (e.g., pharmaceuticals and food processing) and increase their output, employment, profits— and ultimately tax payments to the government.

The sugar companies provide social services to local communities such as schools, medical facilities, roads, and water for crops and household use. Such services are valuable and the quality of these services often exceeds that provided by the government. This benefit to the local community should be continued and the cost of such services credited, up to a specified limit, against the export taxes paid by sugar companies. This partially offsets the loss of land taken up by sugar companies and creates local ties of the sugar company to the community. It also improves the living conditions of sugar company workers who often live in nearby villages.

8. CONCLUSION AND FUTURE POLICY OUTLOOK:

Conclusion

This paper was sought to investigate the effectiveness of industrial policy on sugar industry in Sudan over the period from 1970 to 2022. The study also aims at discussing the current challenges the sugar industry facing and what are the interventions and institutional arrangements needed to be implemented by policymakers for promoting sugar industry.

The study uses quantitative and qualitative approaches to analyze the effectiveness of industrial policy on macroeconomics and evaluate industrial policy on sugar companies over the period from 1970 to 2022. This study adopted logic model to see whether the industrial policy achieves its intended objectives or not, and the influence of industrial policy on macroeconomics. A benchmarking analysis is conducted to compare policy performance against best industrial policy practices. Finally, we use cost-benefit analysis to analysis the monetary costs and benefits of a policy.

Our major conclusion is that the production volatility for sugar raises uncertainty, where raising labor productivity become harder. Sugar production has been more unstable with current industrial policy. The main findings emphases that the subsidies, tariffs and production price considered are the main factors influencing sugar production.

Policy Implications

In the light of above findings, key policy implications are emerged. It can be argued that the results of our study provide evidence that 40% custom duties on imported sugar is significantly enhancing sugar industry. As part of our academic and professional responsibility to support economic development we are pleased to share the outcome of our research efforts of an extensive study conducted on the effectiveness of industrial policies in Sudan's sugar sector during the period 1970–2022. The study led to a set of well-considered recommendations that, based on systematic analysis effectiveness, and evaluation, we believe could bring about a transformative shift in this vital sector.

Our key contribution lies in presenting an actionable future vision that reflects the realities and complexities of the sector. Overall our analysis confirms the necessity to take into account the harmonization of industrial policy among stakeholders as well as and R&D effort when estimating the effectiveness of industrial policy and productivity growth. Besides the above policies, the following measures and programs are recommended for policy makers. If adopted and implemented, these policies we believe will directly support and have a significant impact on:

1. Enhancing production efficiency and improving the sugar value chain and its derivatives
2. Promoting sustainable use of natural resources, especially water and agricultural land
3. Creating new investment opportunities and revitalizing the local economy
4. Improving the conditions of rural communities engaged in agriculture and industry
5. Enhancing domestic production efficiency, reducing reliance on imports

6. Improving the conditions of rural communities engaged in agriculture and industry
7. Achieving price stability and boosting competitiveness of national products.
8. Promoting investment in industrial infrastructure and renewable energy linked to the sector;
9. As a sound industrial policy instruments are important of productivity, they are facilitated for as well. The results show that industrial policy tools used during the period from 1970-2000, are an important determinant of productivity development of Sudan.
10. Creating sustainable employment opportunities and improving the living standards in rural communities engaged in sugar-related agriculture

This paper argues that Sudan has potential and great opportunity in expanding sugar production due to fertile land availability and abundant water resource from the Nile and underground.

- Liberalizing Sugar imports and eliminates using customs duties on sugar to allow sugar companies gain competitive advantages.
- Government involvement on state-sugar companies should be reduced by privatize these factories to increase efficiency.

We are confident that adopting these policies will help redirect the sector towards sustainability and economic equity, positioning Sudan as a regional leader in this vital industry. We firmly believe that these policies are not merely theoretical proposals, but practical tools that reinforce public-private partnerships and lay the groundwork for sound governance capable of tackling current and future challenges.

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