Kenyan Exports: Tax incentives, Firm traits, Firm-Level, and Macroeconomic determinants

ABSTRACT

This study sought to understand the traits of the Kenyan exporter, what drives exports performance, and how the exporter responds to targeted policy measures. A two-stage approach to modelling was used. In the first stage, the firm's decision to export was done in a panel logistic model. In stage two, the drivers of export volumes at the macro-level were estimated using a Vector Autoregressive (VAR) model. The panel econometric modelling method was applied to 118,380 firm-level data spanning 2014 to 2019. While firm-specific characteristics (age, size, access to credit, labour intensity, and labour quality) affect exports, government policy informs of tax incentives may not create a substantial difference in the decision and volume of exports at the firm level. Exporting firms are labour intensive. The results of a VAR model using time series data from 1960 to 2020 confirm the firm-level analysis. Kenya exports are more driven by local production capacity than world demand. Secondly, exports are more labour responsive than capital responsive at a macro level. Local productivity capacity is significantly labour-driven than capital-driven. Therefore, labour-targeted policies would be more impactful. Exports response to local production capacity is instantaneous while a period of 3.5 years lapses before exports respond significantly to world-changing demand.

Keywords: Kenya, exports, panel econometrics, VAR modelling, tax incentives, Impulse response functions.

1. INTRODUCTION

1.1 Background

Exports policy has metamorphosed over time. Predominantly, tax incentives enshrine most export-promoting policies hence significantly affecting tax expenditure. This study begins by giving a summarised chronology of trade promotion policies in Kenya with a keen focus on specific measures that have an implication on the tax expenditure.

After independence, Kenya adopted the inward-looking import substitution policy regime whose primary goal of trade policies was to promote exports of consumer and intermediate goods while laying the groundwork for the eventual production of capital goods for both domestic and export markets (Gertz, 2008) [1]. In 1974, the government introduced a compensation scheme for the manufacture exporters to compensate them for the tariffs paid on their inputs under the Local Manufactures (Export Compensation) Act Chapter 482. Export of manufactured goods with at least 30 percent domestic value-added was eligible for export compensation and it was administered by the Department of Customs and Excise and the rate given is 10 percent of the freight on board value of exported goods. Kenya's trade policies evolved in 1980 when it signed its first Structural Adjustment Loan with the World Bank with conditions on implementing more liberal and interest rate regimes as well as a more outward-looking industrial policy (Swamy, 1994) [2]. This was further supported with the publication of the sessional paper no 1 of 1986 Economic Management for Renewed Growth which encouraged export-related strategies to help bolster trade (the Republic of Kenya, 1986) [3].

Export incentives began in 1988 with the introduction of the Manufacture Under Bond (MUB) program. This was a scheme extended to manufacturers to import plant, machinery, equipment, and raw materials tax-free, exclusively for use in the manufacture of goods for export (ITC, 2001) [4]. It was meant to encourage both domestic and foreign manufacturers to produce goods for export within the country. The Export Processing Zones (EPZ) program in Kenya was introduced in 1990 with the enactment of the Export Processing Zones Act, Cap 517. This scheme, which is managed by the EPZ Authority, promotes export-oriented industrial investment within designated zones.

The EPZ scheme offers generous incentives with significant implications on exports. Among the incentives provided under the scheme included: ten-year corporate income tax holiday and a 25% tax rate for a further 10 years thereafter (except for EPZ commercial enterprises), ten years withholding tax holiday on dividends and other remittances to non-resident parties (except for EPZ commercial license enterprises), perpetual exemption from VAT and customs import duty on inputs–raw materials, machinery, office equipment, certain petroleum fuel for boilers and generators, building materials, other supplies, perpetual exemption from payment of stamp duty on legal instruments, 100% investment deduction on new investment in EPZ buildings and machinery, applicable over 20 years among others.

In 1992, the Government of Kenya established the Export Promotion Council (EPC) to remove hindrances faced by exporters and producers of export goods and services to improve the export sector's performance. EPC uses a sectoral approach to its operations and identified horticulture and other agricultural, textiles and clothing, commercial crafts and MSEs, fish and livestock products, other manufactures and services other than tourism. Export Promotion Programmes Office (EPPO) was introduced in 1993, a duty drawback scheme which grants repayment of import duties and taxes paid on goods used in the processing or manufacture of exported products, and materials contained in the goods or consumed in the manufacture of the exported products or imported goods re-exported in the same state. In this same year, the Export Compensation scheme was discontinued due to a loss in revenues from exported products.

Further, and later on, Special Economic Zones (SEZ) Act, 2015 established SEZ as a designated geographical area where business-enabling policies are implemented and sector-appropriate on-site and off-site infrastructure and utilities are provided for by the

Kenyan Government. SEZs are aimed at attracting both local and foreign investments, expanding and diversifying production of goods and services for domestic and export markets, promoting value addition, promoting local entrepreneurship through Small and Medium Enterprises (SMEs), enhancing technology development and innovation, promoting rural and regional industrialization by exploiting comparative advantage of local resources. The SEZs scheme sought to achieve these objectives predominantly through offering tax incentives. These key incentives include 10% corporate tax for the first 10 years, 15% corporate tax for subsequent years, Duty & VAT exemption, 100 percent of the investment allowance on the cost of building and machinery, exemption from stamp duty, the exemption for withholding tax, exempt from export duty and Import Declaration Fees among others.

Currently, there is the inward and outward processing scheme in which the Customs Commissioner is given powers by the law to allow temporary importation or exportation of goods for processing operations free from tax provided that the ownership of such goods shall remain to the exporter and importer shall only process them under contract. Below is a summary of the evolution of export strategies in Kenya. Other export promotion reforms and the respective descriptions are in table 1.

Table 1. Summary of the evolution of export strategies in Kenya

YEAR	REFORM	DESCRIPTION
1963	Import Substitution Policy	Promote exports of consumer and intermediate goods while laying the groundwork for the eventual production of capital goods for both domestic and export markets
1974	Introduction of the Export Compensation Scheme	To compensate local manufacturing exporters for the tariffs paid on their inputs
1980	Structural Adjustment Loan with the world bank	This adjustment came with conditions for Kenya to implement more liberal and interest rate regimes as well as a more outward-looking industrial policy
1986	Publication of the Sessional paper no 1 of 1986 Economic Management for Renewed Growth	Change from Import Substitution to export-related strategies to help bolster trade.
1988	Manufacture Under Bond (MUB) program	Encourages manufacturers to import plant, machinery, equipment, and raw materials tax-free, exclusively for use in the manufacture of goods for export.
1990	Export Processing Zones (EPZ) program	Promotes export-oriented industrial investment within designated zones and offers generous incentives to attract new firms manufacturing for export.
1992	Establishment of the Export Promotion Council (EPC)	To remove hindrances faced by exporters and producers of export goods and services to improve the export sector's performance.
1993	Establishment of the Export Promotion Programmes Office (EPPO)	A duty drawback scheme that grants repayment of import duties and taxes paid on goods used in the processing or manufacture of exported products, materials contained in the goods or consumed in the manufacture of the exported products, or imported goods re-exported in the same state.
1993	Repeal of the Export Compensation Scheme	Phased out due to lost revenues from exported products
1994	Common Market for Eastern and Southern Africa (COMESA) treaty	Kenya joined COMESA whose main focus was the formation of a large economic and trading unit that is capable of overcoming some of the barriers that are faced by individual states and promoting regional integration
1995	World Trade Organisation Agreements	Kenya joined WTO whose goal is to ensure that trade flows as smoothly, predictably, and freely as possible.
1999	EAC Agreement	Kenya signed a Cooperation Agreement with Uganda and Tanzania to promote regional integration
2000	Formation of a Free Trade Area (FTA)	Kenya and other eight member countries of COMESA formed a Free Trade Area (FTA) in which no tariffs are levied on goods from

		other member states and therefore have an integrated market for goods and services
2000	Cotonou Agreement	Kenya along with other African Caribbean and Pacific (ACP) countries granted duty-free market access into the European Union for most of the products originating from this regional bloc.
2000	Enactment of African Growth Opportunities Act (AGOA)	Preferential trade agreements with the USA under the African Growth Opportunities Act (AGOA)
2003	Launch of the National Export Strategy	Ministry of Trade and Industry in collaboration with the International Trade Centre (ITC) launched the first Export strategy document focusing on the period 2003-2007
2004	Establishment of the EAC Customs Union	This was created to form a Single Customs Territory (SCT)
2014	Implementation of the Single Customs Territory (SCT)	Involves interconnectivity of customs systems to facilitate seamless flow of information between customs stations and a payment system to manage transfers of revenues between the EAC Partner States
2015	Extension of AGOA	The USA extended this preferential trade arrangement to 2025 thereby giving Kenya's exports a boost to grow in their market.
2017	Launch of the Integrated National Export Development and Promotion Strategy	Kenyan government another exports strategy document intending to increase Kenya's exports share in the target regional and global markets through sustained production of goods and services for export focusing on the period 2018-2022.
2019	Establishment of the Kenya Export Promotion and Branding Agency	Export Promotion Council and Brand Kenya Board were merged to form one agency that implements export promotion and nation branding initiatives and policies.
2020	Kenya – US Free Trade Agreement Negotiations	Kenya and USA formally began negotiations for the Free Trade Agreement that will increase and guarantee preferential market access to Kenya's export products upon success.

Source: Author

Although a myriad of policy issues have been implemented to increase exports, some of these policies have increased tax expenditure and impacted negatively on revenue collection. Empirical research had questioned the effectiveness of such incentive measures in attaining the intended objectives by early 2000, but they still exist today (Glenday and Ndii, 2000) [5]. One notable aspect of the tax incentivized export promotion schemes is that significant revenue is foregone. Some features of tax incentives are discernible from prior studies. For instance, whereas the foregone revenue is quantifiable, the gains in employment, social welfare, additional investment, exports, foreign exchange earnings, and economic growth are hardly quantified. Additionally, although the advantages of tax incentives are known, they are not discussed in the literature as extensively as their respective disadvantages.

Beginning with the positives, tax incentives may lead to an increase in private sector output (Kosonen, & Harju, 2018) [6], attract foreign direct investment (Klemm, & Van Parys, 2012) [7], and increase real domestic investment, and exports (Nallareddy, Rouen & Serrato, 2018) [8]. Conversely, tax incentives counter initiatives aimed at raising more tax revenue through tax base expansion (see for instance Poterba (2011) [9] and Klemm 2009) [10]. They also violate the optimal tax principles of simplicity, efficiency, transparency, predictability, and equity which exacerbates the cost of tax incentives. Besides, they have the potential to create abusive tax avoidance schemes. Hence, the direct and indirect costs associated with tax incentives seem to overshadow the envisaged economic benefits.

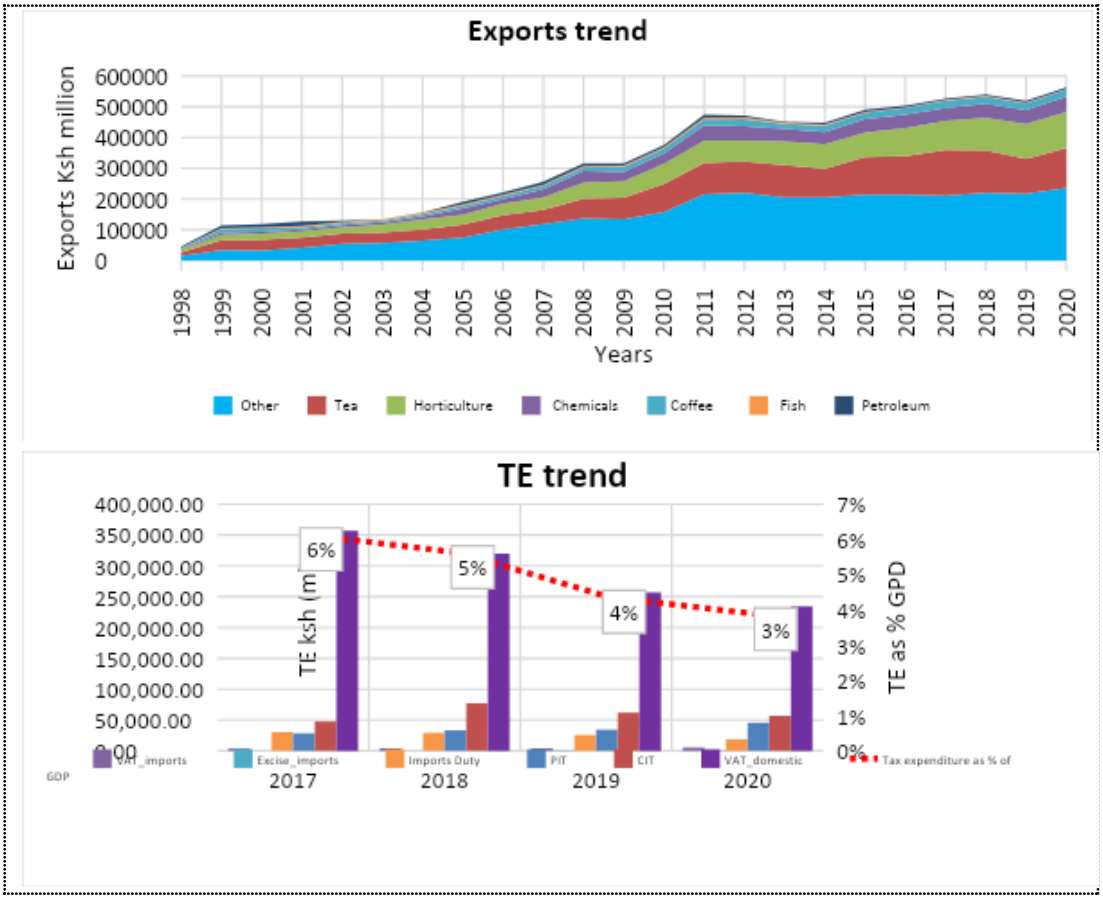

Fig. 1. Exports and Tax expenditure (TE) trends
Source: Author

The foregone revenue or the cost of tax incentives in Kenya is enormous and it predominantly emanates from exports related incentives. Kenya loses Kshs. 100 billion annually due to tax incentives Curtis, Kambuni, Daniels, Mosioma, Mshana, Ambrose, & Ngowi, 2012) [11]. Recent estimates in Kenya show that the revenue foregone due to tax incentives has grown three-fold to Kshs. 352 Billion in 2015, Kshs.456 billion in 2016, Kshs. 478 billion in 2017 and Ksh. 536 billion in 2018 (Figure 1). These represent 5.6%, 6.5%, 5.9%, and 6.0% of the GDP for the respective years. While the cost of tax incentives is not with a relative degree of precision, the benefits are hardly quantified.

All the categories of exports depict an increasing trend as shown in figure 1, but is not clear what are the factors driving the exports. Revealing the drivers of exports is crucial in not only shaping the exports policy but also making it more targeted. Tax incentivized export promotion schemes have a cost implication in the sense that a significant amount of tax revenue is foregone. Predominantly, the incentives lean-to capital other than labor as factors of production. However, the contribution of these factors to export volumes and economic performance may not be symmetrical. Importantly, knowing the traits of exporting firms and

their relative response to tax incentives is key in shaping exports policy. Therefore, this study sought to model the traits of exporters at the firm level using a panel logit model. Similarly, controlling for firm traits, the study sought to determine the relative effect of tax incentives on a firm's decision to export. Lastly, the study modelled the determinants of exports at a macro level for comprehensive insights to inform trade policy.

1.2 Literature Review

1.2.1 Traits of exporting firms

Firm ability to export is predominantly captured in the old international trade theory of comparative advantage (see. Heckscher–Ohlin comparative advantage), Bernard, Jensen, Redding, & Schott (2007) [12]. However, recent trade patterns lean more towards firm heterogeneity models. Firm heterogeneity models point out that there are significant differences between international trading and non-trading firms. In deciding to export or the magnitude of export propensity (exports to total sales ratio), firm heterogeneity matters(Roberts and Tybout, 1997 [13]; Bernard, & Jensen,1997 [14]; Niringiye and Tuyiragize 2010 [15], Kahia 2017) [16].

Empirical review shows exporting firms have unique traits. Arnold and Hussinger, (2005) [17] show that exporting firms tend to have high productivity, a large number of employees (three times as much as non-exporting firms), high sales volume, advanced innovation techniques, high investments in research and development to encourage innovation of new products. Notably, not all firms can participate in exports.

According to Bernard, Redding, and Schott, (2007) [12], participating in the export trade is a rare occurrence. In the year 2000, out of 5.5 million firms operating in the US only 4% were in the export business, and out of those exporting the top 10% accounted for 96% of the total exports. This goes to show the importance of these export firms in the country's export trade. Characteristics of these firms were determined to be more productive, larger in size, highly skilled workers, and capital intensive, and paid higher wages. Analysis of the manufacturing industry showed that exporting is highly likely to happen in the skill-intensive sectors like manufacturing of electronics such as computers as opposed to the manufacture of clothing.

In Austria, Pöschl, Stehrer, and Stöllinger, (2009) [18] in their study documented the characteristics of exporting firms in the manufacturing industry and their importance to the economy. It was found that exporting firms were few, recorded a larger number of employment opportunities, higher wages, a larger number of sales and investments. These firms are also capital intensive meaning that tasks requiring low skills are automated and done by machines that are maintained by highly skilled workers. Summarily, exporting firms employ highly skilled labour, high levels of productivity, invest heavily in research and development, a large number of employees, capital intensive, a large number of sales, high wages, and increased diversification of risks. Niringiye, (2014) [19] showed that higher levels of capital to labour ratio, firm size, Asian ownership, and being an agro-based and chemical firm are the major determinants of propensity to export in the African region

1.2.2 Macroeconomic drivers of export

Several macroeconomic factors have been cited as drivers of exports. Lapp, Scheide, & Solveen, (1995) [20] investigate the drivers of exports in G7 countries. Using the error correction model, the study revealed that real effective exchange rates, exchange rate volatility, and economic activity in trading partner countries have a considerable impact on real exports of the G7-countries. Abidin, & Sahlan (2013) [21] investigate the impact of

economic factors on bilateral exports between Malaysia and the OIC member countries. Using the panel estimation, gravity estimates imply the importance of side effects, level of openness of the economy, inflation rates, and the exchange rates as determinants of Malaysia's exports to OIC countries. Similar findings are echoed in Shahriar& Kea (2019) [22] when modelling the factors that drive meat exports in China. The analysis reveals that GDP, exchange rate, common language, and country land area are the significant factors affecting the Chinese pork exports flows.

Prasad, (2000) [23] models the drivers of exports in Fiji. The results show that in the long run, trading partner income largely drives movements in Fiji's exports. In the short run, exports are mainly influenced by changes in factors that affect the output capacity of agricultural production, such as weather conditions and industrial disputes, as well as relative prices and changes in foreign demand. This underscores the essence of world income (GDP) as a proxy for exports demand and gross domestic product (a proxy for local productivity) as a driver of exports capacity.

Malhotra, & Kumari, (2016) [24] investigated the drivers of exports in Japan and South Korea, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, Bangladesh, India, Pakistan, and Sri Lanka. Using aggregate annual data, the study shows that exports are driven by both demand and supply factors. The conventional demand and supply factors like world demand, real effective exchange rate, production level or capacity, and relative prices, are key determinants of exports. Further, the study also incorporates the effect of foreign direct investment (FDI) inflows and trade openness are key drivers of exports performance. In developing countries, Matthee, & Naudé, (2008) [25] find that gravity estimates are key drivers of exports.

Most export policies are tax incentives. It is not clear if such incentives drive exports. Similarly, farm characteristics could be crucial in understanding the drivers of exports, tax policy incentives withstanding. At the macro level, it is critical to know what matters as export drivers. Importantly, it should be critical to determine if labour or capital incentives should be applicable. This study used firm-level tax return data and macroeconomic time-series data to determine the drivers of exports in Kenya.

2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

To the drivers of exports at the firm level, the study employed a decision to export logit model borrowed from Bernard and Jensen, (1997) [26].

$$y_{it} = \beta\ x_{it} + \lambda\ z_{it} + \varepsilon_{it} \quad \text{.....1}$$

where y is a binary variable on whether a firm exports or not, X_{it} is a vector of tax incentives while Z_{it} is a vector of firm-specific attributes including size, wage expenditure, and capital intensity. The tax incentives under consideration are; investment deduction, industrial building deduction, wear and tear allowance, and location in SEZ or EPZ.

To determine the macroeconomic drivers of exports in Kenya, a six variables Vector Autoregressive (VAR) model represented as follows was used.

$$X_t' = \left[\ln gdp_t \quad \ln w\_gdp_t \quad \ln x_t \quad \ln e_t \quad \ln L_t \quad \ln gcf_t\right]' \quad \text{.....2}$$

Where ln_gdp is the natural logarithm of the gross domestic product of Kenya, Lnw_gdp is the logarithm of world Gross Domestic Product representing world demand for exports, ln_Xt is the natural logarithm of Kenyan exports, ln_L is the natural logarithm of labour

participation in Kenya, ln_e is the natural logarithm of the exchange rate, while ln_gfc is representing natural logarithm of gross capital formation. Both labor and gross capital formation are entering the model to replace GDP sequentially in the subsequent analysis.

The benchmark reduced-form VAR is stated as:

$$X_t = \alpha_0 + \alpha_1 t + A(L)X_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots 3$$

Thus the relation between the reduced form disturbances ε_t and the structural disturbances v_t takes the following form.

$$\begin{bmatrix} 1 & 0 & 0 \\ \alpha_{21} & 1 & 0 \\ \alpha_{31} & \alpha_{32} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{\ln w\_gdp} \\ \varepsilon_t^{\ln gdp} \\ \varepsilon_t^{\ln Xt} \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_t^{\ln w\_gdp} \\ v_t^{\ln gdp} \\ v_t^{\ln xt} \end{bmatrix}$$

This recursive scheme entails that the ordering of the variables has important implications for the identification of the shocks. This particular ordering has the following implications: (i) world GDP (ln_gdp) does not react contemporaneously to shocks from other variables in the system; (ii) local GDP (lngdp) does not react contemporaneously to shocks originating from all factors except world GDP. Exports react contemporaneously to shocks of the entire vector. Technically, this amounts to estimating the reduced form, then computing the Cholesky factorization of the reduced form VAR covariance matrix. In other words, the relation between the reduced-form errors and the structural disturbance is given by the above matrix. We construct a similar VAR model using labor, capital, and exchange rate.

2.1 Data and Data Sources

The raw data set consisted of 264,810 firms however only 118,380 firms' data were reliable after data cleaning. Data was obtained from Kenya Revenue Authority tax management system. Corporate income tax returns from 2015-2018, which cover 151 EPZs and 8 SEZs, were used to retrieve information on the nature of investments and firm turnover. Time-series data were obtained from the World Bank.

3. RESULTS AND DISCUSSION

3.1 Descriptive results

Table 2 shows the proportion of exports values, export numbers, gross value added, employment expenditure, total tax deductions, and employment levels across sectors. The main exporters are in the Agricultural sector (30%) and the manufacturing sector (34.1%).

Most of the tax incentives in terms of capital deductions are in Agricultural Sector (24%) which is also the leading in employment numbers.

Table 2. Descriptive across sectors

	Export values	Exporters number	Gross value added	Employment expenditure	Total_ deduction	Total_ employees
Agriculture	30.4%	8%	12%	13%	24%	11%
Manufacturing	34.1%	5%	4%	4%	5%	5%
Wholesale and retail trade	0.6%	11%	5%	3%	8%	8%
Electricity and water supply	0.0%	4%	2%	4%	1%	5%
Professional, admin, and support services	8.0%	3%	8%	4%	13%	3%
Mining and quarrying	0.0%	4%	21%	18%	4%	4%
Transport and storage	0.1%	3%	2%	4%	1%	4%
Other services	0.1%	4%	11%	9%	6%	4%
Construction	0.2%	8%	2%	4%	4%	8%
Accommodation and restaurant	5.6%	1%	1%	0%	1%	1%
Health	7.9%	11%	11%	10%	11%	11%
Real estate	0.1%	0%	0%	0%	0%	0%
Information and communication	0.1%	15%	3%	2%	4%	9%
Public administration	1.7%	6%	14%	12%	18%	6%
Education	10.7%	12%	2%	8%	3%	14%
Financial and insurance	1.3%	6%	3%	3%	1%	5%

Source: Author

3.2 The decision to export

The results of the panel econometric model are presented in table 3a and 3b.The analysis reveals that an exporter is likely to be large, old, accessing credit, labour-intensive, seeking cheap labour, and enjoying some capital expenditure deductions. Firm size, age, credit, and capital deduction significantly increase firms' odds in favour of exporting. The signs are consistent with empirical expectations. The positive and significant coefficient in firm size implies that large firms have economies of scale to enter and compete in foreign markets. Similarly, the age effects imply that mature firms may have accumulated considerable knowledge stocks and capabilities that allow them to better penetrate foreign markets. The effect of labour quality is significantly negative while capital intensity is insignificant. This can be attributed to the fact that large export values for the period of analysis are in the Agricultural sector (30%) and manufacturing sector (34.1%) which are mainly labour-intensive, low-technology firms, and may not need skilled or highly educated labour force. A shilling allowed as capital expenditure increases the probability of exporting by 0.48%.

Table 3.a. Exports and firm-level traits

VARIABLES	(1) logit	(2) logit	(3) logit	(5) OLS Subtype_Sector_ Time_FE	(6) OLS Subtype_Sector_ Time_FE	(7) Margins

lncapital_deduction	0.8152***	0.2073***	0.2073***	0.1371***	0.1371***	0.0048***
	(0.0200)	(0.0359)	(0.0359)	(0.0421)	(0.0421)	(0.0015)
Firm_size		1.0930***	1.0930***	0.9487***	0.9487***	0.0338***
		(0.0520)	(0.0520)	(0.0602)	(0.0602)	(0.0020)
Age		0.0170***	0.0170***	0.0150***	0.0150***	0.0005***
		(0.0022)	(0.0022)	(0.0026)	(0.0026)	(0.0001)
in borrowing		0.0657**	0.0657**	0.1547***	0.1547***	0.0055***
		(0.0298)	(0.0298)	(0.0376)	(0.0376)	(0.0013)
lncapital_intensity		-0.0096	-0.0096	-0.0337	-0.0337	-0.0012
		(0.0384)	(0.0384)	(0.0473)	(0.0473)	(0.0017)
lnquality		-0.1855***	-0.1855***	0.2316***	0.2316***	0.00827***
		(0.0465)	(0.0465)	(0.0503)	(0.0503)	(0.0018)
Constant	-17.7944***	-27.5404***	-27.5404***	-20.0792***	-20.0792***	
	(0.3016)	(0.9420)	(0.9420)	(1.5107)	(1.5107)	
Observations	80,388	32,719	32,719	32,296	32,296	
Number of ID	30,753	14,069	14,069	14,001	14,001	
TimeFE	NO	NO	NO	YES	YES	
Business_subtypeFE	NO	NO	NO	YES	YES	
SectorFE	NO	NO	NO	YES	YES	
Cluster_se	NO	NO	NO	YES	YES	
N_clust				14001	14001	
N_robust				32296	32296	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Author

The study further models the determinants of the decision to export controlling for business subtype, sector, and time effect. On the business subtype, EPZ is the reference category while sector and year, manufacturing, and 2015 are the reference categories. The results are robust and consistent.

Table 3.b. Exports and firm-level traits

	(1)	(2)	(3)	(4)	(5)
VARIABLES	OLS	OLS	OLS	OLS	Subtype _ Sector _Time_FE
firm_size			1.0930***	1.0930***	0.6541***
			(0.0520)	(0.0520)	(0.0445)
age			0.0170***	0.0170***	-0.0000
			(0.0022)	(0.0022)	(0.0006)
lnb			0.0657**	0.0657**	-0.0026
			(0.0298)	(0.0298)	(0.0258)
lncapital_intensity2			-0.0096	-0.0096	0.0102
			(0.0384)	(0.0384)	(0.0427)
lnquality			-0.1855***	-0.1855***	-0.1356***
			(0.0465)	(0.0465)	(0.0434)
lntotal_capital_deduction	0.8152***	0.8152***	0.2073***	0.2073***	-0.0216
	(0.0200)	(0.0200)	(0.0359)	(0.0359)	(0.0301)
2016_					-0.3624***
					(0.0622)
2017_					-0.4042***
					(0.0684)
2018_					-0.3929***
					(0.0744)
2019_					-0.5121***
					(0.1479)
others					-3.7762***

					(0.3464)
Foreign_Company					-3.2969***
					(0.5602)
Private_Company					-3.5155***
					(0.2538)
Public_Company					-3.4193***
					(0.5064)
SEZ_Company					2.4195***
					(0.1645)
Construction					-1.3625***
					(0.2612)
Education					-2.0836***
					(0.3959)
Electricity and water supply					-0.4570
					(0.3101)
Financial and insurance					-3.7931***
					(0.6736)
Health					-1.1934***
					(0.3602)
Information and communication					-1.8505***
					(0.2586)
Mining and quarrying					-1.5393***
					(0.4168)
Professional, admin and support services					0.5104
					(0.5402)
Public administration					-1.4549***
					(0.2866)
Real estate					-0.1993
					(0.8246)
Transport and storage					-1.5923***
					(0.2172)
Wholesale and retail trade					-1.1767***
					(0.1740)
Other services					-1.1796***
					(0.3890)
Constant	-17.794***	-17.74***	-27.54***	-27.54***	8.6292***
	(0.3016)	(0.3016)	(0.9420)	(0.9420)	(0.8489)
Observations	80,388	80,388	32,719	32,719	4,239
Number of ID	30,753	30,753	14,069	14,069	2,077
TimeFE	NO	NO	NO	NO	YES
Business_subtypeFE	NO	NO	NO	NO	YES
SectorFE	NO	NO	NO	NO	YES
Cluster_se	NO	NO	NO	NO	YES
N_clust					2077
r2_w					0.0648
r2_b					0.345
r2_o					0.358

thta_max					0.758

3.3 Macroeconomic determinants of exports

The study sought to model Kenyan exports demand using a time series macro-econometric model. We begin by interrogating the time-series properties of the variables under consideration. Both Philips perron and Augmented Dickey fuller tests for stationarity are used. The set of variables have unit roots. However, The labour (Ln_Labor) series is an I(2) process. We work with different series.

Table 4 ADF and PPP unit root tests

	Levels		First difference		Conclusion
Variables (Price)	ADF	PP	ADF	PP	
Ln_exports (x)	-1.072806	-1.082352	-3.756810***	-8.823743***	I(1)
Ln_GDP	0.830102	0.527218	-5.893219***	--6.026915***	(1)
Ln_Labor (L)	-1.064377	-0.173363	-1.264322	-1.334490	(2)
Ln_exchange rate (e)	-0.09222	-0.229114	-5.779659***	-5.767868***	(1)
Ln_Gross Capital Formation	-1.243911	-2.408859	-9.251786***	-10.36245***	(1)
Ln Word GDP(w_GDP)	-2.571242	-3.095198*	-3.820851***	-3.788821***	(1)

*** Significant at 1%, Ln-natural logarithm, ADF –Augmented Dickey-Fuller, PP-Philips-Perron, I(1)-Integrated of order 1

Source: Author

3.4 Cointegration test

In the next step, we seek to determine if the variables in consideration have a long-run relationship. Therefore we conduct are VAR-based Johansen-Johansen and Juselius (1990) [27] approach to establish the co-integrating vectors. Two test statistics are used to test the number of cointegrating vectors, based on the characteristic roots. For both trace and Eigen statistics, the null is at most r co-integrating vectors.

Table 5. Cointegration test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.478943	65.55155	47.85613	0.0005
At most 1	0.298475	28.39344	29.79707	0.0719
At most 2	0.102907	8.187053	15.49471	0.4456
At most 3	0.034430	1.997069	3.841466	0.1576
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.478943	37.15810	27.58434	0.0022
At most 1	0.298475	20.20639	21.13162	0.0670
At most 2	0.102907	6.189984	14.26460	0.5890
At most 3	0.034430	1.997069	3.841466	0.1576

Source:Author

Both the Eigen and Trace statistic rejects the none co-integration hypothesis at a 5percent significance level for 1 cointegrating relationship. This reveals that there is enough statistical evidence for the existence of a unique co-integrating vector for the set of variables in the VAR model.

3.5 Lag length selection criteria

The optimal lag length was selected based on a comparison of the following information criteria which include Akaike information criterion (AIC) Schwarz information criterion (SC), Hannan – Quinn information (HQ) criterion, Final prediction error (FPE), and Sequentially modified LR test statistic.

Table 6 Optimal lag length selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-82.27945	NA	0.000271	3.137434	3.283422	3.193889
1	302.3259	699.2824	4.10e-10	-10.26640	-9.536456*	-9.984122
2	333.4826	52.11671	2.38e-10	-10.81755	-9.503659	-10.30946*
3	352.2132	28.60679*	2.21e-10*	-10.91685*	-9.019003	-10.18293
4	366.4081	19.61472	2.48e-10	-10.85120	-8.369410	-9.891474
5	372.7203	7.804155	3.81e-10	-10.49892	-7.433174	-9.313371
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author

Too many lags impact degrees of freedom while few lags create the problem of serial correlation. The majority of the criteria indicate that the optimal lag length should be 3. Since the variables are integrated to order 1, except the short labour participation series, we model a VAR-based model. Imports demand has expressed a function of domestic production capacity measured by local; GDP, world demand measured by world GDP, and the price of trading currency measured by the exchange rate.

3.6 Exports, World demand, and local production capacity

The cointegrating model reveals the following, domestic export is an increasing function of local production capability and world demand. A 1% increase in GDP increases local exports by 0.8%. The high responsiveness is expected given that the average exports share to GDP for the entire period of the analysis is 26%. However, exports are significant but less responsive to external demand. This can be explained by the fact that Kenya is a small economy and a price taker in the world market. Secondly, the domestic output lags in response to changes in world demand given that Kenya exports are predominantly agricultural. A percentage increase in world demand, proxied by world GDP increases Kenyan exports by 0.15%.

Cointegrating model 1

Table 7 Exports long-run model (Based on supply and demand factors)

Dependent Variable: LNX_N				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_WGDP	0.149918	0.063027	2.378634	0.0208
LNGDP	0.759454	0.081065	9.368489	0.0000
@TREND	0.010636	0.006578	1.616941	0.1114
R-squared	0.995105			
Adjusted R-squared	0.994933			

Source: Author

3.7 Exports, labor participation, and gross capital formation

Cointegrating model 2, exports are more responsive to labour than gross capital formation. These findings support the firm-level analysis that reveals that exporting firms in Kenya are labour-intensive. A 1% increase in the labour force and gross capital formation increases exports by 0.7% and 0.45% respectively.

Cointegrating model 2

Table 8 Exports long-run model (Based on capital and Labour)

Dependent Variable: LNX_N				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNL	0.743495	0.063340	11.73809	0.0000
LNGCF	0.452362	0.052102	8.682247	0.0000
LNE	0.560303	0.122164	4.586495	0.0001
R-squared	0.981079	Mean dependent var		26.60645
Adjusted R-squared	0.979727	S.D. dependent var		0.949290

Source: Author

3.8 GDP, labour participation, and capital formation

The analysis further looked at the responsiveness of GDP to gross capital formation and labour participation. The estimates imply that the GDP for Kenya is more labour-driven than capital-driven. The findings support the essence of more labour-supportive incentives other than capital-targeted policies. A percentage increase in the gross capital formation increases gross domestic product by 0.25%, while labour increases gross domestic product by 1.58%.

Cointegrating model 3

Table 9 Long-run GDP growth model

Dependent Variable: LNGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGCF	0.250125	0.092863	2.693501	0.0133
LNL	1.585461	0.381967	4.150776	0.0004
@TREND	0.037030	0.013238	2.797149	0.0105
C	-6.242520	5.157251	-1.210436	0.2390
R-squared	0.996146	Mean dependent var		28.48835
Adjusted R-squared	0.995620	S.D. dependent var		0.945281

Source: Author

3.9 Impulse, response functions and variance decomposition

The study further sought to model the dynamism of labour, capital accumulation, and exports using the VAR tool kit. This kit contains impulse response function and variance decompositions. The impulse response function shows the response of a target variable after a shock. Variance decomposition breaks down the extent to which innovations explain the changes in the dependent variable. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables

The first panel shows Kenyan exports (LNX_N) have a lagged response to an increase in world demand (LN_WGDP). The response becomes significant after 3.5 years. The gestation period is explained by the fact that Kenyan exports are predominantly raw agricultural products. Secondly, Kenya being a small economy has no control over the world market. In the second panel, the response of exports to a sudden shock in local productivity demand is positive and immediate. When local production increases (LNGDP), domestic firms seek to offload the excess output by exporting. In the third panel under figure 2, a shock in exports may take up to five years to decay. This signifies the need for policy to promote exports.

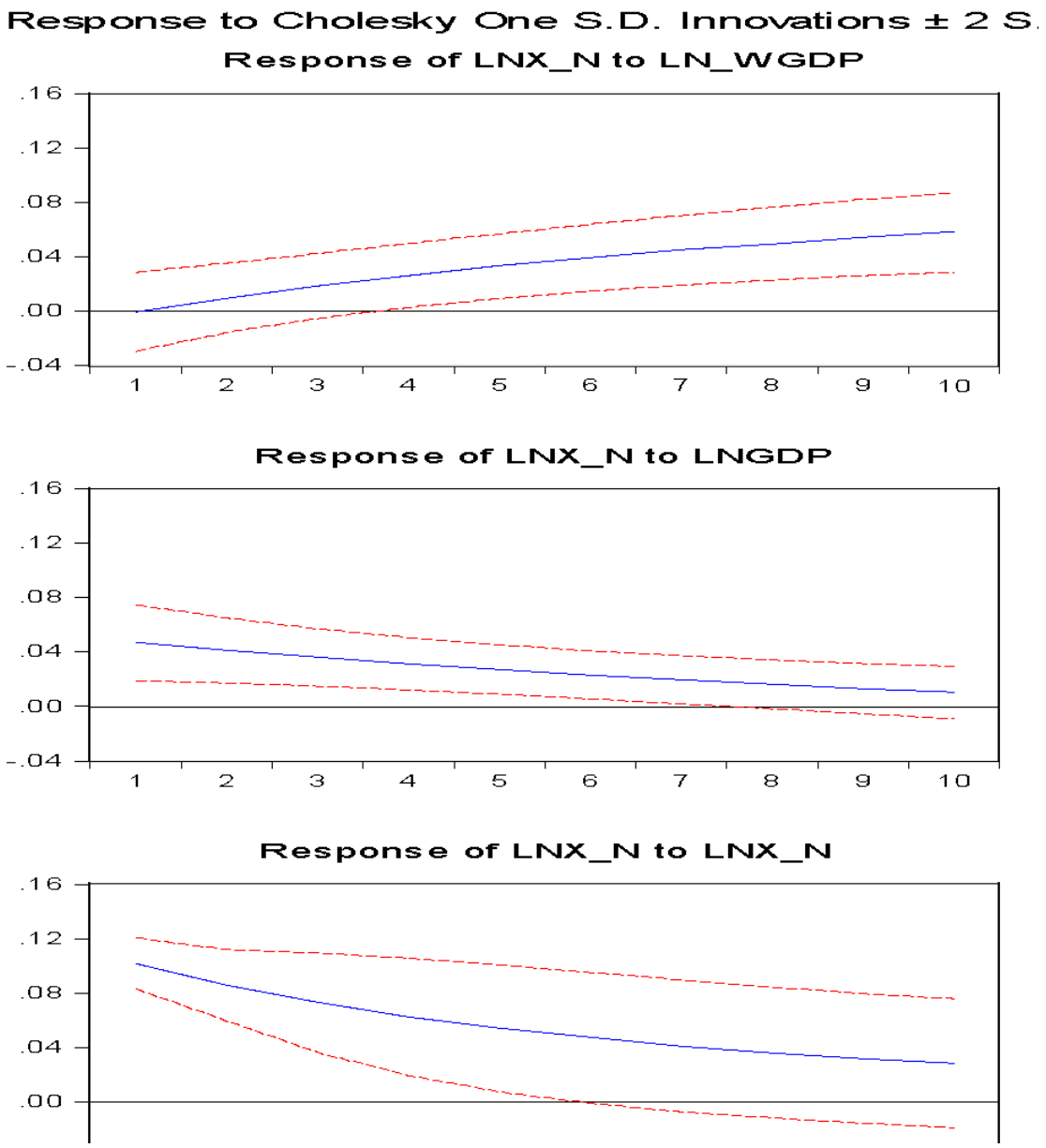

Fig. 2 Impulse response functions
Source: Author

4. Conclusion

The study finds that while firm-specific characteristics (age, size, access to credit, labour intensity, and labour quality) affect exports, government policy informs of tax incentives may not create a substantial difference in the decision and volume of exports at the firm level. Further, a Vector Autoregressive (VAR) Model using time series data from 1960 to 2020 was used to determine the drivers of exports at the macro level. The findings support the

firm-level analysis. Kenya exports are more driven by local production capacity than world demand. Secondly, exports are more labour responsive than capital responsive at a macro level. Local productivity capacity is significantly labour-driven than capital-driven. Therefore, labour-targeted policies would be more impactful. In addition, a shock in local production affects exports instantaneously while a gestation period of 3.5 years may lapse before exports respond to external demand.

References

1. Gertz, G. Kenya's trade liberalization of the 1980s and 1990s: Policies, impacts, and implications. 2008
2. Swamy, G. Kenya: structural adjustment in the 1980s (Vol. 1238). World Bank Publications. 1994
3. The Republic of Kenya. Economic Management for Renewed Growth (Sessional Paper No. 01 of 1986). 1986
4. International Trade Centre (ITC). Kenya's Export Strategy. 2001
5. Glenday, G., and D. Ndii. Export platforms in Kenya. African Economic Policy Discussion Paper. 2000(43)
6. Kosonen, T., & Harju, J. The impact of tax incentives on the economic activity of entrepreneurs. 2013
7. Klemm, A., & Van Parys, S. Empirical evidence on the effects of tax incentives. International Tax and Public Finance. 2012 19(3), 393-423
8. Nallareddy, S., Rouen, E., & Suárez Serrato, J. C. Corporate tax cuts increase income inequality (No. w24598). National Bureau of Economic Research. 2018
9. Poterba, J. M. Introduction: Economic analysis of tax expenditures. National Tax Journal, 2011; 64(2), 451-458.
10. Klemm, M. A. Causes, benefits, and risks of business tax incentives (No. 9-21). International Monetary Fund. 2009
11. Curtis, M., Kambuni, L., Daniels, J., Mosioma, A., Mshana, V., Ambrose, S., ... & Ngowi, H. Tax competition in East Africa: A race to the bottom. Tax incentives and revenue losses in Tanzania, Tax Justice Network-Africa and ActionAid International. 2012
12. Bernard, A. B., Jensen, J. B., Redding, S. J., & Schott, P. K. Firms in international trade. Journal of Economic Perspectives, 2007; 21(3), 105-130
13. Roberts, M. J., & Tybout, J. R. The decision to export in Colombia: An empirical model of entry with sunk costs. The American Economic Review, 1997; 545-564.
14. Bernard, A. B., & Jensen, J. B. Exporters, skill upgrading, and the wage gap. Journal of International Economics, 1997; 42(1-2), 3-31.

15. Niringiye, A., & Tuyiragize, R. Determinants of a Firm's Level of Exports: Evidence from manufacturing firms in Uganda. AERC. 2010
16. Kahia, M. The key factors of export intensity in Tunisia: A Logistic regression with the random-effect model. 2017
17. Arnold, J. M., & Hussinger, K. Export behavior and firm productivity in German manufacturing: A firm-level analysis. Review of World Economics, 2005; 141(2), 219-243.
18. Johannes Pöschl, Robert Stehrer and Roman Stöllinger. Characteristics of exporting and non-exporting firms in Austria. 2009
19. Niringiye, A. Determinants of private investment behavior in Ugandan manufacturing firms. AERC. 2014
20. Lapp, S., Scheide, J., & Solveen, R. Determinants of Exports in the G7-Countries (No. 707). Kiel Working Paper. 1995
21. Abidin, I. S. Z., & Sahlan, R. The determinants of exports between Malaysia and the OIC member countries: A gravity model approach. Procedia Economics and Finance, 2013; 5, 12-19.
22. Shahriar, S., Qian, L., & Kea, S. Determinants of exports in China's meat industry: A gravity model analysis. 2019
23. Prasad, S. Determinants of exports in Fiji. Economics Department, Reserve Bank of Fiji. 2000
24. Malhotra, N., & Kumari, D. Determinants of Exports in Major Asian Economies. Journal of International Economics. 2016; (0976-0792), 7(1).
25. Matthee, M., & Naudé, W. The determinants of regional manufactured exports from a developing country. International Regional Science Review, 2008; 31(4), 343-358
26. Bernard, A. B., & Jensen, J. B. Exporters, skill upgrading, and the wage gap. Journal of International Economics, 1997; 42(1-2), 3-31.27.
27. Johansen, S., & Juselius, K. Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. Oxford Bulletin of Economics and Statistics, 1990; 52(2), 169-210.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.