Determinants of Agricultural Export Trade: Case of Fresh Pineapple Exports from Ghana

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Authors' contributions

This whole work was carried out in collaboration between all authors. Structured, guided and edited by the author DB, this work is the output of effective contributions from the authors DB, BOKL and JA. This article has been read and approved by all.

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ABSTRACT

Aims: This study is purposed on informing future trade policy decisions on how the fresh pineapple export industry of Ghana can be revitalized following declines in both volumes and value of exports since the year 2004. To achieve this, effort is made to identify and assess the magnitude and effects of key determinants of fresh pineapple exports from Ghana for the period 1984-2009
Study Design: The study involves separate consideration of value and volume of exports as explained variables, and sourcing of ways by which beneficial implications noted could be maximized for both variables, while minimizing adverse ones in the process.
Place and Duration of Study: This study solely involves the use of secondary data and own-computations on volume and value of pineapple exports, production, domestic demand, export price faced by exporters, terms of trade index of exports, real effective exchange rate, comparative export performance index and net inflow of foreign direct investment
Methodology: Separate regression with value and volumes of exports as explained variables were estimated with the Ordinary Least Squares estimator, and tested for appropriate standard Gaussian assumptions, appropriateness of specification and stability of coefficients

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Results: The results show that Ghana's fresh pineapple export industry has competitive advantage and is more price-driven than volume driven. Both volume and value of exports have positive association with production, openness to trade, and the index of competitiveness. Both however have an inverse association with domestic demand and net inflow of foreign direct investment. In as much as the value of exports increases with export price faced by exporters, the response for volumes exported is not significant. The effect of lagged volume of exports on both explained variables is as well not significant.

Conclusion: Reviving the fresh pineapple export industry requires increasing production (to be achieved through creation of favorable production conditions), improvement in quality of produce exported, improvement in the country's openness to trade, and minimization or avoidance of domestic market capturing and tariff jumping types of foreign direct investments.

1. INTRODUCTION

The extreme reliance of Ghana's agriculture sector and the economy on the cocoa subsector cost the country a period of great depression during the mid-1960s to mid-1970s following the collapse of world cocoa prices (and other marketing and fiscal inefficiencies in the domestic environment). In effort to revive the agriculture sector and promote economic development, the then government introduced various initiatives to help shield the country from future shocks on the international market due to the highly volatile and fragile nature of agricultural trade. Among the numerous initiatives introduced was the agricultural diversification project (1991-1999), with a primary aim of promoting production and export expansion of non-cocoa tree and horticultural crops. This initiative did contribute effectively to improving export performance of the agriculture sector as a whole, although subsector performances did differ. Among the subsectors that responded positively to the initiative and has for over two decades now been perceived to have steered growth of the horticulture industry is the pineapple subsector. From virtual non-existence in the early 1980s, pineapple exports from the country increased to approximately 56,000 tonnes (by FAO estimate) yielding a value of $68,340 ("000") by the year 2004. Following shifts in market demand and other relevant economic and policy indicators, as well as the country's slow adaptation to changes on the market however, the fresh pineapple export industry has experienced a steep decline in volume and value of exports since the year 2005.

Export of pineapples as shown in Fig. 1 declined in terms of volume (based on FAO data) from 56,094tonnes in 2004 to 9,971 tonnes in 2010, increasing thereafter to 45,999tonnes in 2011. These figures correspond to values of 68,343 ($1000), 3,531 ($1000) and 51,144($1000) respectively. With the country's slow adaptation to developments on the international market by virtue of persisting local policy, structural and biophysical constraints, Ghana's share in European pineapple imports is quoted to have fallen by 18 percent between 2003 and 2007 [1]. In effort to revitalize the pineapple subsector (and other non-traditional crops) in terms of export, the government has since the year 2010 introduced concessions on income-tax to exports, thereby taxing exporters of pineapples at the company tax rate of 8 percent instead of the standard 35 percent regardless of export performance [2]. In another scheme, exporters are provided direct export incentives through company income tax rebates according to export performance. Effective revitalization of the pineapple subsector in spite of all these efforts and incentives, may require improvement in quality of exports (in terms of MD2 and the other three existing varieties namely Smooth

cayenne, Sugar loaf and Queen Victoria), as well as increases in volume and valueof exports. Achieving these however requires identification of existing associations between value and volume of pineapple exports and key determinants of export trade, capturing the effect of quality through a competitiveness index (Primarily the CEP[1]). By this, the present study is purposed on informing future trade policy prescriptions on how the pineapple exports dimension of the subsector can be revitalized through identification and assessment of the magnitude and effects of key determinants of fresh pineapple exports from Ghana for the period 1984 to 2009.
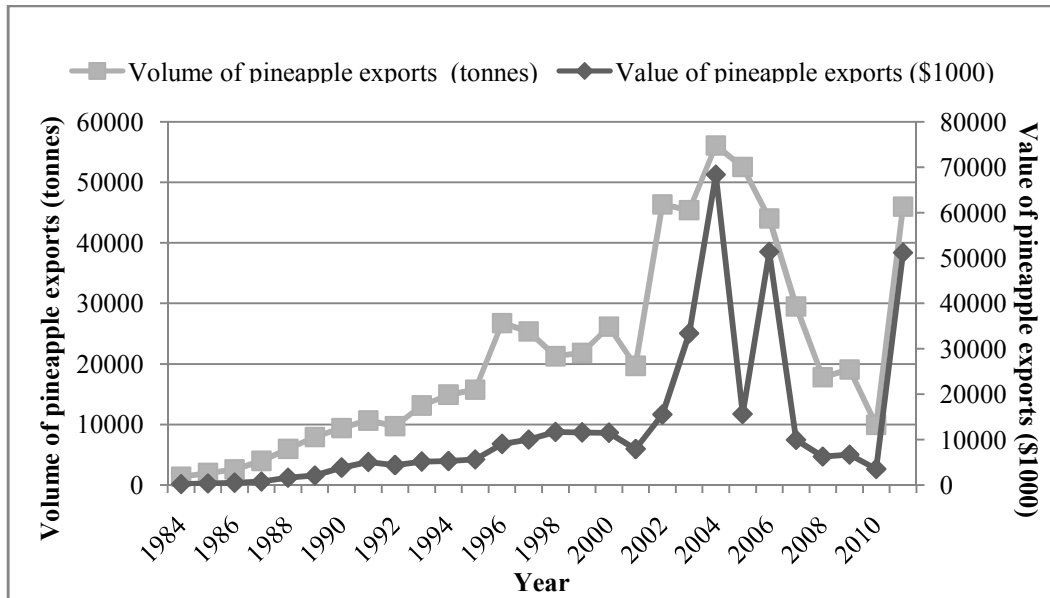
Fig.1. Developments in pineapple exports from Ghana
Data Source: Agricultural Trade Database of FAO (FAOSTAT)

2. LITERATURE REVIEW

Historically, the share of trade in gross domestic product (GDP) of many nations has been an important ingredient for growth and development. In developing countries however, the export of primary commodities and import of finished products may define the basic structure of the economy. In an attempt to explain or predict the type of goods and services exported and imported by nations, their market destinations, and the underlying economic and political conditions, several theories have been formulated.

According to the scholarly review by [3], notable theories justifying free trade include classical tenets of absolute advantage and comparative advantage espoused by Smith and Ricardo respectively, and neo-classical models such as the Heckscher-Ohlin and New Trade Theory (NTT). Although free trade policies have been heavily criticized in literature, they are still utilized to advance trade liberalization especially in developing countries [4]. Thus, it is within the ambit of the free trade paradigm that trade liberalization policies were instituted in

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[1]*Comparative Export Performance Index – holds a definition similar to the Balassa index, but uses the world as a reference group and is more sector-bound.*

many developing countries as an alternative to the import-substitution economies in the 1980s.

Ghana represents an interesting model country that could offer empirical evidence for the corollaries of trade liberalization regime. The striking decline in economic growth recorded in post mid-1960s led to the implementation of trade policy reforms to salvage the economy from collapse. Specifically, Ghana implemented the Structural Adjustment Programme (SAP) in 1983 geared towards repositioning the economy on the path of desired economic growth. As noted by [5], Ghana's trade reform in 1983 and its later fortification in 2005 resulted in diversification and growth of the agricultural sector. The main objective of the current economic policy reforms of Ghana is to promote export-led growth through agriculture and to enhance international competitiveness.

In many sub-Sahara African countries, exports of non-traditional commodities including fruits and vegetables have increased [6] with Europe serving as the primary export destination for most horticultural exports. The situation is not different in Ghana as adoption of the SAP and other economic policy reforms stimulated export-growth of fruits and vegetables as new addition to traditional export crops like cocoa. Following the wave of trade reforms especially in developing countries, many empirical scholarships have emerged. We generally review some of such studies, and place emphasis on areas that are particularly pivotal to our paper. Various authors have studied the determinants of cross-country agricultural commodity exports and recommended plausible variables accordingly. We take a look at some of these variables to inform our empirical study.

Deemed a key supply side determinant of export growth, output (production) of primary agricultural commodities has been noted to yield beneficial implications for exports in several studies. In as much as increments in production is deemed bad for trade in a closed economy due to the downward pressure such increments induce on prices, in open economies however, increased production offers a great opportunity for export expansion through surpluses. For example, in assessing the competitiveness and determinants of cocoa exports from Nigeria, [7] discovered a strong positive impact of increments in cocoa production on volumes exported. Similarly, [8] discovered a significant positive association between output of cocoa and volume of exports from Ghana. In assessing the determinants of agricultural exports through OLS estimation of export supply regressions with primary emphasis on cocoa and rubber from Nigeria, [9] discovered a significant positive effect of production on exports of both cocoa and rubber from Nigeria. In a similar study for India but on tomato exports, [10] discovered a significant negative association between production and export growth for tomato in India. Being against their initial expectation however, the authors attributed this discovery to a possible coincidence between domestic and international production of the commodity.

In contrast to the general positive association expected and mostly observed between production and exports however, a general 'pulling' (negative) association has been noted in literature between domestic demand and export growth. In as much as domestic production creates surplus by which foreign exchange is earned through exports, higher level of domestic demand as proposed by [11] reduces the resources devoted to exports. This consequently reduces the volume exported, and possibly value in case of minor exporting nations (as minor exporters are mostly price takers). In their analysis on the determinants of cocoa and rubber exports from Nigeria, [9] discovered a significant negative association between domestic consumption and export growth for both cocoa and rubber. Similarly, in assessing the competitiveness and determinants of cocoa exports, [8] found a significant negative association between domestic consumption and cocoa export growth for Ghana.

Generally, a fair share of the studies investigating the determinants of agricultural export performance shows that in many least developed countries (LDCs), commodity price variables are very important drivers of exports. As proposed by [12], prices generally serve as a conduit through which relevant economic policies affect agricultural variables such as production, supply, exports and income. In affirming the importance of commodity prices for export growth, [13] noted a strong impact of foreign prices on export performance for South Africa's manufacturing sector. Although observing a negative effect of foreign price on export growth for Uganda in the long-run (which was deemed a mixed signal), [14] discovered a significant positive association between the second and third lags of foreign price and export growth for the country in the short-run. The short-run association observed conforms to proposition by [15]. Similarly, in accessing cloves export response to trade liberalization in Tanzania, [16] discovered a significant positive association between foreign price and export growth in both the short and long-run. In contrast to these significant associations however, [7] found no significant effect of export price on volume of cocoa exports from Nigeria. Similarly, [9] found no significant effect of world price on volumes of cocoa and rubber exports from Nigeria.

Although several drivers of export have been proposed in literature, one amongst the lot that has from the early 1990s till date received much attention in export supply response studies is the terms of trade index of exports. Openness to trade as suggested by [17] presents countries not only with market and trade opportunities, but also introduces exporters to competition from other competing countries, thereby promoting efficiency in the process. Efficiency as noted in production, trade and development economics is a stimulator of competitiveness and hence export performance and growth. In a study to assess the effect of agricultural and financial sector reforms on export growth of cotton lint from Pakistan, [18] found that export of cotton lint from the country is stimulated by increasing world demand for the commodity, export competitiveness of the country, and by increase in trade openness. In affirming the positive association between openness to trade and exports, [17] discovered a significant positive effect of terms of trade index on exports from Cameroon for the period 1970-2008. In a study on 'Rethinking policy options for export earnings', [19] discovered that deterioration in terms of trade index is associated with contraction of export earnings. Similarly, [14] found a significant positive association between the index of trade openness and export growth for Uganda in both the short- and long-run. This discovery by [14] affirms earlier results from [20] of a positive effect of terms of trade on exports from Uganda. In addition to the terms of trade index, [20] also found a significant positive association between lagged export growth and current export growth.

From the extant literature, quite interesting views have been expressed on the impact of exchange rate on agricultural exports. In as much as some analysts estimate the effect of changes in nominal exchange rate on exports, others with policy interest mostly use the real exchange rate due to the latter's ability to adjust for purchasing power differences in currency of trading partners. In contrast to the nominal exchange rate where increments in the rate reflect currency depreciation, increments in real exchange rate reflect currency appreciation, the two consequently yielding contrasting implications for exports. In as much as currency depreciation according to economic and trade theory makes exports cheaper and demand generally higher, currency appreciation usually dampen export-growth. In a study to assess the determinants of export growth rate in Uganda for the period 1987-2006 however, [14] found a mixed signal (positive effect) for the association between real exchange rate and export growth in the long-run. The short-run association was however not significant. The latter observation conforms to proposition by [20] that real exchange rate has

insignificant effect on export growth rate. In contrast to the insignificant association and mixed signal discovered by [14,20] however, [21] noted a significant negative association between real exchange rate and export growth for India. Upon this outcome, he appropriately inferred that a fall in domestic prices due to exchange rate depreciation makes exports cheaper in the global market, and this consequent stimulates demand. In affirming the discovery by [21,22,23] found a positive association between depreciation in real exchange rate and export growth. On the nominal side of this rate, [24] found a significant positive association between nominal exchange rate and exports of rubber from Nigeria. Although a priori expecting a positive association between the nominal exchange rate of Nigeria and cocoa exports from the country, [7] rather observed a significant negative association between these two indicators. This unexpected outcome was attributed to declining productivity of the Nigerian economy and a corresponding weak currency of the country.

Under favorable domestic production and marketing conditions, foreign direct investment (FDI) stands fueling export growth in less developed economies. This claim is made on grounds that, such investment have the potential to advance technological process, and improve efficiency and quality of exports. Besides creating favorable trading relationship between the recipient (host) country and its investing partners, foreign direct investments do strengthen capital formation, innovation capacity and organizational and managerial practices. In spite of these general beneficial implications of FDI noted worldwide, quite controversial implications of FDI on exports have been found in economic, business and trade literature. Although some researchers including [25] affirm a significant negative relationship between FDI and export growth, [21,26] found no significant effect of FDI on export growth. Others, including [27,28] found a significant positive association between FDI and export performance. In countries where domestic demand for some agricultural commodities is generally high, most of the investments (FDI) made in such commodities purpose on capturing domestic markets instead of stimulating export growth, while others capture not only domestic markets, but also use that as a means to jump tariffs. Whenever investments are made with a domestic market capturing or tariff jumping motive, they usual yield detrimental implications for export growth [26]. Investments however with export promotion motive usually yield beneficial implications for exports.

3. PINEAPPLE SUPPLY AND EXPORT CHAIN FOR GHANA

Ghana produces four main varieties of pineapples, namely the Smooth cayenne (SC), MD2, Sugar loaf and Queen Victoria. Production and exports are however dominated by the Smooth cayenne and MD2 varieties. Exports of the Smooth cayenne variety of fresh pineapples to Europe commenced in 1984, marking the beginning of pineapple exports from Ghana based on available data from FAO. In the development phase of pineapple exports, small-holders accounted for at least 50% of volumes of pineapple exported from the shores of Ghana [29]. Following a decrease in profitability of fresh pineapples production due to unexpected shifts in demand by foreign consumers toward the MD2 variety and the inability of most small-holders to quickly adapt to the situation, the number of small-holder pineapple producers has decreased from 1600 to less than 200 engaged in commercial production. As of the year 2004, the country had a total number of 50 exporters. This number has decreased to 14 recently, with about eight of the exporting firms being responsible for 93% of fresh pineapple exports from Ghana [29]. The number of processing firms engaged in juice production is reported by [29] to have increased following the growth of the sector between the years 1999 and 2004. Most of the processing factories however have for over five years now been out of operation due to lack of pineapples for processing. This is due to
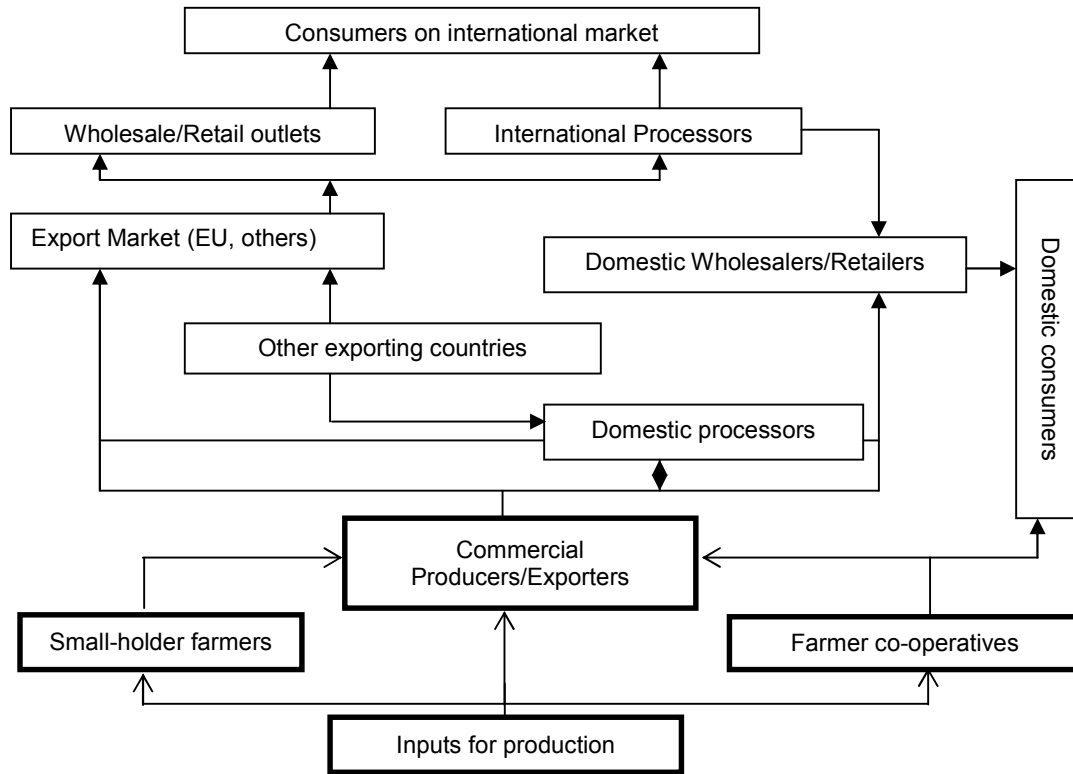
drifting of majority of the producers from the pineapple sub-sector based on the transition challenge from smooth cayenne and the other varieties to MD2 and the resulting decrease in profitability. In spite of this however, firms and producers that were able to convert production from the smooth cayenne variety to MD2 pineapples are reported to have had heterogeneous impact on export volumes, with most of them witnessing major increases in their export shares [29]. By this, growth of the pineapple sub-sector is believe to be inhibited by production and productivity challenges, slow adaptation to market shifts and inability of majority of the producers to transit to new varieties of the pineapple fruit to help meet demands in primary and secondary destinations. With a total of 14 export destinations as of the year 2007, the number of destination countries for pineapple exports from Ghana decreased to 8 by the year 2010, primarily due to import diversion toward MD2 varieties by such countries (see Table 1)

Table 1. Destinations for pineapple exports from Ghana

Share in pineapple exports	2007	2009	2010
Between 0% and 1 %	United States of America, South Africa, Egypt, Libya, Spain, Netherlands, Vietnam	South Africa, United Arab Emirates, Libya, Egypt, Spain, Germany, Denmark, United Kingdom	Spain, Netherlands
Between 1% and 10 %	Italy, Switzerland, Germany, United Kingdom United Arab Emirates	Morocco, Italy	United Kingdom Morocco
Between 10% and 25%		France	Italy, France
Between 25% and 100%	France, Belgium	Switzerland, Belgium	Switzerland Belgium

Source: Detailed world Agricultural Trade Flows (FAOSTAT) [31]

Ghana has a relatively less complex pineapple supply and export chain (see Fig. 2) compared to chains for commodities like cocoa and coffee observed in Ghana and in countries like Ethiopia [see chains in 8,30]. Like many other commodities (although usually ignored in various supply chains), the pineapple supply chain commences from the factor market side with sourcing of relevant inputs, especially high quality crowns, fertilizer and fumigants. Achieving higher yields requires the undertaking of important cultural practices like weeding, spraying, fertilization among others. Three groups of people have been identified so far to engage in pineapple production; the small-holder as an individual, co-operatives (organization owned and run jointly by a group of small-holders), and large scale producers (nucleus farmers/exporters). In as much as some of the small-holders sell directly to wholesalers on the domestic market by themselves, or through co-operatives (in case of contract), majority of the farmers sell their produce to the larger producers/exporters. Similarly co-operatives have the option of selling directly to wholesalers/retailers and to consumers, or selling their produce to exporters (due to limited capacity for most cooperatives to engage directly in export).

Table 2. Composition of pineapple exports from Ghana

Year	Fresh pineapple exports ($1000)	Canned pineapple exports ($1000)	Total pineapple exports($1000)	Value added (%)
1997	9,998	0	9,998	0
1998	11,676	0	11,676	0
1999	11,593	0	11,593	0
2000	11,514	5,926	17,440	33.98
2001	7,933	5,655	13,588	41.62
2002	15,520	5,500	21,020	26.17
2003	33,403	3	33,406	0.01
2004	68,343	253	68,596	0.37
2005	15,664	109	15,753	0.69
2006	51,367	29	51,396	0.06
2007	9,950	282	10,232	2.76
2008	6,260	94	6,354	1.48
2009	6,692	190	6,882	2.76
2010	3,531	18	3,549	0.51
2011	51,144	18	51,162	0.04

Source: Authors computation with data from FAOSTAT (Agricultural Trade Database) [31]

4. METHODOLOGY

In estimating export supply functions, several approaches ranging from co-integration techniques (notably the Engle-Granger approach and Johansen Full Information Maximum Likelihood test) and bound test to OLS estimation of static models have been applied in literature. In as much as the co-integration techniques and bound test are generally useful, they only yield efficient estimates for extended series (at least 30 years), factoring in long- and short-run effects. Usually, it becomes impossible (due to problems with lag order selection) to apply the Johansen technique (deemed the most efficient co-integration approach) for analyzing data series with less than 28 observations. Bearing in mind the scope (1984-2009, because pineapple exports from Ghana commenced in 1984 and data on domestic consumption was up to 2009, as of the time data was collected and analyzed) of our study, we employ the OLS estimation technique to assess the magnitude and effects of key determinants of exports based on the literature reviewed. To avoid discussing output of regressions hauling nonsense correlation between unrelated random walks however, residual series for the regressions specified in the subsequent sections are tested for stationarity and for appropriate standard Gaussian assumptions. The coefficients are as well tested for reliability through the CUSUM and CUSUM of squares tests, and the respective equations tested for misspecification through a RAMSEY Reset test. In this study, two primary equations are estimated; one with value of exports as the explained variable, and the other with volume of exports as the explained variable. Use of two different explained variables is to help identify how the effects of the respective explanatory variables on one explained variable (volume of exports) translate into the other (value of exports).

4.1 Sources of Data

All the data (secondary) used in this study were gathered from the agricultural production, supply and trade database of FAO (FAOSTAT [31]) and the United Nations Conference on Trade and Development Statistics (UNCTADSTAT [32]). Data gathered from the

UNCTADSTAT include real effective exchange rate, terms-of-trade index of exports (as against that for goods and services) and foreign direct investment (Net inflows). All other series except export price faced by Ghana for pineapples and comparative export performance index of exports (CEP) are gathered from FAOSTAT [31]. Based on differences in quality of products exported by countries, as well as spatial differences in policy environment (including barriers to trade –tariffs among others), countries face respective export prices that are usually different from the average world price for a given commodity. Along this line, we make use of the export price faced by Ghana for export of pineapples and not the price quoted on the world market as is usually seen in other studies. The export price is calculated based on value and volume of exports as follows:

$$\text{Export price} = [(\text{Value of export}) / (\text{Volume of export})] \times 1000 \qquad (1)$$

The outcome is in \$/tonne. Multiplication of the fraction by 1000 is due to the fact that value of exports gathered from the FAOSTAT is in \$1000, while volume of exports is in tonnes.

4.2 Model Specification

Based on the empirical literature reviewed and objective of this study, our model is specified econometrically as follows holding the following a priori expectations (for both value and volume of exports):

$$\text{Ln (EXPTVal)} = C + \text{Ln (Prod)} + \text{Ln (Domcons)} + \text{Ln (EXPTprice)} + \text{Ln (TOT)} + \text{Ln (REXR)} + \\ + \text{Ln (CEP)} + \text{FDI} + \text{Ln (EXPTVol (-1))} \qquad (2)$$

$$\text{Ln (EXPTVol)} = C + \text{Ln (Prod)} + \text{Ln (Domcons)} + \text{Ln (EXPTprice)} + \text{Ln (TOT)} + \text{Ln (REXR)} + \\ + \text{Ln (CEP)} + \text{FDI} + \text{Ln (EXPTVol (-1))} \qquad (3)$$

Where a priori, {C, Ln (EXPTVol (-1)), FDI} <> 0; {Ln (Prod), Ln (EXPTprice, Ln (TOT), Ln (CEP)} > 0; {Ln (REXR), Ln (Domcons)} < 0

Ln (EXPVal):	Log of value of pineapple exports
Ln (EXPVol):	Log of volume of pineapple exports
Ln (Prod) :	Log of domestic production of pineapple
Ln (Domcons) :	Log of domestic consumption (demand) of pineapple
Ln (EXPTprice) :	Log of export price of pineapple
Ln (TOT):	Log of Terms-of-Trade Index of exports (measure of trade openness)
Ln (REXR) :	Log of Real Effective Exchange Rate
Ln (CEP) :	Log of Comparative Export Performance Index (to help capture Competitiveness: Improvement in quality and share of exports)
FDI:	Net inflow of Foreign Direct Investment [2]
C:	Intercept

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[2]*Use of FDI in level instead of logging it is to make the specification externally valid and pave room for future replication by other researchers. In as much as the values obtained for the period under study are positive, some values for years before the scope of the study (1984-2009) are negative. This could preclude logging for extended period. In addition, data for some countries from the developing world shows negative net inflows in a significant number of years, and using log of FDI may require modification of our specification in situations where researchers want to apply the exact equation in their study.*

Employed in this study, the log of comparative export performance index is defined as follows:

$$ln(CEP) = ln\frac{\left(\frac{X_{iB}}{X_B}\right)}{\left(\frac{X_{iA}}{X_A}\right)} \tag{4}$$

Where

X_{iB} - value of pineapple exports from Ghana
X_B - total value of agricultural exports from Ghana
X_{iA} - value of world exports of pineapple
X_A - total value of world agricultural exports.

Equations 2 and 3 are estimated with the OLS estimator and tested for appropriate standard Gaussian assumptions, appropriateness of specification (through a reset test) and stability of coefficients (through the CUSUM and CUSUM of Squares test). The Analysis involves use of data for the period 1984-2009.

5. RESULTS AND DISCUSSION

In testing for the appropriate standard Gaussian assumptions, the residuals from estimation of both equations 2 and 3 were found to be normally distributed, non-serially correlated and homoscedastic. This inference is based on observed Jarque-Bera values, Breusch-Godfrey Serial Correlation LM values (for the F-statistic) and Q-statistic, and F-statistic from the Breush-Pagan-Godfrey Heteroskedasticity Test. Appropriateness of the specification and stability of coefficients are affirmed by the F-statistic value from a Ramsey Reset Test and the CUSUM and CUSUM of squares test (see Fig. 3). As a check on spuriousness of our results, the residual series for each specification was tested for stationarity through the Augmented Dickey-Fuller unit root test, the outcome of which confirmed stationary (absence of unit root) nature of the residuals. In checking for issues with endogeneity as often claimed by some researchers when OLS is used in estimating a regression, a two-stage least squares estimation of the regression equations was performed (although results not presented here) and the output was consistent and perfectly in line with that of the OLS; hence we stick to the use of the OLS output for discussion (output for the control estimation technique is deemed primarily less informative).

In interpreting the results, value of pineapple exports is noted to have a positive association with production, export price, terms of trade (trade openness) and index of competitiveness (increased share and quality of exports). Value of pineapple exports however has an inverse association with domestic consumption (demand) and net inflow of foreign direct investment. No significant association is found with respect to real effective exchange rate and lagged volume of exports. The intercept (C) term was also found highly significantand negative, implying that should conditions in all the other variables remain constant, the value of pineapple exports from Ghana would decrease significantly with time. This reflects a highly competitive nature of the world pineapple export industry and a relatively low power of Ghana in terms of share on the world market. As shown in Appendix 1, value of Ghana's pineapple exports represents only 1.067% of world export shares (and 0.788% in terms of volume), compared to 40.625% (54.269% -volume) for Costa Rica, 14.123% (8.088% - volume) for Belgium, 11.429% (6.556%-volume) for Netherlands, 6.197% (3.232% -volume)

for the United States of America and 3.543% (7.881% -volume) for the Philippines. A total of 98.77% of variations in export value are explained by the associations identified in this study. This statement is reflected by the adjusted R-squared value observed.

Table 3. Regression results

Dependent variable⟶	Ln (EXPTVal)		Ln (EXPVol)	
Variables	**Coefficient**	**Std. error**	**Coefficient**	**Std. error**
C	-8.529286***	2.239984	-1.621530	2.239984
LnProd	0.980094***	0.227825	0.980094***	0.227825
LnDomcons	-0.310502***	0.065398	-0.310502***	0.065398
LnEXPTprice	0.846626***	0.123463	-0.153374	0.123463
LnToT	0.757655*	0.423276	0.757655*	0.423276
LnREXR	-0.206847	0.240172	-0.206847	0.240172
Ln CEP	0.185686*	0.088092	0.185686*	0.088092
FDI	-0.000132*	0.000070	-0.000132*	0.000070
LnEXPTVol(-1)	0.199383	0.121832	0.199383	0.121832
R-squared	0.991820		0.983449	
Adj. R-squared	0.987730		0.975173	
Log Likelihood	19.01030		19.01030	
F-statistic	242.5072		118.8358	
Prob (F-statistic)	0.000000		0.000000	
Durbin-Watson Stat	2.250357		2.250357	
Akaike info criterion	-0.800824		-0.800824	
Schwarz Criterion	-0.362029		-0.362029	
Hannan-Quinn criter	-0.679121		-0.679121	
Jarque-Bera	2.436059		2.436059	
Q-stat (1)	0.4582		0.4582	
Q-stat (2)	1.7452		1.7452	
BG-LM Test: F-stat 1	0.466483		0.466483	
BG-LM Test: F-stat 2	0.750313		0.750313	
B-P-G Het: F-stat	0.393497		0.393497	
Rest Test F-statistic	1.638920		0.944763	
ADF of Residual	-5.333056***		-5.333056***	

***significant at the 1% level, *significant at the 10% level

With the exception of the intercept term and export price which were found to have insignificant effects on volume of pineapple exports, similar associations were observed between volumes of export and all the other variables. Lagged volume of export is observed to have insignificant positive effect on both value and volume of exports. This once again affirms the lower share of Ghana's pineapple exports on the world market and potentially, a relatively positive image of previous exports from Ghana. In as much as exports of larger exporting nations could induce an adding-up effect, thereby causing a decrease in price of future exports and possible decrease in exports (both volume and value), the effect observed in case of Ghana is not statistically significant. A total of 97.52% of variations in volume of pineapple exports are explained by the associations observed in this study. By this, with the exception of the insignificant effect of real effective exchange rate and export price observed for output of equation 3, all associations observed are in conformity with our a priori expectation. Associations observed in this study apply only to pineapple exports and may not necessarily reflect effects on agricultural exports in the broader sense.
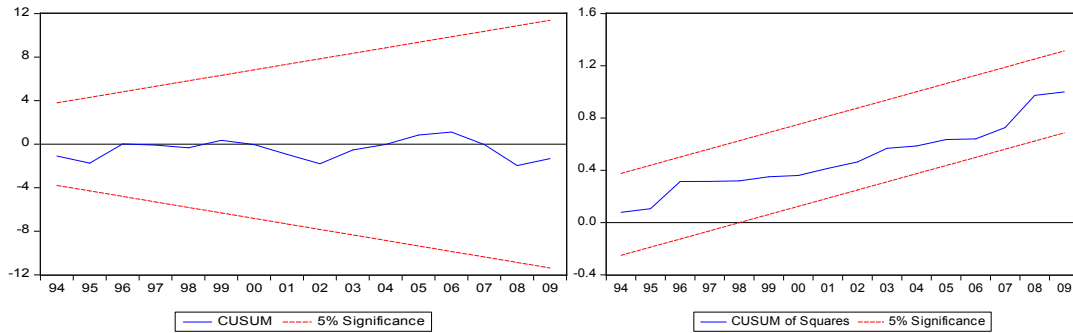
Fig. 3 Stability test of coefficients

A one percent increase in domestic production of pineapple leads to a 0.98% increase in both value and volume of exports, significant at the 1% level. Increasing production of pineapple ensures adequate volumes of the produce for both domestic consumption and for exports. Most of the processing and exporting firms in the country are reported by [29] to be out of operation due to lack of pineapples for processing and export. With majority of the smallholders (who supplied about 50% of total volume of exports in the developmental stages of the industry) drifting from the subsector following recent development in the destination markets, as well as decreased productivity driven by changes in other key indicators and policy environment, the annual volumes of pineapple in the country available for export and for meeting domestic consumption needs has decreased significantly, and this in part could be a relevant cause of the recent decline in exports. Increasing production of pineapple in the country, through drafting of incenting measures could go a long way to revitalize the industry. The positive association observed between production and exports conform to propositions by [7,8,9].

In as much as domestic production has a "boosting" or "pushing" effect on exports, domestic consumption on the other hand, as suggested by [8] has a "pulling effect" on both export volume and value. In the present study, a 1% increase in domestic consumption leads to a 0.31% decrease in both volume and value of export, significant at the 1% level. This observation affirms a suggestion by [11] that at relatively higher levels of domestic demand, the quantity of resources devoted to export is lower. By this, at lower domestic demand, the surpluses obtained from production lead to increased volume (and probably value) of exports. Neutralization of this significant "pulling effect" could be ensured through increasing volumes of production at rates equal to or well above that for domestic consumption.

A 1% increase in export price faced by the country leads to a 0.85% increase in value of exports (significant at the 1% level), but no significant effect on volume of exports. Lagged volume of exports is noted to have no significant effect on both value and volume of exports. From this, we infer that value of Ghana's pineapple exports has been driven more by price faced by exporters than by actual volumes exported. This affirms competitiveness of Ghana in pineapple exports, thus a price-driven export rather than quantity driven exports. In addition, export demand is in theory believed to increase with a drop in price and vice versa, however, the inverse association observed in this study between price and volume of exports is not significant. This is an indication of competitive advantage of Ghana in export of the commodity. Improving on the quality of the country's exports, and attracting higher prices could therefore go a long way to increase value of pineapple exports from Ghana.

The index of openness to trade (captured by Terms-of-Trade index of exports) yields positive implications for both value and volume of exports. A one percent increase in this index leads to a 0.76% increase in both value and volume of export, significant at the 10% level. Being open to trade opens doors to greater opportunities for countries that are purposed on diversifying their exports. In addition, it promotes efficiency in production and export through exposing the countries involved to fierce competition on the global market. Such exposure ensures drafting and implementation of export-growth enhancing policy measures, which go a long way to firmly anchor beneficial export trade in such countries. The effect of the index of openness to trade on exports as observed in this study is in conformity with propositions by [20,14,18].

The index of competitiveness (captured by CEP-comparative export performance index) is observed to enhance both value and volume of exports, and the effect is significant at the 10% level. In as much as the association is positive and significant, the responsiveness is quite low, implying that increase in share and quality of pineapple exports from Ghana, although stimulates volumes and value of exports, such increments have been quite low. This is due to the fact that increases in volume of exports haven't been continuous and there equally have been quite some quality challenges in the sector. Slow adaptation of the country to shifts and developments in the global pineapple market, generally precludes the country from exploiting beneficial (or profitable) developments to the maximum. With the country's exports having no significant adding-up effect on world exports, increasing both the volumes and quality of pineapple exports from the shores of Ghana could help revitalize the sector and position it positively in wait for profitable developments in the near future.

Noted in empirical literature, the role of FDI in export promotion in developing countries has been quite controversial. In as much as some studies find a positive effect of FDI on export promotion [e.g. 27], others find insignificant or weak effect of FDI on exports [e.g. 26]. Other researchers including [25] found a negative association between FDI and export growth. Highlighted in such studies, the effect of FDI depends on the motive for such investment. Tariff-jumping types of investmentor investments that have a primary purpose of capturing domestic markets mostly do not contribute to export growth [26], while export-oriented investments generally contribute to export growth by taking advantage of a country's comparative and competitive advantages. Observed in Ghana, most of the investments noted so far in the pineapple sub-sector have been towards capturing domestic markets (with majority being towards value addition to meet domestic demand and jumping tariff through establishment of both local and foreign centers of trade). Such investments tend to dampen trade. In the present study, a one percent increase in net inflow of foreign direct investment is associated with a 0.013%[3] decrease in both value and volume of pineapple exports, significant at the 10% level.

In summary, should there be no major improvements in current economic, policy and marketing environments, value of pineapple exports will decrease significantly with time, although the decrease in volume may not be significant. In as much as value of exports is driven by prices faced by exporters, the effect of export volumes on the value is relatively insignificant. Both value and volume of pineapple exports from Ghana are noted to increase with increasing production, openness to trade and improvements in export performance. They however decrease with increasing domestic consumption and net inflow of foreign direct investment, based on the domestic market capturing and tariff jumping nature of majority of such investment. Real effective exchange rate (as a surrogate measure of

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[3]*0.013% = 100(e(-0.000132)-1), where "e" represents exponential.*

incentive) is found to have no significant effect on both value and volume of pineapple exports from Ghana.

6. CONCLUSION

In identifying the key determinants of pineapple exports from Ghana, effort was made to estimate separate regressions with value of exports and volume of exports being the explained variables in the respective regressions. The study reveals that, should conditions for all the variables considered remain constant, value of pineapple exports from Ghana would with time decrease significantly. This reflects the highly competitive nature of the pineapple industry globally, and a need for Ghana to learn to adapt appropriately to market shifts in the shortest possible time. Both value and volume of exports were found to have a positive association with production, openness to trade and improvement in quality and share of exports (captured by the CEP index). Both however have negative association with domestic demand and foreign direct investment, with effect for the latter case being attributed to the tariff-jumping and domestic market capturing motive of majority of such investments in the country. A positive association was as well observed between export price faced by exporters and the value of pineapple exports. The corresponding association in terms of volume of exports however was not significant. The effect of lagged volume of export on both current value and volume of exports was not significant. This implies that, Ghana's pineapples export is more price-driven than volume driven, an attribute reflecting competitive advantage of the country in pineapple export. To increase both value and volume of exports, measures should be put in place to increase production of pineapples for exports and domestic processing. In addition measures should be put in place to improve the quality of pineapples (both Smooth cayenne and MD2) exported from the country. Improving on the country's openness to trade could as well go a long way to enhance export growth. Although foreign direct investments are generally perceived to complement efforts by domestic industries to restructure production and export facilities and institutions, future efforts to attract foreign direct investments should place strong emphasis on identification of the motive behind such investments. In so doing, emphasis should not only be placed on achieving benefits from FDI inflows, but in attracting FDI with export growth motive; hence if attraction of such investment is to enhance export growth, domestic market capturing and tariff jumping types of investment should be minimized.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Appendix 1. World exports of pineapple

Region/Country	2007/2008	2008/2009	2009/2010	2010/2011	4-year average	Share,%
Volume of exports (tonnes)						
World	2,884,571	2,849,733	2,908,082	3,146,214	2,947,150	
Africa	102,568	94,103	81,516	130,032	102,055	3.463
Americas	1,870,632	1,889,129	2,041,255	2,114,977	1,978,998	67.150
Asia	328,478	250,105	208,368	304,534	272,871	9.259
Europe	582,860	616,259	576,836	596,588	593,136	20.126
Oceania	33	137	107	83	90	0.003
Belgium	234,123	273,014	229,022	217,359	238,380	8.088
Brazil	32,566	19,818	1,886	2,238	14,127	0.479
Costa Rica	1,458,975	1,511,458	1,677,702	1,749,363	1,599,375	54.269
Cote d'Ivoire	69,201	54,443	54,956	64,116	60,679	2.059
Germany	30,648	31,263	37,545	41,604	35,265	1.197
Ghana	17,819	19,112	9,971	45,999	23,225	0.788
Italy	18,500	18,566	21,875	20,480	19,855	0.674
Netherlands	216,131	197,038	175,193	184,464	193,207	6,556
Philippines	219,825	209,532	164,650	263,019	232,257	7.881
United Kingdom	9,294	21,364	19,032	25,535	18,806	0.638
United States of A	90,512	88,108	99,076	103,300	95,249	3.232
European Union	582,492	615,831	576,419	596,317	592,765	20.113
Value of exports ($1000)						
World	1,555,447	1,513,907	1,543,218	1,727,204	1,584,994	
Africa	43,172	35,882	32,462	91,174	50,673	3.197
Americas	814,171	839,997	919,315	962,169	883,913	55.769
Asia	80,557	70,583	63,916	89,479	76,134	4,804
Europe	617,493	567,270	527,379	584,230	574,093	36.222
Oceania	54	175	146	152	132	0.008
Belgium	239,429	240,854	206,754	208,312	223,837	14.123
Brazil	16,381	10,580	980	1,402	7,336	0.463
Costa Rica	574,921	604,517	677,392	718,725	643,889	40.625
Cote d'Ivoire	29,110	21,528	21,528	27,112	24,820	1.566
Germany	37,588	35,887	42,407	47,804	40,922	2.582
Ghana	6,260	6,692	3,531	51,144	16,907	1,067
Italy	18,032	16,117	18,270	17,234	17,413	1.099
Netherlands	224,055	179,581	150,628	170,327	181,147	11.429
Philippines	61,653	53,115	42,359	67,491	56,155	3.543
United Kingdom	9,960	17,485	15,808	22,145	16,350	1.032
United States of A	93,405	89,096	102,735	107,659	98,224	6.197
European Union	616,925	566,792	526,887	583,708	573,578	36.189

Appendix 2. World imports of pineapple

Region/Country	2007/2008	2008/2009	2009/2010	2010/2011	4-year average	Share,%
Volume of Imports (tonnes)						
World	2,634,601	2,557,583	2,714,371	2,918,151	2,706,177	
Africa	5,997	5,709	6,919	10,695	7,330	0.271
Americas	857,595	845,671	955,589	1,047,269	926,531	34.238
Asia	303,681	279,832	310,136	378,552	318,050	11.753
Europe	1,459,246	1,420,659	1,434,977	1,477,502	1,448,096	53.511
Oceania	8,082	5,712	6,750	4,133	6,169	0.228
Belgium	309,156	290,252	258,827	232,054	272,572	10.072
China	19,310	23.027	34,216	59,737	34,073	1.259
Germany	173,060	202,557	183,325	191,956	187,725	6.937
Italy	149,255	140,453	142,105	151,300	145,778	5.387
Netherlands	228,079	198,087	213,781	232,850	218,199	8.063
Switzerland	19,170	21,420	22,716	21,980	21,322	0.788
United Arab Emir.	26,468	10,837	10,263	12,110	14,920	0.551
United Kingdom	125,932	144,518	155,257	167,513	148,305	5.480
United States of A.	713,584	712,945	815,872	817,131	764,883	28.264
European Union	1,384,862	1,349,788	1,350,407	1,392,416	1,369,368	50.602
Value of Imports ($1000)						
World	2,328,083	2,113,159	2,208,242	2,373,622	2,255,777	
Africa	3,785	3,676	4,521	5,362	4,336	0.192
Americas	641,863	629,823	698,701	699,731	667,530	9.592
Asia	200,452	192,940	214,604	275,069	220,766	9.787
Europe	1,474,373	1,280,652	1,283,358	1,388,453	1,356,709	0.144
Oceania	7,610	6,068	7,058	5,007	6,436	0.285
Belgium	292,932	239,201	209,280	201,388	235,700	0.449
China	11.731	13,835	20,788	38,221	21,144	0.937
Germany	185,502	195,870	179,339	200,509	190,305	8.436
Italy	144,871	122,539	122,270	134,850	131,133	5.813
Netherlands	218,588	160,079	175,212	195,699	188,895	8.374
Switzerland	27,005	27,437	28,098	30,374	28,229	1.251
United Arab Emir.	19,483	4,358	4,964	4,660	8,366	0.371
United Kingdom	141,203	137,219	138,751	157,236	143,602	6.366
United States of A	531,854	527,180	585,167	550,420	548,655	4.322
European Union	1,398,160	1,207,915	1,193,479	1,287,694	1,271,812	56.380

Source: Authors computation with data from FAO (Agricultural Trade Database)

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