Exports of Palm Oil from Ghana: A Demand Analysis

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Studies have shown that the economy of Ghana cannot afford to rely solely on cocoa exports. It is imperative to diversify the export base of the Ghanaian economy. In this respect, the palm oil sub-sector of the agricultural sector, which until the early part of the 20th century was the major agricultural export commodity of Ghana, needs to be considered for promotion. Currently the palm oil industry faces the challenge of bleak export potential. This study examines trends in the quantity exported of Ghana's palm oil and quantifies the effects and magnitudes of the determinants of export demand. Empirical analysis of Ghana's palm oil exports from 1987 to 2006 reveals a general upward growth over the study period at an annual growth rate of 23.2 percent. This result can be attributed to the privatization of state-owned oil palm plantations in the 1980s and 1990s. The effects and magnitudes of the determinants of the demand for Ghana□ palm oil were achieved with ordinary least squares regression. The study identifies the following significant determinants of the demand for Ghana's palm oil: real export price and real domestic price of Ghana's palm oil, real export price of Malaysia's palm oil (a competitor with Ghana's palm oil exports), and real exchange rate in Ghana. A one-percent fall in the real domestic price of Ghana's palm oil will bring about an 11.9-percent increase in the quantity exported (demanded) of Ghana's palm oil by her trading partners; a one-percent increase in the export price of Malaysia's palm oil will increase the demand for Ghana's palm oil by 2.1 percent; quantity demanded of Ghana's palm oil increases by 0.4 percent for every one-percent decrease in the export price of Ghana's palm oil; and a one-percent depreciation of the Ghana cedi against the U.S. dollar will bring about an 11.1-percent increase in the demand for Ghana's palm oil by her trading partners, all other things being equal. This study recommends that a price support system (i.e., maximum-price legislation) be instituted in the domestic palm oil market to minimize domestic price increases. Policymakers and stakeholders in the palm oil industry should consider the export price of Malaysia's palm oil when pricing Ghana's palm oil in the international market. Exchange-rate stabilization policies should be strengthened in order to promote mutually beneficial trade between Ghana and palm oil-importing countries.

Agriculture is the mainstay of the Ghanaian economy. The sector's importance to the economy is apparent from its immense contribution to several important economic variables. Agriculture employs about 60 percent of the country's active work force on formal and informal bases and accounts for about 36.5 percent of GDP per annum (ISSER 2007). There is a positive linkage between Ghana's economic growth rate and the performance of the agricultural sector. Agriculture is also a major source of revenue and foreign exchange for the economy. Agriculture was the leading source of foreign exchange earnings in the country prior to 1992. Agriculture contributed an average of 62 percent of total annual export earnings during the 1970s and 1980s (Fosu 1989). From January to March 1996, non-traditional agricultural exports alone contributed US$ 43,707,780.31 to the foreign exchange earnings of the country, a 52.46-percent increase over that the same period

in 1995 (GEPC 2006). Because foreign-exchange earnings secure a country's ability to meet demands for foreign commodities and to manage current-accounts deficits and the balance of payments, the importance of agricultural export to the economy of Ghana cannot be overemphasized.

Although agricultural exports contribute significantly to the foreign-exchange base of Ghana, their performance has been declining. Many analysts attribute this decline in part to the falling performance of cocoa exports, which have been the main agricultural export since the 1980s. For instance, research revealed a negative elasticity of cocoa exports with respect to cocoa base capacity (Fosu 1992). Ghana therefore cannot afford to rely primarily on cocoa for foreign exchange, but should diversify the export base. In view of this, palm oil is one agricultural commodity that has been considered for promotion.

Palm oil, a product of oil palms, was until the early part of the 20th century the leading export of the Gold Coast and, along with gold, the mainstay of the economy (La Anyane 1961). When cocoa

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became highly sought-after the palm oil industry began to deteriorate (Laryea and Antwi-Asare 2005). The colonial government undertook a number of measures to help revive the industry. Some of these measures involved the introduction of hand-operated processing machines and the establishment of plantations. All these measures were unsuccessful in reviving the oil palm industry due to poor planning and implementation strategies (Otoo 1993). The decline persisted, and Ghana became a net palm oil importer in 1955. The fight to revive the oil palm industry remained on the government's agenda even after independence in 1957. The government established oil palm plantations in the Western, Central, Eastern, and Ashanti regions, and in 1964 established an oil palm research institute at Kusi, in the Eastern Region, to provide research into plant genetics, extension, farm-management training, and to supply improved oil palm seedlings at a reasonable cost to farmers. In spite of these strategic measures to help revive the oil palm industry, the sub-sector continued to perform poorly throughout the 1970s (Laryea and Antwi-Asare 2005). Following economic hardship in the 1980s which necessitated the intervention of the International Monetary Fund (IMF) and the World Bank through the Structural Adjustment Program, many state-owned plantations were privatized in the 1980s and 1990s (Laryea and Antwi-Asare 2005).

This privatization of the state-owned plantations and other holistic measures helped revamp the oil palm industry to some extent. Ghana currently exports palm oil to France, Germany, the Netherlands, the UK, and the U.S., although in small quantities. Ghana is one of the West African countries in the actual African oil palm belt (Hartley 1988), so it is endowed with natural resources for the production of oil palms from which palm oil is processed. Currently, oil palm is the second most important cash crop, after cocoa. It contributes to GDP and foreign-exchange earnings and employs a significant fraction of the population—a majority of whom are rural, thus slowing rural-urban drift. Palm oil has both household and industrial uses.

Still, in spite of the importance of the oil palm industry and the suitability of the typical Ghanaian environment to the production of the crop, the oil palm industry has underperformed since the latter part of the nineteenth century. This decline in performance has been attributed to the high cost of production and low product (palm fruit) prices (Otoo 1993) as well as to the bleak export potential of Ghana's palm oil (Antwi-Asare and Laryea 2005). Over the years, strategic research have been taken to revive the industry, but most of these have been directed toward developing measures to curtail the cost of production in order to improve profitability. To adequately address the challenges of the oil palm industry, it is very prudent that attention also is given to the export demand of palm oil. In order to study the export demand for Ghana's palm oil, the following questions become relevant: What has been the trend in the quantity exported of Ghana's palm oil from 1987 to 2006? What are the magnitudes and the effects of the determinants of the export demand for Ghana's palm oil? This study establishes reliable and adequate information about export demand for Ghana's palm oil to help facilitate the formulation of appropriate policies for the palm oil industry. We describe the trend in the quantity exported and price of Ghana's palm oil from 1987 to 2006, and identify the determinants of the export demand for Ghana's palm oil, as well as their magnitudes and effects.

Methodology

Our first objective, which aims to describe the trend in quantity exported of Ghana's palm, is addressed using trend equations, and the patterns are described qualitatively. The graphical relationship is between quantity exported of Ghana's palm oil and time during the period under consideration. The trend equation used to describe the growth in quantity exported is

(1) $\text{Log}\lambda = k_0 + k_1 * T$,

where λ represents quantity of Ghana's palm oil exported, k_0 is the intercept of the trend equation, the parameter k_1 is the rate of growth, and T represents time. The magnitude of k_1 indicates the growth rate of the quantity exported. The sign of the growth rate indicates whether trends have been upward (positive) or downward (negative).

The second objective will be achieved with OLS estimation of the parameters of a multiple linear regression. The analysis will be based on Ghana's palm oil export demand.

Market demand for a commodity is determined by a number of factors: its own price, consumer income, prices of related commodities, consumer tastes, income distribution, total population, consumer wealth, credit availability, government policies, past levels of demand and past levels of income, among others. The traditional theory of demand, however, considers only own price, other prices, and consumer income and tastes (Koutsoyiannis 1979). The relevant determinants of the export demand for Ghana's palm oil have been identified to include own international and domestic market prices, real exchange rate in Ghana, per-capita income and population of the importing countries of Ghana's palm oil, and the previous year's quantity demand of Ghana's palm oil. Taste and preferences of the importing countries is yet another factor that affects the export demand for palm oil. Taste and preferences are captured by a trend term (e.g., Brew-Riverson 1999). The relevant export demand function for Ghana's palm oil is specified as

$$(2) \quad Qd_t = f(PD_{r,t}, PD_{r,t-1}, PI_{r,t}, PI_{r,t-1}, PM_{r,t}, PM_{r,t-1}, \\ ER_{r,t}, Q_{d,t-1}, Y_t, PO_t, T_t, e_t),$$

where Qd_t is the quantity of Ghana's palm oil demanded by her major trading partners in year t, $PD_{r,t}$ and $PI_{r,t}$ are domestic and international market prices of Ghana's palm oil in the current year and $PD_{r,t-1}$ and $PI_{r,t-1}$ are their respective previous-year values; $PM_{r,t}$ and $PM_{r,t-1}$ represent the international prices of Malaysia's Palm oil in the current and previous-years, respectively.[1] Qd_{t-1} is the quantity demanded in the previous year. Y_t represents the average trade-weighted per-capita income of importing countries in the current year. $ER_{r,t}$ is the real exchange rate in Ghana; PO_t denotes the average population of the importing countries in the current year. T_t is a trend term capturing the effect of taste and preferences, and e_t is a stochastic error term. The model employed in this study is a semi-log model (i.e., log-linear model) (Gujarati 1992, p.169); consequently, the coefficients in the model multiplied by 100 are semi-elasticities. However, to eliminate approximation error, Equation 3 has been employed to compute the semi-elasticities (S.E) (e.g., Wooldridge 2003, p.187):

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[1] Malaysia's and Ghana's Palm oil compete for demand on the international market.

$$(3) \quad S.E. = 100*[100(\alpha_i) - 1],$$

where α_i is the coefficient of the independent variable.

The elasticities of the independent variables in the model were computed as

$$(4) \quad \eta = \alpha_i \bar{x},$$

where η, α_i, and $\bar{x}$ represent elasticity, coefficient of the independent variable, and mean of the independent variable, respectively.

Empirical Application

Annual time-series data from 1987 to 2006 on total quantity exported in tons and the total export value in U.S. dollars of Ghana's palm oil were obtained from the Ghana Export Promotion Council. The total export values were divided by the respective total quantities exported to obtain the per-ton export value of Ghana's palm oil, which in turn was used to represent the international price of Ghana's palm oil. Data on yearly average wholesale price of palm oil in Ghana were obtained from the Ministry of Food and Agriculture and used as the domestic price of palm oil in Ghana. The international price of Malaysia's palm oil was computed as the ratio of value to quantity of Malaysia's palm oil exports. Data on the value and quantity of Malaysia's palm oil were obtained from the Food and Agricultural Organization (FAO) Statistical database. The real values of the above variables (domestic and international prices of Ghana's palm oil and international price of Malaysia's palm oil) were computed by deflating them with the respective country's CPI at constant 2000 prices. All prices except the domestic price of Ghana's palm oil were measured in U.S. dollars, so the domestic price of Ghana's palm oil was also converted to from Ghanaian cedis to U.S. dollars using each year's appropriate exchange rate. Trade-weighted average per-capita income of Ghana's trading partners was estimated as follows: the proportion of each of Ghana's trading partner's imports of the world's total palm oil imports was calculated for each year. The ratio of gross domestic product (GDP) of trading partners to their respective populations was calculated to determine the nominal per-capita incomes from which the real per-capita incomes were calculated using

consumer price indexes at constant 2000 prices for the deflation over the study period. The product of the real per-capita income of each of trading partner and its proportions of world palm oil imports was computed. The values for each trading partner were summed across the countries for each year to obtain the total trade-weighted per-capita income, calculated in US dollars. Values were weighted to account for the fact that trading partners do not consume equal quantities of palm oil. Nominal per capita GDPs of Ghana's trading partners in palm oil—France, Germany, the Netherlands, the UK, and the U.S.—were reported in the respective local currencies; these were converted to U.S. dollars using the nominal exchange rate in those countries for each year before their inclusion in the calculations. Data on nominal per-capita GDP, world- and country-level imports of palm oil, nominal exchange rates, and populations of the importing countries were obtained from the International Monetary Fund (IMF) world outlook database. The average of the population of the importing countries was computed for each year. The real exchange rate in Ghana was computed by adjusting the nominal exchange rate in Ghana for inflation at constant 2000 prices. Data on the nominal exchange rate between Ghana and the rest of the world were obtained from the Bank of Ghana. The trend term (T_t = 1, 2, 3... 20) served as a proxy for taste and preferences, and solved any spurious regression problem that may have occurred.

Empirical Results

The trend analysis of Ghana's palm oil exports from 1987 to 2006 reveals that there has been a general upward growth in export of Ghana's palm oil over the study period at an annual growth rate of 23.2 percent. Quantity exported remained fairly constant over the first four years (i.e., 1987–1991) of the study period; this resulted from the fact that production and domestic demand for palm oil also remained about constant over the period. Between 1994 and 1998, quantity exported increased at an annual rate of 87 percent. This sharp increase can be attributed to two issues: a 27.3-percent annual increase in the real international price and a 2.2-percent annual decline in the real domestic price of Ghana's palm oil over that period. This general rise in exports can also be attributed to the priva-

tization of state-owned oil palm plantations in the 1980s and 1990s (Laryea and Antwi-Asare 2005). The privatization was a strategy adopted to revive the deteriorating oil palm industry. It was implemented through the Structural Adjustment Program proposed by the IMF and the World Bank during the 1980s economic hardship in Ghana. The privatization of the state-owned plantations increased palm oil production (through the increase in palm fruits) far above domestic demand. The surplus available for export thereby increased in the 1980s and 1990s. The use of improved varieties and improvement in farm-management practices following research developments at the Kusi Oil palm Research Institute also might have contributed to the general rise in exports from 1987 to 1998. The general rise also might have resulted from the 4.84-percent annual decline in the domestic price of palm oil over the period.

The sharp increase in exports between 1994 and 1998 was followed immediately by a sharp decline, from 29,370 tons in 1998 to 7,475.83 tons in 2001. This 74.5-percent decline in the total quantity of palm oil exported within the period can be attributed to the decline in the real international price of Ghana's palm oil, from US$942.4 per ton in 1998 to US$164.5 per ton in 2001. From 2001 to 2004 the quantity exported increased gradually from 7,475.83 to 11,095.7 tons, growth of 48.4 percent over the period. This may be due to the 58.2-percent increase in the real international price of Ghana's palm oil. The quantity exported increased in 2005 and decreased in 2006. These fluctuations in exports in 2005 and 2006 resulted from fluctuations in the real exchange rate in Ghana. An increase in the real exchange rate in Ghana depreciates the cedi against the U.S. dollar, thereby compelling exporters to export more in order to maximize profits. Depreciation of domestic currency is a promoting factor of non-traditional exports (Bawuah 2007; Stevens and McQueen 1991).

We used ordinary least squares analysis to identify the determinants of the export demand for Ghana's palm oil and their magnitudes and effects. A log-linear functional form was employed in the estimation. The adjusted R-squared value of 0.941802 shows that the model explains 94.2 percent of the total variation in the quantity demanded of Ghana's palm oil over the study period. The F-statistic of 2.895 (p-value = 0.0000) shows that the

independent variables in the model jointly explain the variations in the export demand for Ghana's palm oil at the one-percent level of significance. The Jarque-Bera test statistic of 0.56 (*p*-value = 0.7542) shows that the error term is normally distributed, and the Breusch-Pagan test statistic of 13.34 (*p*-value = 0.7) is strong evidence for the null hypothesis of homoscedasticity in the error term even at the ten-percent level of significance. The Engel's LM test statistic of 0.026 (*p*-value = 0.87) rules out the presence of autoregressive conditional heteroscedastity (ARCH) to the first order even at the ten-percent level of significance. Real domestic price and the one-year lagged real domestic price of Ghana's palm oil conform to their respective *a priori* expectations and significantly affect export demand of Ghana's palm oil at the one-percent level of significance. A one-percent fall in the real domestic price of Ghana's palm oil will bring about an 11.94-percent increase in the quantity exported (demanded) of Ghana's palm oil, all thing being equal. A one-percent fall in the per-litre real one-year lagged domestic price of Ghana's palm oil results in a 4.2-percent increase in the quantity exported (demanded) of Ghana's palm oil. Real international price and the one-year lagged real international price of Ghana's palm oil conform to their respective *a priori* expectations and significantly affect quantity demanded of Ghana's palm oil at the one-percent and ten-percent levels of significance, respectively. All other things being equal, the quantity demanded of Ghana's palm oil will increase by 0.4 percent for every one-percent decrease in the per-ton international price of Ghana's palm oil. The quantity demanded of Ghana's palm oil will increase by 0.18 percent for every one-percent decrease in the per-ton one-year lagged real international price of Ghana's palm oil.

Real international price and the one-year lagged real international price of Malaysia's palm oil conform to their respective *a priori* expectations and significantly affect the export demand of Ghana's palm oil at the ten-percent and five-percent levels of significance, respectively. A one-percent increase in the per-ton international price of Malaysia's palm oil will, all other things being equal, increase the demand for Ghana's palm oil by 2.1 percent. Likewise, a one-percent increase in the per-ton one-year lagged international price of Malaysia's palm oil will increase the demand for Ghana's palm oil by

2.5 percent, all other things being equal. The real exchange rate in Ghana (ERr) conforms to *a priori* expectation and significantly affects export demand of Ghana's palm oil at the one-percent level. A one-percent depreciation of the cedi against the U.S. dollar will bring about an 11.14-percent increase in the demand for Ghana's palm oil by her trading partners, all other things being equal. The one-year lagged quantity demanded of Ghana's palm oil conforms to *a priori* expectation and affects quantity demanded significantly at the one-percent level. Quantity demanded increases by 1.1 percent for every one-percent decrease in the lagged one-year's quantity demanded, *ceteris paribus*. Neither average trade-weighted per-capita income nor average population of the importing countries significantly affect quantity demanded of Ghana's palm oil even at the ten-percent level. While the former result conforms to *a priori* expectation, the latter result (average population) does not. On average, therefore, Ghana's palm oil is a normal good to the importing countries. The surprising negative relationship between quantity demanded and average population of the importing countries might have resulted from a shift in preference from palm oil in general (i.e., not only palm oil from Ghana) to other vegetable oils as population increases. The trend term used as a proxy for taste and preferences does not significantly affect quantity demanded at even the ten-percent level but conforms to the *a proiri* expectation. As the years pass, taste and preferences of the importing countries tend to move away from Ghana's palm oil.

Conclusion

This study examines the export demand for Ghana's palm oil from 1987 to 2006 using a demand analysis. We examined the trend and growth rate of export demand and specified the demand function, which we estimated using ordinary least squares regression. The empirical results reveal that the quantity exported of Ghana's palm oil experienced an upward annual growth rate of 23.2 percent. Exports remained almost unchanged for the first four years and rose thereafter until 1993, when some fluctuations were observed for the following two years. A sharp rise followed, reaching its peak in 1998. The period between 1998 and 2002 recorded a sharp decline. Slight fluctuations followed to the end of the study period.

This study had a second objective of identifying the factors influencing demand for Ghana's palm oil and quantifying the effects of these factors. The factors that significantly influence export demand for Ghana's palm oil have been identified to include real domestic price of Ghana's palm oil, real international price of Ghana's palm oil, real international price of Malaysia's palm oil, and the respective one-year lagged values of these factors. The real exchange rate in Ghana and the one-year lagged quantity demanded also significantly affected quantity demanded of Ghana's palm oil over the study period. Although the effect of average trade-weighted per-capita income of the importing countries and the trend term are as expected, they do not significantly affect demand for Ghana's palm oil exports. Likewise, average population of the importing countries does not significantly affect demand for Ghana's palm oil. Quantity demanded of Ghana's palm oil is domestic-price elastic. Quantity demanded of Ghana's palm by her trading partners increases by 11.94 percent for every one-percent fall in the per-litre real domestic price of Ghana's palm oil, all other thing being equal. There is the tendency of prices in the domestic palm oil market to rise very high (especially during the lean season), thus retarding palm oil exports. In view of this, government intervention in the domestic palm oil market is strongly recommended. The government should frequently intervene in the local palm oil market with favourable price-support systems in order to promote international demand for Ghana's palm oil by curbing unprecedented price increases in the local market.

The study reveals that palm oil exported by Malaysia and Ghana compete for demand in the international market, as demonstrated by the negative cross-price elasticity of demand with respect to Malaysian palm oil. To promote Ghana's palm oil exports, therefore, stakeholders should price Ghana's palm oil in line with that of Malaysia in the international market. The importing countries of Ghana's palm oil also import palm oil from countries other than Malaysia, so the international price of palm oil from those countries should be considered as well when pricing Ghana's palm oil in the international market. The export demand of Ghana's palm oil is also responsive to changes in the exchange rate in Ghana. A one-percent depreciation of the cedi against the U.S. dollar will bring

about an 11.14-percent increase in the demand for Ghana's palm oil by her trading partners, all other things being equal. This means that a reduction in the value of the cedi in relation to other currencies cheapens Ghana's palm oil in the international market, bringing about increases in foreign consumption. Following this development, we recommend exchange-rate stabilization policies that would result in the creation of a favorable international trade environment which would eventually ensure a mutually beneficial trade between Ghana and her palm oil trading partners.

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