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Analysing the Major Effects of Exports and Imports on the Balance Of Foreign Trade In Ghana

Yakubu Dekongmene Kanyiri [1*] Dr. Richard Kodzo Avuglah[2] Emmanuel Harris[3]

1. Department of Mathematics, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana

2. Department of Mathematics, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana

3. Department of Mathematics, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana

[*]E-mail of corresponding author: kd_yak@yahoo.com

Abstract

This paper presents the analysis of major effects of exports and imports on the balance of foreign trade in Ghana. The study made use of principal component analysis (PCA), multiple linear regression analysis and stepwise regression analysis to find out which export and import commodities have significant effects on the balance of foreign trade in Ghana. The sampling test made use of Mineigen criteria of 0.25 in absolute values. The data which was sought from the Trade Statistics Division of the Ghana Statistical Service (GSS) was divided into three groups, namely, food, textile and manufacturing. The analysis showed that, for the food group, cocoa beans had significant effect on balance of trade on exports while rice had significant effect on imports. For the textile group, kente had significant effect on exports while boxes had significant effect on imports for balance of trade in Ghana. The manufacturing group had monetary gold and aluminum sheet having effect on exports buckets, while shovels and gribs of machines had significant effect on imports of balance of trade in Ghana. The gap between exports and imports with regards to food commodities was found to be closing up especially in exports while that of manufacturing commodities was increasing. The balance of trade considered in this paper was for goods only.

Key words: Principal Component (PCA), Stepwise Regression Analysis, Multiple Linear Regression Analysis, ANOVA.

1. Introduction

The economy of Ghana with its long standing tradition in international trade had experienced difficulties in the last three decades and had undergone several major macroeconomic and trade policy reforms. The late 1970s and early 1980s proved to be extremely trying economic times for the developing countries. Throughout these trying moments, a number of combinations of exogenous shocks, such as worsening terms of trade, falling growth rates in the cost of living and availability of foreign financing, created serious macroeconomic management problems for policy makers in developing countries (Ghana country studies, 2004). Ghana has two main seaports at Tema and Takoradi which handle most of the country's exports and imports commodities respectively. Both ports have undergone extension and rehabilitation which has improved efficiency. The turnaround time for ships at Ghana's ports is now one of the quickest in West Africa and the tonnage handled has also increased significantly. Yaw (2002) Ghana's total exports receipts increased by 33 percent in 2006 and all components of exports except Timber and Wood products experienced substantial growth in value terms. The overall growth was led by the two dominant export commodities in the country, which are cocoa beans and gold. Either (1992) Balance of trade is the difference between the monetary value of exports and imports in an economy over a certain period of time. A positive balance of trade is known as trade surplus and consists of exporting more than importing; and a negative balance of trade is known as a trade deficit or, informally a trade gap. The balance of trade forms part of the current account, which also includes other transactions such as income from the international investment position as well as international aid. The current account balance is subdivided into two; the trade balance, which is the balance between visible exports and imports, and the balance of services or the balance of invisibles. A deficit in the balance of trade may likely affect the position of the current account leading to unfavorable balance of payments. Ghana recorded an external trade deficit of US$1.7 billion in the first nine months of January-September of 2011. According to Bank of Ghana (BOG), the total merchandise exports within the period amounted to US49.8 billion in 2011, representing a growth of about 67 percent over the same period of 2010 whereas total merchandise imports amounted to US$11.5 billion, representing an annual growth of 45.6 percent.

This means that Ghana imports more than it exports on the internal market having a shortfall of US$1.7 billion within the period compared to US$2 billion for the corresponding period in 2010. And by the eleventh month it was US$2.6 billion. Again, second quarter of 2012 Ghana trade deficit was U$1,339.50 million according to (BOG, 2012). The desire of successive governments in their attempt to improve the country's exports sector and scaling down its imports is still having challenges. There still exist a large gap between exports and imports which needs to be looked at and measures taken to close this gap. Hence the study looks closely at the export and import commodities contributing largely to this trade deficit. In the light of all these macroeconomic indicators, there is the need to analyze the possible effects of export and import commodities on the balance of trade, hence the need for the study to find out which export and import commodities have significant effects on the balance of foreign trade in Ghana and to compare export and import commodities that has effect on balance of foreign trade in Ghana.

2. Material and Methods

The major effects of exports and imports on the balance of foreign trade in Ghana was analysed after a careful review of the relevant literature on the use of principal component analysis in many field of research. Jip (2010) Principal Component Analysis (PCA) on Side-Channel Attacks. The author wish explained how principal component analysis could be applied to capture the variance of the key leakage of the different S-boxes. It requires power traces, which usually are highly dimensional, but may leak key information at multiple time instances. Since the largest variance is captured in the highest principal components, if there is no noise in the measurements, the information about the key leakages should be in these largest components. McAdams et al. (2006) worked on the use of Principal Component Analysis in data reduction for GIS Analysis of water quality data. In their work, the PCA analyses distinguish between different areas of the composition of a lake. The areas correlating strongly with the Polluted variables are areas known for discharge of pollutants such as Phosphorus and Nitrogen due to the entry of pollutants from the streams that were carrying industrial waste. The other section of the lake which is buffered by a wildlife protection area and minimal urbanization were the highest loadings and the good water quality variables were found. In this paper, the attention is to find out which export and import commodities have significant effects on the balance of foreign trade in Ghana and to compare export and import commodities that have effect on balance of foreign trade in Ghana. The paper will inform policy makers in the exports and imports market the effects of some major commodities that have significant effects regarding international trade in Ghana. It would also help improve the export and imports sector in terms of the various groups, namely, food, textile and manufacturing, which are the commodities which could have effect on the balance of foreign trade in Ghana. The paper made use of quantitative data, which were sought from the Trade Statistics Division of the Ghana statistical service (GSS) alongside with their value of balance of trade in Ghana from the period 2004 to 2010.

The paper started by using the Mineigen criteria to come out with the commodities that have highest loadings and to ascertain the relationship between the variables by first looking at the components from each group. The methods were base on principal component analysis, multiple linear regression and stepwise regression analysis. The stepwise analysis was then used to best select the variables from the principal components for the model for the three groups (food, textile and manufacturing) respectively.

3. Data analysis, findings and discussion

We used principal component (PC) analysis for the deduction of variables which had significant effect on balance of trade in Ghana. The data was divided into three groups before applying the principal components on each of them with regards to export and import of balance of trade in Ghana. Those three groups were food, textile and manufacturing commodities. Principal component was applied to each group to extract variables that contribute significantly to balance of trade. All variables with factor loadings greater than or equal to 0.25 in absolute values were retained for further analysis. Both stepwise and multiple linear regression further analyzed the components of the three groups emanating from the first PC in each group to ascertain the effect on balance of trade. The procedure for the stepwise regression terminate when all the independent variables not in the model become insignificant at the α -level. In this paper, the stepwise regressions were applied at each stage following the factors being extracted from the principal components analysis procedure from the first PC. The balance of trade is taking as dependent variable, while all the other commodities in each group for both export and import are taking as independent variables. Analysis of variance (ANOVA) was used to test the model adequacy for all the three groups.

3.1 The effects of principal components on balance of trade (food exports)

In this group we applied the regression technique to check the food commodities that have major effect on the balance of foreign trade. The seven variables from the first principal components in the food group were cocoa,

orange, maize seed, cashew, Shea (karite) oil, palm oil and groundnut oil. This commodities represents $X_1, X_2, X_3, X_4, X_5, X_6$ and X_7 respectively.

$$Z_1 = 287.907 + 29.855X_1 - .193X_2 + .184X_3 - .290X_4 + .120X_5 + 024X_6 - .221X_7$$

The adjusted $\mathbf{R^2}$**=0.79** which tells us that 79% of the variation in the balance of trade with regard to exported food commodities is explain by these variables.

3.2 The effects of principal components on balance of trade (food imports)

In this group we applied the regression technique to check the food commodities that have major effect on the balance of foreign trade. The eight variables from the first principal components in the food group were, rice, fish (frozen), pineapple, maize seed, Shea (karite) oil, orange, banana and soya beans oil representing $X_1, X_2, X_3, X_4, X_5, X_6, X_7$ and X_8 respectively.

$$Z_2 = 22.046 - .333X_1 + .056X_2 - .203X_3 + .349X_4 + .208X_5 - .082X_6 - .210X_7 - .192X_8$$

The adjusted $\mathbf{R^2}$**=0.84** which tells us that 84% of the variation in the balance of trade with regard to imported food commodities is explain by these variables.

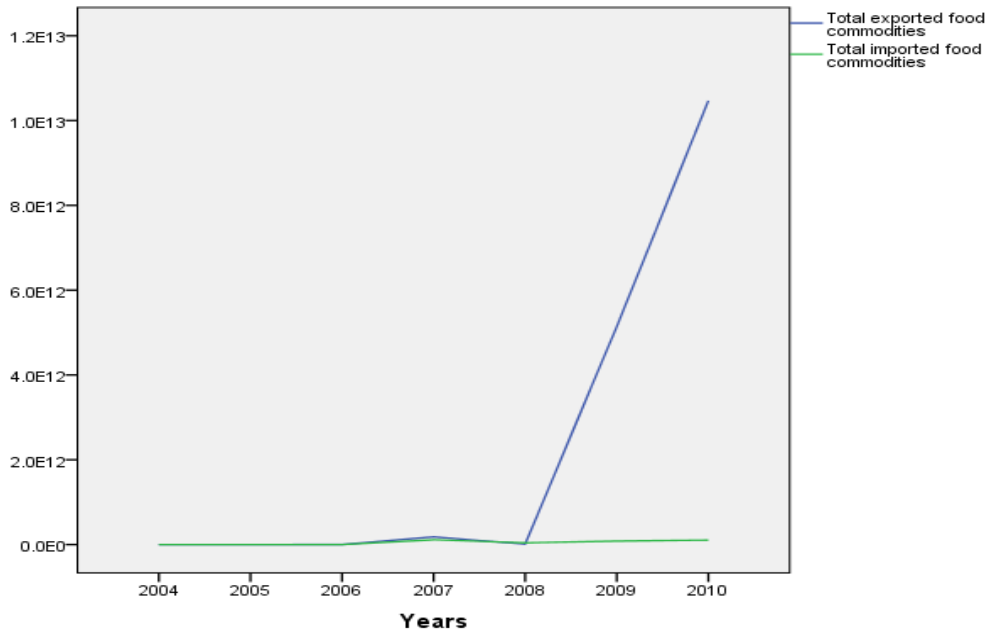

Figure 1. The Effects of Principal Components on Balance of Trade (food exports and imports) Description for the above figure

3.3 The effects of Principal Components on Balance of Trade (textile exports)

In this group we applied the regression technique to check the textile commodities that have major effect on the balance of foreign trade. The six variables from the first principal components in the textile group were, kente, letter cards, boxes, exercise books, sanitary towels, and multiple yearn polyester representing X_1, X_2, X_3, X_4, X_5 and X_6 respectively.

$$Z_1 = 16.556 + .555X_1 - .006X_2 + .154X_3 - .545X_4 - .653X_5 - .436X_6$$

The adjusted $\mathbf{R^2}$**=0.76** which tells us that 76% of the variation in the balance of trade with regard to exported textile commodities is explain by these variables.

3.4 The Effects of Principal Components on Balance of Trade (textile imports)

In this group we applied the regression technique to check the textile commodities that have major effect on the balance of foreign trade. The five variables from the first principal components in the textile group were, boxes, envelops, letter cards, handkerchiefs, sanitary towels and exercise books representing X_1, X_2, X_3, X_4 and X_5

$$Z_2 = 16.945 + .541X_1 - .081X_2 + .253X_3 - .383X_4 + .528X_5$$

The adjusted $\mathbf{R^2=0.66}$ which tells us that 66% of the variation in the balance of trade with regard to imported textile commodities is explain by these variables.

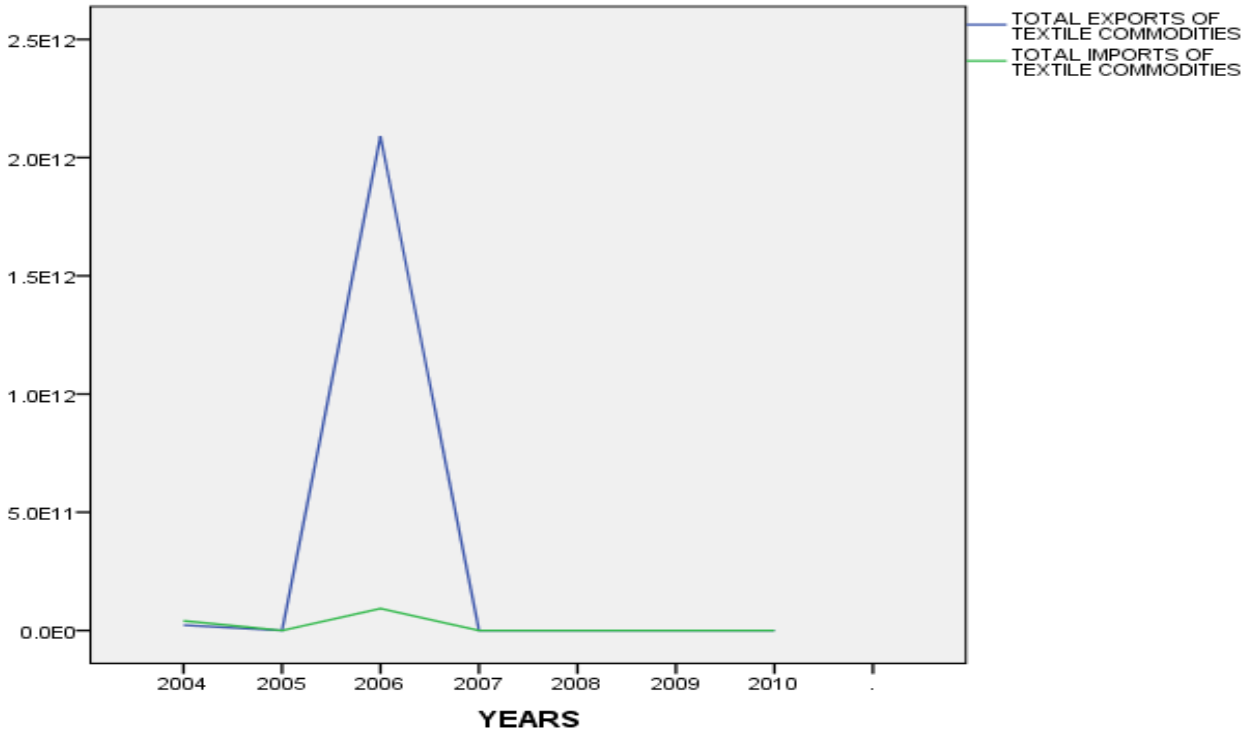

Figure 2. The Effects of Principal Components on Balance of Trade (textile export and import) Description for the above figure.

3.5 The Effects of Principal Components on Balance of Trade (manufacturing export)

In this group we applied the regression technique to check the manufacturing commodities that have major effect on the balance of foreign trade. The six variables from the first principal components in the manufacturing group were, monetary gold, aluminum sheets, ceramic roofing tiles, buckets, shovels and grib of machines, iron, steel and barbed wires and domestic heating or cooking apparatus representing X_1, X_2, X_3, X_4, X_5 and X_6.

$$Z_1 = 27.065 + .214X_1 - .230X_2 - .112X_3 - 153X_4 + .512X_5 + .318X_6$$

The adjusted $\mathbf{R^2=0.87}$ which tells us that 87% of the variation in the balance of trade with regard to exported manufacturing commodities is explain by these variables in the model.

3.6 The Effects of Principal Components on Balance of Trade (manufacturing import)

In this group we applied the regression technique to check the manufacturing commodities that have major effect on the balance of foreign trade. The six variables from the first principal components in the manufacturing group

were, buckets, shovels and gribs of machines, ceramic roofing tiles, iron, steel and barbed wires, standard wires and compacting machinery representing X_1, X_2, X_3, X_4, X_5 and X_6.

$$Z_1 = 24.469 + .195X_1 - .227X_2 + .126X_3 - .489X_4 - 365X_5 - .297X_6$$

The adjusted $\mathbf{R^2=0.60}$ which tells us that 60% of the variation in the balance of trade with regard to imported manufacturing commodities is explain by these variables in the model.

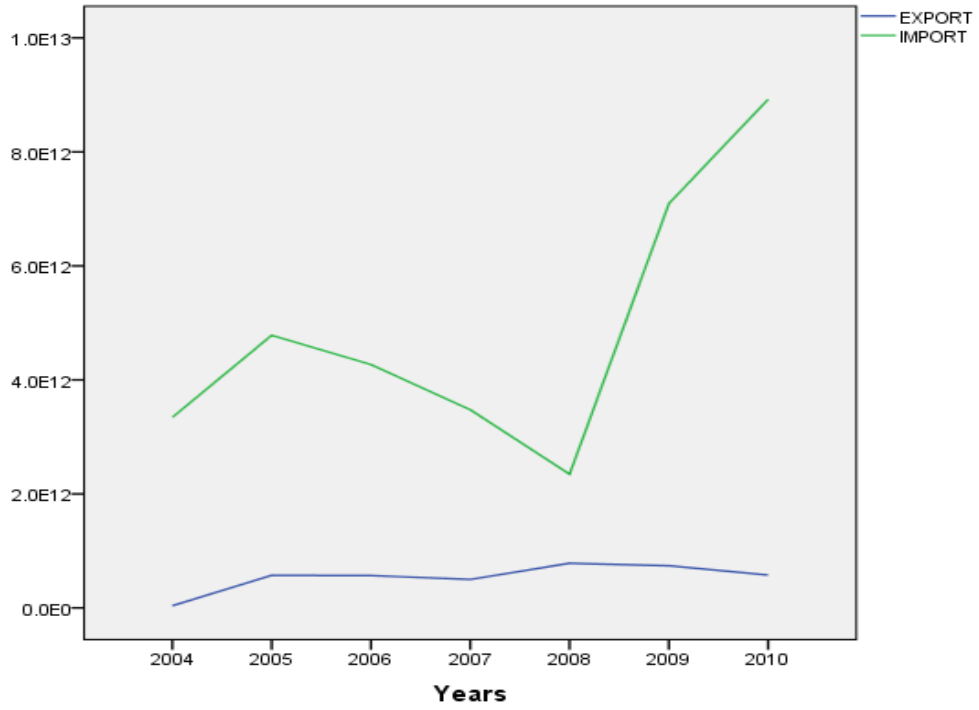

Figure 3. The Effects of Principal Components on Balance of Trade (manufacturing exports and imports) Description for the above figure.

4. Conclusion and Recommendation

The analysis revealed that, the first group cocoa beans and rice were some of the commodities that had major effect on balance of foreign trade in Ghana, the second group textile, Kente and boxes also had significantly effect of balance of foreign trade and finally, in the manufacturing group, monetary gold, aluminum sheet, buckets, shovels and gribs machines were some of the largest commodities that had effect on balance of foreign trade in Ghana. The paper recommends that,

4.1 Food industry: Improvement should be done in the quality and quantity of the production of the following commodities thereby, helping the export sector base of the market. Such food commodities are; rice, orange, banana, Shea (karite) oil, groundnut (shell), palm oil, onion, maize seed, and live sheep and goat. Since Ghana is somehow an agriculture based economy, it can gives a boost to small and medium scale enterprises, thus benefiting the economy of the country.

4.2 Textile industry: Cotton/ textile industry should be promoted extensively because, Ghana as a country is continues relying on imports from the market. Ghana can still improve in this sector by encouraging our craft men and women to go into leather work, basket weaving and others as well as providing support to farmers to go into large scale cotton production as the country has potentials of doing well in these areas to help its export market. Again, it can be serving as employment opportunities for the youth.

4.3 Manufacturing industry: Monetary gold and aluminum are helping the exports market, whereas mineral, Buckets, shovels, gribs of machinery, ceramic roofing tiles, iron, steel, book binding machines, compacting machinery, lubricants are dependent on imports. Machinery, lubricants and minerals are vital industry for any nation and can play a pivotal role in development. These types of industries must be promoted even if it requires the nation pumping much of its resources into it to help enterprises grow and also to expand the job market. Ghana as a country has the potentials of increasing its minerals exports if a critical look is taking at certain minerals such as; diamond, salt and bauxite.

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