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FOREIGN DIRECT INVESTMENT AND EXPORT PERFORMANCE IN GHANA: MODELING UNCERTAINTY USING BAYESIAN MODEL SELECTION APPROACH

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ABSTRACT

This paper employs the Bayesian Model Selection (BMS) to determine the link between Foreign Direct Investment (FDI) and export performance in Ghana. The BMS enables us to consider a large number of potential explanatory variables and deal with the issue of model uncertainty. The study revealed positive effect of FDI on export performance but not as a major driver of export growth in Ghana. However, the effect of domestic savings, trade liberalisation and infrastructure development are found to have stronger effect on export performance than FDI inflows. The study recommends government policies should be geared towards improving domestic savings and the liberalization of the economy towards international trade.

Key words

BMS, Export, FDI, Ghana

Introduction

The impact of Foreign Direct Investment (FDI) inflows on exports of a host country remains one of the most critically examined and yet unresolved issues in developing economies. It is critical because it is seen as a channel through which FDI could impact on growth and hence poverty reduction (Johnson, 2006). The impact of FDI on exports remains unresolved because FDI depends on a host of factors such as the country specific characteristics and motives behind the FDI. The general opinion is that Foreign Direct Investment (FDI) promotes exports of host countries by adding to domestic capital for exports, aiding technology and new product transfer for exports, making a possible access to new and large foreign markets, and providing training for the local workforce and upgrading of technical and management skills. There is, however, a divergent view about the economic impact of FDI on exports performance. It is argued that FDI may reduce or substitute domestic investment, transfer inappropriate or unsuited technology for the host country's factor proportions which is aimed basically at the host country's

domestic market. Also, FDI may impede the growth of local firms that might become exporters as the local firm may not be able to develop their dynamic comparative advantages (Tambunan, undated; UNCTAD World Investment Report, 2006).

Export promotion is considered to be key in achieving Ghana's development goals and objectives as outlined in the Ghana Poverty Reduction Strategy (GPRS I, 2003) document. Besides, as acknowledged in the country's trade policy document, Ghana's comparatively small domestic market implies that export growth must necessarily come through increased international trade. Thus, the basic strategy by successive governments has been to pursue an export-led industrialization strategy to contribute to the realization of the country's export growth and development. In this respect, a host of incentives have been put in place for exporters and producers of export products in a bid to attract investment to the sector and boost export development. Since the development of supply capacity is viewed in Ghana's trade policy as essential for the pursuance of export-led industrialization, one of the basic objectives has been to encourage foreign investment in productive sectors throughout the country, particularly those with greatest export potential.

As part of the strategy to recover the Ghanaian economy from the deterioration experienced in the late 1970s, in 1983 to the present, the government of Ghana has embarked on various economic reform interventions, key amongst which were the Economic Recovery Programme (ERP) and Structural Adjustment Programme (SAP). The main policy in these reforms was liberalisation and privatization of the economy. During the implementation of these reforms, most State Owned Enterprises (SOEs) were privatised and a new investment code of 1994, (a revision made to the 1985 code) is currently being implemented in the country. The basic objective of the new code was to focus on encouraging private sector investments as an engine of export promotion and economic growth. Consequently, the Ghana Investments Promotion Centre (GIPC) was set up under GIPC Act 2013 (Act 865) to promote the country's export and investment opportunities.

Consequently, Ghana has experienced a significant increase in FDI inflows from both developed and developing countries (World Bank, 2002, 2003, 2005). On average, overall FDI inflows increased by 15 % for the second half of the 1990s though this could not be sustained for the first half of the 2000s as growth of overall FDI inflows fell to just 4.3% (World Bank 2010). Over the same period, the country's export performance kept fluctuating with the highest performance in 2011. This performance in the export sector during the period is attributed to Ghana's discovery and exportation of oil during the period. Data from WDI (2013) reveals total

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exports averaged 12.2% for the second half of the 1990s and 5.1% for the first half of the 2000s. In addition to this, a significant level of macroeconomic stability with improved growth rates has been achieved World Bank (2003).

The increasing trend in FDI and the fluctuation patterns in export performance motivates the quest for an answer to the question of whether the growth trend in FDI inflows has any correlation with export growth performance in Ghana. There is no conclusive evidence in literature on how FDI inflow affects export performance of host developing countries and this ambivalence is attributable to the fact that most empirical studies on foreign direct investment and export growth focus on few explanatory variables and theoretical models. To solve this problem, this paper makes use of Bayesian Model Selection (BMS), a modeling approach that addresses the issue of model uncertainty. Firstly, the BMS approach enables its user to rank models and determine the most preferred one. Secondly, this approach for the making of inferences based on the entire set of candidate models conditional on data and accuracy without reliance on asymptotic approximation. Thirdly, because there exists a variety of models which give statistically reasonable but different conclusions, BMS focuses on regressors to include in the analysis and quickly determine models, or a specific set of explanatory variables which possess high probabilities. Fourthly, to the best of our knowledge, there is no study that identifies the link between foreign direct investment and export growth in Ghana, using the BMS approach. Finally, Bayesian Model Averaging (BMA) approach, a modelling approach that addresses the issue of model uncertainty (see Raftery et al., 1997) because a single model is inappropriate of the existence of a dual economy in Ghana.

In this paper, the BMS approach is applied to time series data from 1970 to 2015 and consequently the empirical analysis addresses the issues of multicollinearity and statianonarity. Besides, the robustness and the consistency of the posterior results are addressed by using different models and coefficient priors. Lastly, the contribution of this study is to provide essential variables relevant for the determination of export growth in Ghana in order to provide policy makers with an important tool that would inform growth policy. The rest of the paper is structured as follows: Section 2 present a brief review of related works. Section 3 briefly discusses the empirical model, data and variable justification used in the paper. Section 4 discusses the empirical results. Finally, section 5 presents the concluding comments.

Literature review

The success stories of East and South East Asian countries suggest that FDI is a influential tool of export promotion. However, empirical studies have proven that the impact of FDI on export performance of countries will vary depending on conditions specific to the host economy, type of FDI inflows and the motive behind the FDI (Siddtharthan, 1999; Aggarwal, 2000; Kumar, 1998; and Kumar and Sddharthan, 1997). A host of literature has been identified that explains how increased foreign direct investment could lead to export growth. According to Franco (2013), FDI could increase exports performance

when entered in a production function as capturing externalities, learning by watching and spillover effects, and is thus considered an important source of human capital and new technology which could lead to greater efficiency in the exports sector for developing countries. It is regarded as contributing positively to exports by augmenting domestic capital and the transfer of technology. Balasubramanyan et al. (1996) explain that foreign firms are also seen as natural channel(s) or means or medium for information about external markets, foreign consumers and through which local firms can distribute their goods.

In addition, foreign firms, especially those that are affiliates of Trans National Corporations (TNC), provide access to new overseas markets in host economies, and are better placed internationally to access international financial markets, consumer outlets and transportation networks (Cotton and Ramachandran, 2001; Jenkins and Thomas, 2002). The success stories of East and South Asian countries suggest that FDI is an influential device for export promotion because transnational companies through which most FDI is undertaken have the well established contacts and up to date information about foreign markets. The impact of FDI on host country exports also depend on its motive. If the motive is to capture the domestic market, then it is not likely to contribute to export growth. On the other hand output from efficiency-seeking FDI is normally intended for export, and as such is likely to increase exports from the host country (World Investment Report, 2005). This is supported by evidence of developing-country FDI becoming increasingly efficient-seeking. Foreign firms locate in other regions with lower costs of inputs (example lower labor costs in LDCs) and also to benefit from preferential market access offered under arrangements such as the African Growth and Opportunity Act (AGOA) of the United States. If the motive of FDI is to take advantage of the host country's comparative advantage in order to exploit the international markets, then FDI may contribute positively to export growth. The possibility of FDI contributing to export growth also depends on the nature of policy regime. Of course, an outward-oriented regime promotes export-oriented FDI while an inward-oriented policy regime attracts FDI basically to capture domestic markets (World Bank, 1993).

There are other studies that also recognize the positive contribution of FDI inflow to exports growth, but suggest FDI inflow does not necessarily have significant impact on exports performance. These include Ancharaz (2003) who examined the impact of FDI on the Mauritius' export growth performance and competitiveness, using Mauritius' exports as share of world exports. The study argued that although FDI is instrumental in export development, it has not had much impact on export competitiveness per se. The study did not, however, use any testable quantitative model to determine such relationship. Sharma (2000) also estimated the determinants of export performance, using time series macro data in a simultaneous equation framework for India, and found foreign investment to have a positive but insignificant impact on export performance.

On the export performance of foreign-owned affiliates in developing countries Estrin, Meyer, Wright, and Foliano (2008) used

Heckman's two-stage selection model and found quality of host country institutional environment does not affect the export propensity of foreign owned affiliates. However, they found that the export intensity of foreign owned affiliates is lower in host countries where the institutional environment has a higher level of economic freedom. Love and Mansury (2009) also empirically examined the link between exporting and productivity. They argue that firm size matters and those more productive firms are more likely to become exporters. They further argue that an increase in firm productivity increases both exporting and exposure to international markets.

Wagner (2007) Alvarez and Lo´pez (2008) found that the presence of foreign firms in a country does not always increase the probability of exporting or the export performance of domestic. Alvarez and Lo´pez (2008) have argued that the presence of sunk-entry costs to export markets tends to diminish the overall size of the export spillover effect. In other words, the net effect on export performance will be positive only if the export spillover effects can more than compensate the sunk-entry cost. Therefore, the mixed empirical result suggests that the effect of FDI inflow on export growth of any host country varies from industry to industry.

Empirical model, data and variable justification

The rationale of the BMS approach is that for a given linear model with a large number of explanatory variables (k), there are 2^k possible models which can be obtained by the selection of explanatory variables. Appropriate models with high likelihood are obtained by averaging across the large set of models and selecting variables which are relevant to the data generating process for a given set of parameters and model priors used (Raftery et al., 1997 and Fernandez, Ley and Steel, 2001). Parameter and model sampling in the context of the BMS approach are conducted with the aid of Markov Chain Monte Carlo Model composition (MC^3). The MC^3 method is used to indicate which model should be considered in computing the sums of posterior model and parameter probabilities by identifying the model with high posterior probability.

Given a linear regression model with β_i parameters and i=0,1,2...,k. With k explanatory variables x_1, x_2, x_3,...x_k, the general form of the regression is

$$y = \beta 0 + \sum_{i=1}^{k} \beta_i x_i + \varepsilon$$

Given k explanatory variables, there is a possibility of 2^k models to be obtained with the different combination of explanatory variables. The posterior distribution of the parameters β_i, given the data D, is an average of the posterior distribution of parameters under each model with weights given by the posterior model probabilities expressed as

$$P(\beta_i / D) = \sum_{j=1,\beta_i \in Mj}^{2^k} P(\beta_i / M_j) P(M_j / D)$$

The posterior model probability, $P(M / D)$ is given by

$$P(M_j / D) = \frac{l_D(M_j) P(M_j)}{\sum_{h=1}^{2^k} l_D(M_h) P(M_h)}$$

Where $l_D(M_j)$ is the marginal likelihood of the model M_j which is expressed as

$$l_D(M_j) = \int p(D / \beta_i, M_j) p(\beta_i) p(\beta_i / M_j) d\beta_i$$

Where $P(D/\beta_i, M_j)$ represents the sampling model corresponding to Equation 1 $P(\beta_i / M_j)$. is a prior probability distribution assigned to the parameters of model M_j, and $P(\beta_i)$ is the improper non informative prior for the parameters that are common to all models. The Zellner's g-prior is the preferred choice of prior structure for the regression parameters in most BMS applications. The common improper non informative g-prior structure for $P(\beta_i)$ is often expressed as

$$P(\beta i) \propto \sigma^{-1}$$

Where σ is a scale parameter which represents the standard error of the regression represented in Equation 1. Nonetheless, Fernandez et al. (2001) propose a g-prior for $P(\beta_i / M_j)$ and suggest that a uniform prior represented as g = 1 / max$\{n, k^2\}$. The authors show that such a g-prior leads to reasonable results.

With regards to model probability prior $P(M_j)$, the proposed prior distribution in the literature of BMS refers to uniform distribution prior expressed as

$$P(M_j) = p_j, \quad j = 1, 2\ldots, 2^k \quad \text{with} \sum_{j=1}^{2^k} p_j = 1$$

Following Leamer (1978), the estimated posterior means and standard deviations of β_i, β are constructed as

$$E(\hat{\beta}/D) = \sum_{j=1}^{2^k} \hat{\beta} P(M_j / D)$$

$$V(\beta/D) = \sum_{j=1}^{2^k} (Var(\beta/D, Mj) + \beta^{\hat{}}) P(M_j / D) - E(B/D)^2$$

Different model priors are used in order to obtain posterior parameter and model results. This is essential in order to assure the robustness and consistency of our results.

Data and Variable Justification

The data used for the analysis were obtained from the World Development Indicators and International Financial statistics website. FDI inflows and outflows were obtained from the UNCTADSTAT website. Political stability data were obtained from World Democratic and Political Stability website. The period of the study was from 1970 to 2015. In the quest of examining the impact of FDI on export growth in Ghana using a model that account for modeling uncertainty, the study employed 23 explanatory variables that are argued to influence export growth in empirical and theoretical literature. The dependent variable export was captured as the value of exports for Ghana. The variables considered to influence export growth and their apriori expectations are presented in Table 1.

Table 1: Variables and their apriori expected signs

Variable	Expected sign	Variable	Expected sign
Gross domestic savings	+	liberalization index	+
Domestic consumption	-	Development assistance	+
Transport	+	Infrastructure	+
External market access	+	Mobile phone access	+
Net FDI stock	+	value to manufacture	+
Natural resource rent	+	exchange rate	-
Agricultural value added	+	Labour force	+
Consumer price index	-	Total import volume	+
Total export volumes		World per capita GDP	+
Resource depletion	-	Political stability	-
Capital Formation		credit to private sector	+
Gross domestic product	+		

Source: WDI, 2015; International Financial statistic; UNCTADSTAT

The imports of a country are assumed to have a long run effect on exports growth. Most empirical studies found positive long run co-integrating relationship between exports growth and imports. This would be true if the importation of an economy promotes productivity and leads to increase in the volume of export commodities (Ali, 2013; Husted, 1992; Irandoust, & Ericsson, 2004).

Foreign Direct Investment (FDI) is measured as the difference between the total stock of FDI outflow and inflows. The variable, FDI, is expected to have a positive effect on export growth in Ghana. The use of FDI stock is informed by the study of Aloysius and Tchakounte (2011). The cumulative FDI stock is a better variable to capture the effect of FDI on exports than just the FDI inflows (Barrios et al., 2005). The supply capacity of the country has the tendency of influencing exports. The supply capacity of the country is therefore proxied by the potential GDP. The level of openness is also a contributor to export growth as posited by both empirical and theoretical literature. This is captured by the use of an index to capture trade liberalization. This measure of openness used in this study is consistent with Bamou et al. (2003) who measured liberalization as an index of import ratio to the total volume of trade. To capture the extent to which external markets could be accessed, the study used export penetration index, computed as ratio of export to total international trade. The two measured are used to capture the level of impact trade liberalization would have on export growth in Ghana.

The relative prices of a country affect the performance of its exports on the international market. Therefore, the real effective exchange rate, a measure of relative prices of a country's commodities was included in the model. It is expected that an appreciation of the real effective exchange rate would lead to a fall in export performance while depreciation would cause exports to rise. Other variables that were included in the regression were gross domestic savings is used as a proxy for saving. It is believe that increase in saving would make money available for investment. Hence increase in saving has the tendency of fostering investment in productivity and increase export. The nature of consumption in a particular country may as well encourage export growth. Therefore, domestic consumption is seen as an important variable in export determination, the level of infrastructure is predicted to foster export. Telephone access per 1000 people and transport infrastructure is used to measure the level of infrastructure in the Ghana. The availability of natural resources is key in Ghana's export. Therefore, it is expected that the measure for natural resource should significant effect on export growth. The measures for natural resource availability are natural resource depletion and natural resource rent. These two were expected to have a negative relationship on export.

Domestic demand pressures are also considered as factors that affect export performance. The study considers inflation and domestic consumption levels as factors that could affect export performance. There are several intuitive macroeconomic arguments that can explain a negative relationship between domestic demand and exports. In particular, when domestic demand is growing, the associated inflationary pressures can lead to a decline of the price competitiveness of

exports due to increase in domestic price (Esteves & Rau, 2013). On the supply side, increase in domestic consumption implies less resource for export. Similar to domestic demand, world demand is an influence factor in export performance. Labour and quality of labour is key in the productivity of firms. Empirical literature revealed that labour productivity would be influenced by the quality of labour and labour itself. Increase in the labour force is expected to reduce the cost of production. It is proven that lower wage or wage cuts are avenues of improving export (Darvas, 2012). Hence increased labour supply would relate to export positively. This study used the labour (population between 18-60 years) and the life expectancy to measure quality of labour and therefore a proxy for human capital.

Access to credit for expansion purposes of firms and investment in improved technology would enhance productivity. Therefore, it is expected that an increase in domestic credit to private sector would lead to export growth. Studies have examined the impact of war and violence on export of other countries and has established that political instability and violence impacts negatively on exports (Bashir, Xu, Zaman, Akhmat, & Ikram, 2013). Finally, consumer price index, value added for manufacturing and agricultures sectors, world potential GDP per capitaare also found in the literature to influence export growth (Lim and Ho, 2013).

Empirical results and discussion

To ensure that the time series variables used in the study were stationary, unit root test was conducted on the variables and they are found to be stationary. The results of the BMS analysis reported in Table 2 are obtained with the model prior set to$1/2^k$, where K=23 , is the number of explanatory variables included in the model. The prior probability of the regression coefficients are constructed by using the Bayesian Information Criterion (BIC) for all the models. Moreover, the MC^3 sampling employed is based on taking 1000 000 draws, from which 100 000 draws are discarded as burn-ins replications in order to obtain model and coefficient posteriors.

With the results represented in Table 2, the importance of the covariates in explaining export growth in Ghana is given by the Probability Inclusion Posterior (PIP) reported in the second column. The PIP shows the percentage of the model space wherein a covariate is included. The last two columns contain the posterior means and standard deviation for each regression parameters, averaged across models. The result indicates that there are high degrees of certainty of import, gross domestic savings, trade liberalisation index, consumer price index, and external market access in export performance then FDI. Also, posterior inclusion probability of other variables that contribute to export performance and the level of significance decreases over the model space.

Table 2 Bayesian model selection results from uniform model prior

Explanatory variables	Posterior Inclusion Probability	Posterior Mean	Posterior Deviation	Standard
Import	0.100	0.883	0.356	
Gross domestic savings	0.998	0.188	0.124	
Trade liberalization index	0.100	0.083	0.211	
Telephone per 100	0.623	0.012	0.317	
Domestic consumption	0.145	-0.024	0.088	
Mobile Phone access	0.098	-0.013	0.076	
Gross domestic product	0.075	0.003	0.078	
Consumer price index	-0.991	-0.005	0.041	
Official dev't assistant	0.394	0.001	0.013	
Value added-Manufacture	0.134	0.000	0.010	
Net FDI stock	0.070	0.035	0.193	
External market access	0.991	0.010	0.081	
Natural resource depletion	0.053	0.001	0.018	
World per capita	0.400	0.000	0.028	
Natural resource rent	0.046	0.001	0.017	
Import	0.063	0.071	0.083	
Credit to private	0.391	0.672	0.592	
Political index	0.141	0.452	0.376	
Real exchange rate	0.323	0.000	0.007	
Labour force	0.029	0.000	0.021	
Value added agriculture	0.029	0.000	0.012	
Transport_1	0.020	0.000	0.007	

Source: Authors' estimate

Moreover, there is a high degree of certainty that imports, gross domestic savings, trade liberalization, infrastructure development, external access to market and inflation have considerable impact in Ghana's export growth, given the posterior inclusion probability and the statistical significance of their posterior means averaged over the model space. Nonetheless, the degree of certainly of variable inclusion in the export model of Ghana reduced for the rest of variables. Also, it could be realized that Net FDI was not found significant in Table 1. As such, Net FDI was not included in the five best models in Table 3. In choosing a single equation from the BMA as indicated in Table 3, only variables with high posterior probability were included. Thus Net FDI and other variables with low posterior probabilities was drop.

In order to gain an insight on the degree of uncertainty that single models estimation could provide when assessing the role of FDI in export growth in Ghana, the results reported in Table 3 are compared with those in Table 2. Table 3 provides the results of the first five best single models, classified by the magnitude of the model posterior probability calculated from models visited by the MC^3 algorithm. From Table 2, it is indicated that in model 1 the covariates of export growth are import, gross domestic savings, trade liberalization, access to external market and consumer price index. In addition to explanatory variables for model 1, model 2 includes infrastructure development measured as telephone per 100 people; model 3 includes official development assistance and exchange rate. Model 4 includes world per capita GDP stock and model 5 includes domestic consumption. The results of the single model's estimation reported in Table 2 indicates the degree of uncertainty related to choosing a specific model formulation in estimating the role of FDI in export growth. In addition, choosing a single model can be misleading for policy formulations as per this study as each model has different variables included.

Table 3: Posterior means of the best five models

Explanatory variables	Model 1	Model 2	Model 3	Model 4	Model 5
Import	0.138*	0.902*	0.442*	0.006*	0.364*
Gross domestic savings	0.015**	0.276*	0.145*	0.173**	0.523*
Trade liberalization index	0.044*	0.986*	0.042*	0.561*	0.934*
Telephone per 100	0.543***	0.096*	0.954*		
Domestic consumption					0.775**
Mobile Phone access					
Gross domestic product					
Consumer price index	-0.223*	-0.431*	-0.975**	-1.054*	-0.342*
Import					

Credit to private					
Political index					
Official development assistant			0.975*		0.452*
Value added-Manufacture					
Net FDI stock					
External market access	0.861*	0.004*	0.376***	0.291*	0.765**
Natural resource depletion					
World per capita				0.056*	
Natural resource rent		0.987***			
Real exchange rate			0.541**		0.087*
Labour force					
Value added agriculture					
Transport_1					
R2	0.891	0.801	0.788	0.781	0.749
Posterior Probability	0.242	0.186	0.182	0.171	0.169

Source: Authors' estimate * Indicates 1% level of significance,** 5% and *** 10%

Using the level of significance of 5% alpha level for the covariates averaged across models, the results of the BMS analysis as reported at Table 2 show the importance of import to explain the level of export performance in Ghana. From the results, imports have a positive effect on export performance and this is statistically significant at 5% level. The finding of the study confirms the findings of Arize (2002) and the theoretical position of Husted (1992) who argues that if imports are raw materials and capital goods, they contribute to increase in productive capacity of the economy. In this sense, the increase in imports would result in increased production. This results in long run positive impact on export growth.

Gross domestic saving has about 99.8 % posterior inclusion probability in explaining exports. This indicates that the level of savings affect the export growth of a country. The variable is statistically significant at less than 5%. The result implies that as domestic savings increases, export growth would increase. This paper alludes to the importance of gross domestic savings in explaining export growth. This is obvious from the macroeconomic perspective. Intuitively, increased savings would lead to economic growth through increase investment. In a similar vein, increase in domestic savings leads to increased in investment for productive expansion in the various sectors of the economy. In this sense, saving would lead to

increased expansion in the supply capacity of the economy and hence leads to increased exports. Again, in the short run, saving would reduce the total domestic consumption. This reduction in consumption leads to excess supply over the current levels of domestic consumption of good and service. Hence, the excess would be exported to earn foreign revenue.

Trade liberalization index has a positive effect on export performance with posterior inclusion probability of 100%. Thus, in the case of Ghana, trade liberalization is important in explaining the level of export performance. This is in line with the theoretical postulation that a more opened economy fosters international transaction between the country and the rest of the world. That is export would increase due to the liberalization of the economy. This however does not support the findings of Aloysius and Tchakounte (2011).

Another key variable that is important in explaining export performance is the level of infrastructure development of the country. Infrastructure tends to have a positive effect on export performance. Thus, poor state of infrastructure development would lead to a decline in the growth of export of goods and services. This is because inadequate infrastructure has a number of effects on trade and hence exports performance of Ghana. These include increased costs and uncertainty, reduced investment in exporting industries. The result is in consonance with recent studies that have found that poor infrastructure (example; lack of good transport infrastructure) leads to a reduction in export volumes of an economy (Semerjian & Watters, 2000).

Consumer price index worsens the international competitiveness of export of an economy. This is because; the prices of the commodities relative to the international prices would be higher making exports unattractive. On the second channel, the high prices would discourage domestic production of goods and services which in the long-run leads to reduction in export through the decline in domestic output (Abidin Irwan et al. 2013). This would lead to high competition of the domestic industries and hence the collapse of domestic firms. Such a condition would reduce the volume of exports in an economy. The results found in the study suggest that a higher price of domestically produce good leads to a fall in export performance through either of one of these channels.

The world economic condition definitely has an effect on export performance. A very vibrant global economic activity leads to an increase in the demand of goods and service. Therefore, in such periods, the export performance of Ghana increases per the results of the study. The increase in world per capita income leads to an increase in the export performance. This is in line with the tradition trade theories. This result could be explained from the fact that increase income lead to an increase in demand for goods and service. In periods where per capita income increases, the demand for goods also increase. Countries then tend to augment their domestic production with export to meet the demand of their residents. In this sense, the increase in income would lead to increase in exports for Ghana.

It is not surprising that Official Development Assistance (ODA) is positively related to export performance of Ghana since ODA to the country normally takes the form of technical assistance and infrastructure projects.

This therefore leads to infrastructure enhancement and therefore improves the possibility of export for the domestic manufacturing firms. Also, ODA inflows may require that prudent measures be established to ensure free trade and a restructuring of the economy.

The role of FDI is not significantly important in explaining export performance in Ghana. The posterior inclusion probability indicates that FDI had lower probability of inclusion in export models for Ghana. That is other factors are more important in explaining the level of export performance than FDI. The results support Aloysius and Tchakounte's (2011) finding that FDI's contribution to export performance is low, using Cameroon as a case study. Despite the low probability of inclusion, it has a positive effect, a finding which reflects theoretical predictions and other empirical studies. The positive effect of FDI on export could be explained by two main reasons. The first is FDI increases the productive capacity of the economy through technological and knowledge spillover (Basu, 2003; Kwan, 1996). Again, FDI encourages competition among domestic firms, and this has the tendency of making the local firms export oriented in their production. Several factors may account for the effect of FDI on exports performance. Therefore, to solve the problem of uncertainty about these factors we employ the BMS. In addition, to test the robustness of our results, we re-estimated the BMS model by changing the model priors. The results reported in Table 4 are consistent with the one obtained earlier. Also, Figures 2 and 3 obtained from changing the model prior are as shown in the Appendix A. The upper plot in each figure shows the prior and posterior distribution of model size and shows the impact of the model prior assumption on the estimated result. The upper plot in figure 2 assumes "uniform" distribution for the model prior and the upper plot in Figure 3 assumed "fixed". From Figure 2 and 3, it seems the model prior (either fixed or uniform) has little effect on the posterior distribution of the model sizes. This gives an assurance that our results are robust and consistent with the change of model priors.

Table 4: Bayesian model selection results from fixed model prior

Explanatory variables	Posterior Inclusion Probability	Posterior Mean	Posterior Standard Deviation
Import	0.972	0.864	0.3038
Gross domestic savings	0.743	0.177	0.127
Trade liberalization index	0.833	0.145	0.299
telephone per 100	0.532	0.037	0.009
Domestic consumption	0.107	-0.0124	0.325
Mobile Phone access	0.105	-0.0142	0.086
Gross domestic product	0.079	0.005	0.062
Consumer price index	0.989	-0.071	0.005
Official development assistant	0.051	0.002	0.043
Value added-Manufacture	0.050	0.002	0.008
Net FDI stock	0.178	0.122	0.325
Import	0.049	0.011	0.033
Credit to private	0.321	0.072	0.073
Political index	0.041	0.051	0.099
External market access	0.792	0.013	0.093
Natural resource depletion	0.048	-0.0034	0.017
World per capita	0.582	0.014	0.027
Natural resource rent	0.078	-0.002	0.021
Real exchange rate	0.236	0.002	0.005
Labour force	0.054	0.004	0.033
Value added agriculture	0.029	0.004	0.011
Transport_1	0.047	0.0003	0.033

Source: Authors' estimate

Concluding Comments

Though many theories predict a positive relationship between FDI and export performance, empirical studies are inconclusive on the exact relationship between export and FDI. Again, there is virtually no study in Ghana that has examined such relationship between FDI and exports growth, using BMS model to account for model uncertainty. Those that have embarked on this exercise use different variables as controls. This brings in the question of modeling uncertainty which has not been examined by any empirical studies in Ghana.

The study found imports; trade liberalization index and domestic savings have positive effects on the level of export growth. However, consumption had a negative effect on export growth. The certainty of inclusion of net FDI stock in the model of export is very low. This suggests FDI has plays a not- too -significant role when modeling export performance in Ghana. Nevertheless, the effect of FDI is positive meaning that it contributes positively to export performance. Other variables that were included in the model have low posterior probability of inclusion. The lesson here is FDI may not be of much importance in explaining export performance in Ghana. Thus to increase export, policy makers should rather concentrate on consumption level, import, domestic saving and liberalization of the economy towards international trade. Thus the government must continue with the foreign trade liberalization and embark on favorable trade policies to increase exports. In addition, government must also focus on the level of consumption by increasing the productive capacity of the increase in consumption may not affect the level of export. Further, government must exercise caution or restraint in using Net FDI as a means of increasing exports growth since it was not found to significantly influence export growth in Ghana. Nevertheless, government could still go on to embark on FDI policies to enhance investment level to stimulate growth in the economy.

The study gives an insight on the relationship between export and FDI and the level of uncertainty in modeling such a relationship. However, the study used aggregated data which has the tendency of inhibiting a lot of information from the various sectors. Sectoral FDI would have given much insight in which particular sector that FDI promote export. Despite this challenge, the use of aggregated data does not affect the validity of the result for inference. However, we suggest that future studies may endeavor to use a disaggregated data for such an analysis since it would allow the capturing of possible variations in FDI effect on exports. Further, a disaggregated data would provide meaningful information for policy purposes.

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Appendix A

Figure 2: Posterior Model Size Distribution and Model Probabilities Produced from the BMS package with "uniform" model priors.

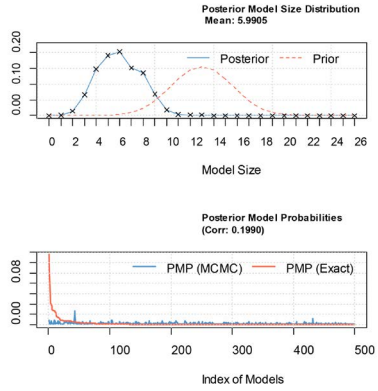
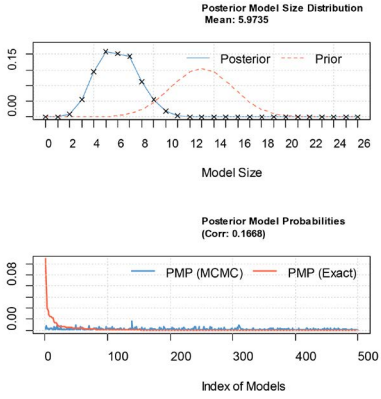


Figure 3: Posterior Model Size Distribution and Model Probabilities Produced from the BMS package with "fixed" model priors



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