



A Gravity Approach to Determinants of Export in a Small Open Economy: Evidence from Jordan

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ABSTRACT

This study seeks to identify the main factors affecting exports in small open economies. It uses panel data from 2001 to 2014 and a gravity model to identify these factors in one such economy. Our results are relevant for policymakers in small economies which engage in free trade agreements (FTA) and trade liberalization to pursue economic development via trade openness and investment. We found mixed results as to the direction of the relationship between FTA and exports, a positive contribution of relative income in boosting exports and negative distortionary effects of distance and costs on exports. These findings suggest that there are differential impacts of trade liberalization over time on the export performance of small open economies. Hence, policies aiming to maximize the benefits of trade agreements and reduce costs may be helpful in promoting exports.

Keywords: Gravity Model, Export Determinants, Economic Growth

JEL Classifications: F1, F13, F43

1. INTRODUCTION

The engagement of small open economies in trade goes back more than 100 years. To boost economic growth, most small economies have made free trade agreements (FTAs) and followed a path of trade openness. According to Jansen (2004), small economies characterized as open to trade because they have to rely on imports and exports tend to be highly concentrated in a few sectors, making them highly vulnerable to the deleterious effects of globalization. Historically, these countries have suffered from trade deficits which dampened their economic development and they continue to do so (Zahonogo, 2017). There has been an ongoing debate and conflicting views regarding the relationship between trade openness and economic growth in small open economies. The results of empirical research have provided no definitive answer. Many studies have found that the impact of trade openness on growth depends on the country's level of development, economic structure and reform policies (Chang et al., 2009). Some researchers (Kipkoech, 1990; Edwards, 1998; McCombie and Thirlwall, 1999; Yanikkaya, 2003) have found that trade openness has had an adverse impact on growth in small open economies.

Others have argued that trade liberalization and reform have increased inequality (UNCTAD, 1997; Faux and Mishel, 2000; Naschold, 2002). We have identified several studies supporting the view that trade openness and reforms affect growth positively and can reduce poverty (Aksoy and Beghin, 2005; Hansen and Rand, 2006; Blalock and Gertler, 2008; Maertens et al., 2011). Factors determining trade between countries in general and exports in particular, such as relative income, the engagement of the country in free trade and distance, have received little attention in empirical research. Only a few empirical studies (Arora and Vamvakidis, 2004; Kowalski et al., 2015) have investigated factors determining exports. A country's comparative advantage and natural resource endowment are important determinants of its export performance (Kowalski, 2010) and its ability to diversify exports, as well as to penetrate new markets (Jansen, 2004). In addition, the main determinants of export performance, such as trade policy, exchange rate regime and labor skills, enhance the ability of the country to increase its exports (Penkova-Pearson, 2011). Other determinants are political and economic stability and the extent of capital investment in the country (Edwards and Alves, 2005). Thus, the need to diagnose export performance is

vital for small economies and understanding export determinants is a crucial step toward improving policy action to promote exports growth and alleviate trade deficits. Using panel data covering the period 2001–2014, this study investigates the main determinants of export performance and proposes a gravity model to account for their effects. The general objective of the study is to identify the determinants of Jordan's exports. Specifically, the study seeks answers to the following questions:

1. What is the relative importance of the income factor for export performance?
2. What is the relative importance of the distance and/or adjacency factor for export performance?
3. How have the various trade agreements affected the development of Jordan's exports?

This paper is organized in the following manner. Section II reviews the literature on the relationship between trade and economic growth using a standard gravity model. Section III provides an overview of export performance in Jordan. Section IV presents the theoretical model. Section V discusses the estimation results and Section VI concludes the study.

2. LITERATURE REVIEW

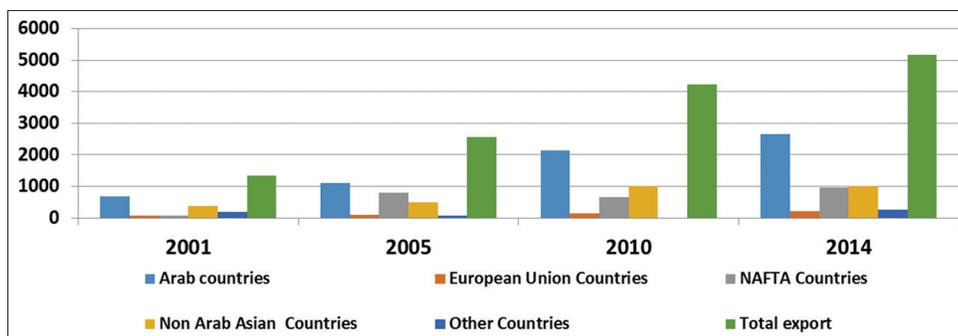
Some small open economies that have tried to stimulate and enhance export performance to contribute to their future economic growth have achieved the goal of strong export growth, while others have not and are still far from improving export performance. Furthermore, even when these countries have achieved high export growth, the impact on the economy has been weak (Abdmoulah and Laabas, 2010). A report by DFID (2015) found that some countries benefited more than others from trade liberalization and reforms. In many small countries, exports are considered an engine of economic growth (UNCTAD, 2003). However, empirical studies of the relationships among trade, exports and economic growth have had mixed results. Some have found a unidirectional effect of growth on exports (Soufan, 2014), while others have found that it is exports which affect growth (Dumitriu et al., 2010; Agrawal, 2014). Overall, research into export determinants in small economies remains limited, with confusing results and inadequate statistical methodologies. It is apparent that only a few empirical studies (Arora and Vamvakidis, 2004; Kowalski et al., 2015) have investigated the factors determining exports. Research related to export determinants shows that distance is no longer a barrier to trade (Alawin, 2009) and that the higher the weight and shorter the distance between the countries, the stronger the trade flows between them (Smarzynska, 2001). Using a gravity model, found that accession to the World Trade Organization (WTO) had a positive effect on Jordan's foreign trade performance. Karam and Zaki (2012) also employed a gravity model to investigate the impact of WTO commitments on trade in services in 21 countries, and found that being a WTO member boosted trade in services. Lawless (2009) employed a gravity model for Ireland and found that distance had strong negative effects on exports, while common languages and infrastructure development had positive effects on trade between countries. On the other hand, found that factors such as culture and geography strongly affect a country's total trade. Empirical

results of research by Sandberg et al. (2006) show that history and regionalism have had strong and significant effects on the trade of Caribbean Community member countries. Additionally, income per capita and population have significant and positive effects on trade, while the distance between trading partners exerts the expected negative effect (Brodzicki and Uminski, 2013). Oh and Sardar (2013) employed a gravity model and found that Bangladesh's exports were heavily dependent on the US market. Other studies that have applied a gravity model across regions and industries show significant disparities among states and industries (Funk et al., 2006). Nevertheless, gravity models have been used in explaining trade performance between countries and within the same region. A study by Chi and Kilduff (2010) found that greater geographic distance between trading partners and the USA significantly impeded their exports to the USA, while each country's infrastructure development, literacy rate and language commonality with the USA were pivotal factors in determining its competitiveness. Artal-Tur et al. (2014) studied the cases of France and Egypt to provide evidence of how proximity enhances trade. They found that additional trade effects are found in countries sharing closer ties and that migrants appear to help firms to deal with fixed trade costs, influencing the trade-migration linkage and resulting in specific trade effects. In general, the above studies that have been conducted using a gravity model are limited in their scope and findings. In addition, the periods covered by their analyses have been found to be inconsistent, so that these studies have failed to explain the presence of a persistent trade deficit during the last few decades in Jordan.

3. TRADE DEVELOPMENTS, EXPORT DIRECTION AND DIVERSIFICATION

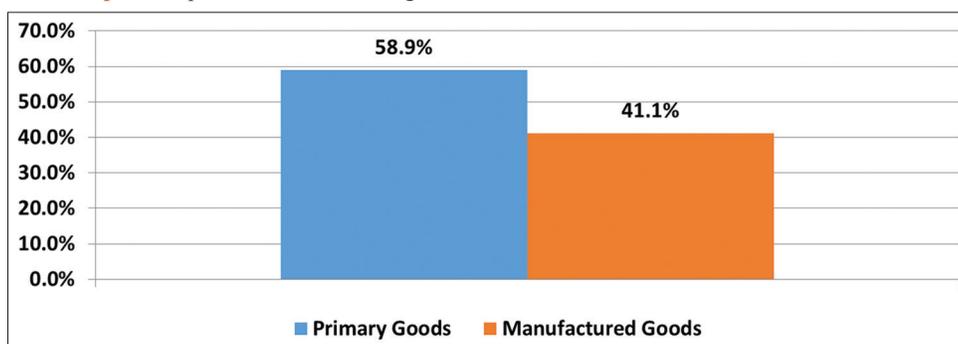
The development of the Jordanian trade balance shows that domestic exports recorded strong growth during the period 2001–2014, with an average annual growth rate of 12%. This remarkable growth was due to the role of the private sector in boosting exports by penetrating new markets, as well as the export growth strategy which was adopted in the late 1980s. Additional factors were the exchange rate regime which was first adopted in the mid-1990s, the free market policy, the liberalization of the economy and the FTAs that Jordan signed with other countries and blocks. The government can be considered to have used such agreements as a tool to generate export-led growth. Implementation of its growth strategy has ensured that export performance continues to drive the economy forward. Despite all these developments, however, the intended economic benefits have not yet materialized, as Jordan still has a large trade deficit and high rates of unemployment and poverty. Graph 1 shows that exports via FTA to the various blocks increased in value from JD 1352.4 million in 2001 to JD 5164 million in 2014. This amount represents around 75% of domestic exports. Nevertheless, Busse and Gröning (2008) found that the various FTAs and WTO accession had had no statistically significant impact on Jordan's trade flows. The exception was the agreement with the USA, which was found to have led to a steep increase in Jordan's exports to the United States and a rise in imports from other NAFTA member countries.

Graph 1: Jordan’s exports through free trade agreements, 2001–2014



Source: Central Bank of Jordan, monthly and annual data

Graph 2: Export structure according to Standard International Trade Classification, 2001



Source: Central Bank of Jordan, monthly and annual data

Among the main determinants of Jordan’s export performance are the nature and structure of exports, as well as the types of goods exported. During the last 14 years, Jordan has witnessed little change in its export structure. The country relies strongly on the export of a few classes of primary goods, while imports, which constitute around 70% of Jordan’s foreign trade, consist of a variety of products. Exported goods mainly comprise clothes, manufactured plastics, machinery and transportation equipment, raw materials and petroleum products. In 2014, clothing and machinery accounted respectively for 17.6% and 5% of exports, while the relative importance of raw materials and petroleum products decreased to 20% in the same period. Thus, this type of export structure can be seen as mainly responsible for the weak performance of exports in the economy and the inflexibility of the economic structure. In addition, exports will become more vulnerable in the international markets. Based on the UN’s Standard International Trade Classification (SITC), commodities are usually categorized as primary goods and manufactured goods. Graph 2 shows that according to this classification, an average of around 59% of Jordan’s exports in 2001 were primary goods, while 41% were manufactured goods. The share of primary goods in exports had increased slightly to 62.1% by 2014.

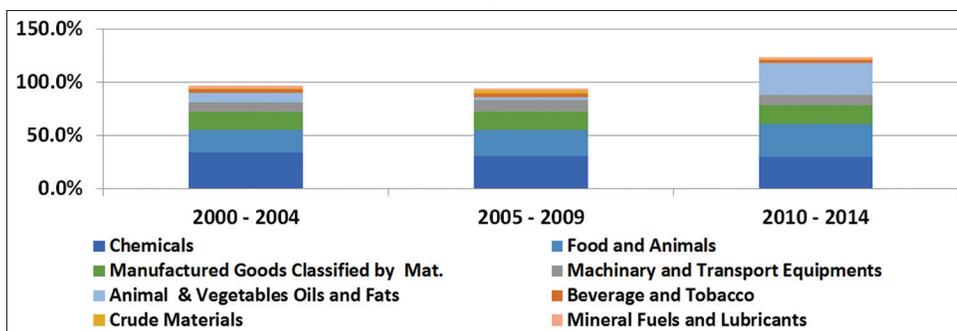
Changing the composition of exports toward manufacturing industries is vital if Jordan is to achieve rapid and sustainable economic growth. Graph 3 shows that during the first 14 years of this century, exports were driven by chemicals, animal food and manufactured goods. There was little change in this pattern from 2000 to 2009, then in the following 5 years, exports of animal and vegetable oils and fats increased strongly, but otherwise

the same structure and composition of goods continued to dominate. Jordan’s export performance cannot therefore be characterized as impressive. This structure of products exported reflects Jordan’s limited competitiveness and its weakness in diversifying exports and in penetrating new markets. In short, from 2010 to 2014, the only notable change in the structure of exports was an increase in the share of primary products, as can be seen in Graph 3.

As for the geographical structure of destination markets and the distribution of exports, data for the period 2001–2014 show that export diversification and the penetration of new markets were below expectation, contributing to weak export performance overall. According to the National Export Strategy 2014–2019 (NES), around 41% of Jordanian exports target old and traditional markets, while 61% target new markets, but less than 1% of new exports actually penetrate new markets.¹ However, the increase in production assists in increasing exports, as do trade agreements with other countries. Given the strong competition from other countries that Jordan’s exports face, exports of new products and the penetration of new markets are still weak; therefore, products need to be further diversified in order for Jordan’s exports to compete in international markets. Graph 4, charting the distribution of exports from 2000 to 2014, shows that they were mainly concentrated in the Middle East region. Around 50% of Jordanian exports go to Arab countries. The country that receives the second largest proportion of Jordanian exports is the USA,

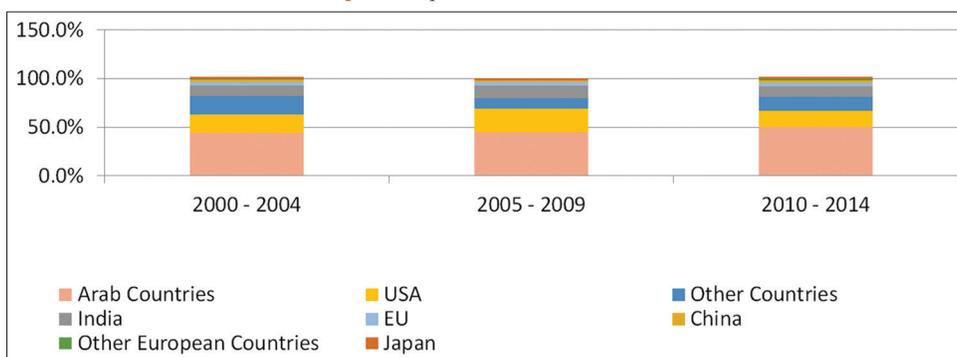
¹ Ministry of Industry, Trade, and Supply, 2014, “National Export Strategy 2014–2019.”

Graph 3: Evolution of Jordan’s exports by commodities, 2000–2014



Source: Central Bank of Jordan, monthly and annual data

Graph 4: Export direction 2000–2014



Source: Central Bank of Jordan, monthly and annual data

at 16.6%, followed by India (10.7%), the EU (4.1%) and China (2.3%), while around 29% go to the rest of the world.

Additional indicators of Jordan’s export performance for the years 2001–2014, listed in Table 1, are the number of products, their concentration and diversification, based on the three-digit SITC product classification. According to the methods approved by the United Nations Conference on Trade and Development (UNCTAD), the number of products is relevant because the more types of products that are exported, the greater the diversity of exports. The second measure is the concentration index, which reflects the degree to which a country’s exports are concentrated on a small number of products or a small number of trading partners. The third measure is the diversification index, which ranges between zero and unity, with higher values indicating a more concentrated trade structure and weaker diversification. The data in Table 1 suggest that Jordan is catching up with other countries concerning the number of products exported, as there was a small increase from 210 in 2001 to 218 in 2014. As for the concentration index, the fact that this increased by 23% from 0.13 in 2001 to 0.16 in 2014 (compared to 0.06 in more advanced economies) means that Jordan’s exports are increasingly more concentrated in a narrow range of products. However, these values represent the lowest degree of concentration in developing countries. With regard to export diversification, countries that have lower concentration rates have more diversified exports. A country with an index closer to zero has great export diversification. In Jordan, the high value of the diversification index, which stood at 0.65 in 2014, indicates that Jordan’s exports are highly dependent on primary goods, which in return leads to unstable prices and trade shocks.

Table 1: Export concentration and diversification, Jordan, 2001–2014

Year	Number of products	Concentration index	Diversification index
2001	210	0.13	0.54
2002	213	0.15	0.62
2003	216	0.13	0.60
2004	213	0.14	0.59
2005	221	0.14	0.60
2006	222	0.14	0.65
2007	218	0.15	0.58
2008	220	0.19	0.61
2009	217	0.16	0.60
2010	222	0.17	0.64
2011	222	0.18	0.65
2012	222	0.16	0.65
2013	219	0.15	0.67
2014	218	0.16	0.65

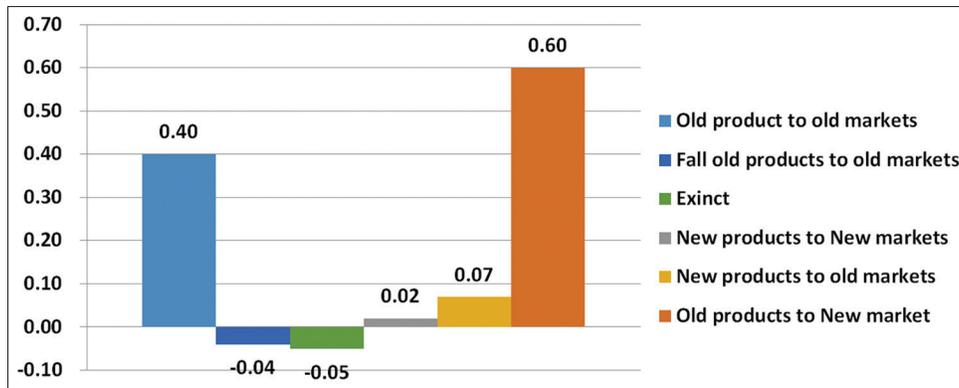
Source: UNCTAD, 2016

Graph 5 shows Jordan’s export diversification and intensification during the last years. According to the NES, around 41% of Jordan’s exports are of old and traditional commodities to old markets, while 61% of exports are old products to new markets. Only 2% are of new commodities to new markets and 7% are new commodities going to old markets.

4. THEORETICAL BACKGROUND

To examine export fluctuations and performance in small open economies, we employed a gravity model, which has become an essential tool for analyzing trade performance. Over the years since

Graph 5: Export diversification and intensification index



Source: National Export Strategy 2014–2019

the pioneering work of Tinbergen (1962) and Anderson (1979), this model has witnessed many developments, shortening the gap between theory and empirical work. The application of the current model is not restricted, as in previous versions, and new factors can be added and tested easily. A review of empirical gravity models indicates that a majority of them take account of distance, income, population, transportation costs, labor costs and tariffs. Some researchers have focused on the effects of amending them by adding other factors (Anderson and Marcouiller, 2002; Buch et al., 2003; Kristjan, 2013). The significance of the gravity model itself and its direct influence on trade direction and relationships in the context of small economies have been addressed within narrow limits. The use of gravity models, as explained earlier, is found to be inconsistent for Jordan; they suffer from weaknesses and spurious regression.

Generally, according to the gravity approach, total bilateral trade between any two countries is positively related to their size and negatively related to the trade cost between them. The basic gravity model specification, similar to Newton’s law, takes the following form:

$$X_{ij} = KY_i^\alpha Y_j^\beta / T_{ij}^\theta \quad (1)$$

X_{ij} = Exports from country i to country j ; or total trade (i.e. $X_{ij} + X_{ji}$)
 Y = Economic size, usually measured by gross domestic product (GDP) or population size.
 T = Trade costs.

Standard proxies used for trade costs in gravity equations include Distance, Adjacency, Common language, Colonial links, Common currency, Island, Landlocked, Institutions, Infrastructure and Migration flows. Hence, a basic econometric gravity model for exports flows can be written in log form as:

$$\ln(X_{ij}) = b_0 + b_1 \ln(Y_i/Y_j) + b_2 \ln(\text{dist}_{ij}) + u_{ij} \quad (2)$$

Where all variables are as defined before and u_{ij} is the random error term. According to this approach to trade, the expected sign is positive for the relative income variable and negative for the cost/distance variable. In this study, the focus is on exports instead of total trade, due to the importance of export performance for

growth and poverty reduction. Annual panel data were used in the estimation, covering the period 2001–2014.

4.1. Empirical Analysis

All estimations are based on data concerning Jordan’s exports to its main trading partners. According to the basic gravity model, the main determinants of Jordan’s exports are relative GDP, an indicator of geographical distance (between capitals), and a set of dummy variables representing various bilateral trade agreements signed by Jordan after the year 2000. Equation 3 represents the gravity model of Jordan’s exports:

$$\text{LEXPO}_{ijt} = \alpha_0 + \alpha_1 \text{LGDPIJ}_{ijt} + \alpha_2 \text{LREM}_{ijt} + \alpha_3 D1 + \alpha_4 D2 + \alpha_5 D3 + U_{ijt} \quad (3)$$

Where LEXPO_{ijt} is the natural logarithm of bilateral Jordanian exports; LGDPIJ_{ijt} is the natural logarithm of relative bilateral income measured by real GDP for corresponding pairs of countries;

LREM_{ijt} is the distance indicator calculated as $\log(\text{distance between capitals}/(\text{GDP}_i/\text{GDP}_j))$; and $D1$, $D2$ and $D3$ are dummy variables representing Jordan’s bilateral trade agreements with Canada,

Turkey and the USA respectively.

One of the most serious problems in using a gravity model to capture the determinants of exports in small open economies is that there are many factors correlated with the model variables such as political, cultural, demographic and economic variables (Zarzoso and Lehmann, 2003). If we ignore these variables, biased estimates will affect the results (Gómez and Milgram, 2010). Therefore, several studies have used panel data to capture the time effect and cross-country effects to control for unobserved heterogeneity (Glick and Rose, 2002). In this study, we used Panel EGLS in order to correct for cross-sectional variance, heterogeneity and autocorrelation. The sample used in estimation covers 14 years and 28 cross-sections producing a sample size of 392 observations. Table 2 presents the estimated results obtained from the model using Panel EGLS.

The results of the estimation of the gravity model for bilateral Jordanian exports is satisfactory, as evident from the high value

Table 2: Results of gravity model regression

Variable	Dependent variable LEXPO _{ijt}			
	Coefficient	Standard error	t-Statistic	P
C	-4.751610	0.572210	-8.303963	0.0000***
LGDPI _{ijt}	0.481378	0.021477	22.41358	0.0000***
LREM _{ijt}	-0.249194	0.026060	-9.562126	0.0000***
D1	-0.681592	0.098675	-6.907454	0.0000***
D2	-1.726193	0.964438	-1.789844	0.0743*
D3	0.750480	0.132673	5.656609	0.0000***
Total observation	392			
Periods included	14			
Cross-sections included	28			
Weighted statistics				
R ²	0.809464	Mean dependent variable		8.574196
Adjusted R ²	0.806996	SD dependent variable		6.395544
SE of regression	0.983419	Sum squared residual		373.3057
F-statistic	327.9722			
P (F-statistic)	0.000000			

***P<0.001, **P<0.05 and *P<0.01

of the coefficient of multiple determination (adjusted $R^2 = 81\%$) and significant value of the Fisher test (F-statistic = 328). The results show that variations in independent variables explain around 81% of the variation in the dependent variable. In addition, all estimated coefficients carry the correct expected sign and are statistically significant at better than 1%. The estimated elasticity of the relative income variable is below one (inelastic at 48%), meaning that a 1% increase in the relative income of trading partners will increase exports by about 0.48%, keeping other things constant. This indicates that the trade of small open economies with higher income countries is more likely to enhance export performance. The estimated elasticity with respect to the cost (distance variable) is about -0.25% (inelastic), meaning that a 1% decrease in trade cost (relatively closer trading partners) will expand Jordanian exports by about 0.25%, other things kept constant. Turning to the effects of the FTA between Jordan and the United States, which came into force in December 2001, the estimated coefficient of the dummy variable is 0.75, statistically significant at better than 1%. The implication of this result is that this FTA makes a strong and positive contribution to boosting Jordanian exports. The estimated coefficient with respect to the FTA with Turkey, which came into force more recently, in March 2011, is -1.73, but with weak statistical significance at only about 7%. The estimated coefficient for the FTA with Canada, which came into force only in October 2012, is -0.68, statistically significant at better than 1%.

The gravity model results support the proposition that the existence of long-term trading relationships between Jordan and other countries are most favorable for improving trade in this small open economy. The results of the estimation may also indicate that FTAs have a negative impact on exports in the short run (as in the cases of Jordan's agreements with Canada and with Turkey), which tend to become positive over the longer term (as in the

case of the USA-Jordan FTA). Our results on the impact of FTAs on Jordanian exports are consistent with the results of Busse and Gröning (2008).

5. CONCLUSIONS AND POLICY IMPLICATIONS

This study has uses a gravity model of small open economy exports to investigate the factors determining exports to trading partners. There are several interesting findings for small open economies: First, Jordan's exports are still concentrated in primary goods and driven by chemicals, food and animals, and manufactured goods. This lack of diversification may result in more vulnerability in the international markets. Second, the adoption of an aggressive trade liberalization strategy has exposed domestic producers and exporters to strong competition, which has made it difficult to export new products and to penetrate new markets. Third, the response of Jordanian exports is found to be inelastic with respect to both income and cost shocks. This result is consistent with the results on lack of export diversification in terms of both composition and direction. Finally, policymakers should consider taking several steps to enhance Jordan's export performance, the major policy implication being that greater product diversification will be required in order for Jordan's exports to compete in international markets and expand in response to FTAs. Finally, the mixed results on the direction of the impact of existing FTAs on Jordanian exports indicate the importance for policymakers, when undertaking new trade agreements, of taking into account the differential impact of trade liberalization on exports over time.

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