A Gravity Model Analysis of Egypt's Trade and Some Economic Blocks

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Abstract

This paper aims to study the economic effects of trade flows between Egypt and some economic blocs, where study confine to AFTA agreement particularly a Arab interface business and agreements of each bloc COMESA and EU generally because of strength opportunities for these blocs by using descriptive analysis and Gravity Model (GM). The major results confirmed the efficiency of the model in explaining Egyptian trade flow for the three previous blocs. Based on the above results, the study recommends continuing to increase the volume of foreign trade, in addition to reducing the constraints faced by Intra-Arab trade.

Keywords: Economic Effects of Trade Flows, Economic Blocks, Gravity model approach

1. Introduction

Trade among Arab countries (ACs) has been consistently weak in spite of several efforts to engage into different forms of regional economic integration. The most important attempts to achieve Arab economic integration were the agreement of 1953 on Transit Trade, the Common Market attempt of 1964, and the agreement of 1981 on the facilitation and development of trade, all signed under the auspices of the Arab League. These attempts, in addition to about 135 bilateral trade-related agreements, were not capable of stretching inter-trade beyond its peak of 10 percent of the total trade of ACs [1].

In 1994, the Intra-trade of ACs as percentage of their total exports was around 8.3 percent. This rate compares unfavorably with the corresponding rates of many regional groupings from both Developed and Developing countries. The latter ratios were 69.9 percent for APEC, 61.7 percent for EU, 47.6 percent for NAFTA, and 11.6 percent for EFTA. For regional groupings from the Developing countries these rates were 18.2 percent for MERCOSUR (Latin America), 12.0 percent for UEMOA (West Africa), and 21.2 percent for ASEAN (South-East Asia).(1)

These rates are not strictly comparable across groupings. Difference in the degree of development, size, and weight in international trade of the different countries of the groupings, explain to a great extent the observed variation between these regional groups. This can be said, however, the extent of Intra-Arab trade is arguably weaker than what it should have been given the common historical, religious, social, cultural, and language characteristics shared by these countries.

Many factors were presented to explain the weakness of Intra-Arab trade and the obvious failure of previous Arab regional agreements to stimulate trade among Arab countries. These factors

1 (1) UNCTAD (1997): Handbook of International Trade and Development Statistics.

range from mere economic factors, such as difference in economic systems, similarity of production structure and traded goods, lack of adequate transportation infrastructure compounded by distance, overprotection, heavy reliance on trade taxes, the lack of convertibility of Arab currencies, lack of market information, weakness of marketing strategies, and poor competitiveness of products.

Other factors are of an institutional nature. These include colonial links or the moral commitment to a well established partner (North African Arab countries to Europe, and Middle Eastern countries to the U.S. and Europe), the poor preparation of and lack of commitment to the regional agreements, the lack of adequate trade financing schemes at the regional level, the low quality of bureaucracy, and lengthy trade-related procedures. Last but not least, trade among Arab countries is very sensitive to political events and relationships among these countries.

These impediment factors notwithstanding, Arab leaders have unanimously taken the decision, during their summit of June 1996 in Cairo, to revive the 1981 agreements and create an Arab Free Trade Area (AFTA). The unanimous decision bears witness to the commitment of Arab countries to reinforce trade among each other as a means of facing the fierce competition in international markets entailed by a rampant globalization.

2. Research problem and objective

The agreements of AFTA which came into effect January 1, 1998, entailed the elimination of non-tariff barriers and the reduction of tariff rates on goods traded among ACs by an average of 10 percent a year, over a period of ten years. Although, the general feeling is that AFTA has been well prepared for and unambiguously committed to, many suspect that most of the factors that are behind the failure of previous agreements are still present. Arguably, this minimizes the chance of a breakthrough in Intra-Arab trade.

This paper presents an objective evaluation of the potential for success in AFTA agreements based on a model accounting for most of the dimensions involved in explaining Intra-Arab trade flows.

3. Methodology

Gravity models, which were originally proposed by [2] and [3], have become one of the most commonly used workhorse models to analyze patterns in international trade. By analogy with Newton's theory of gravitation, these models express bilateral trade as a function of two key variables: the economic size of the two countries engaged in trade and the distance between them. Accordingly, in their most general form these models suggest that the magnitude of trade between two countries depends on the supply conditions in the source country, the demand conditions in the host country (and other factors which may stimulate or hinder bilateral trade); they are consistent with standard models of international trade (see [4] [5] [6]).

As regards other factors, four variables are commonly added (see, e.g. [7]: Firstly, it is likely that countries sharing the same language trade more with each other than otherwise. This may be partly related to historically established trade ties. A common language dummy could for instance explain the relatively high levels of Spain's trade with its former colonies in Latin America. Secondly, if two countries were part of the same territory (such as the countries of former Yugo-

slavia or the former Soviet Union), they may still have closer trade ties than otherwise (history matters). Thirdly, if countries share a common border, transaction costs may be reduced beyond the mere distance factor, translating into a higher bilateral trade. Finally, the accession to a free trade arrangement may stimulate trade among the constituent countries, as the rise of Spanish trade with other euro area countries in the second half of the 1980s indicates.

In view of their simplicity and high explanatory power, gravity models have been applied to the particular case of CEE countries in several studies. [8] and [9], two of the most influential early studies in the field, showed that trade of the CEE countries with developed countries has been only a fraction of potential trade. [9] suggested that actual trade with the EU12 was up to 5 times smaller than potential trade for Bulgaria and former Czechoslovakia in 1989. Some CEE transition economies were found to be much closer to equilibrium (this is the case of Hungary, with a ratio of potential to actual trade of 1.8), while countries like Romania and Albania, which did not participate in the Council of the Mutual Economic Assistance, started trade liberalization with regional trade structures closer to the gravity predictions estimated by Baldwin. [10] found that Romania achieved a significantly higher actual share of trade with the EU than predicted by the model in 1996. [11] and) [12] suggest a rapid convergence towards trade potential levels in non-EU countries which have a trade agreement with the EU (so-called associated countries). [13] and [14]found that trade between the EU15 and the CEE countries was close to the predicted level at the end of the1990s. Meanwhile, [15] found that trade potentials were largely exhausted by the end of the decade (in the longer-run however, trade flows could increase in larger proportions once all structural adjustment is completed).

After the theoretical foundation of gravity model had been established, in the 1990s, further studies concentrated on its empirical application. [16] Formulated a more complex and advanced form of gravity equation where he particularly emphasized the role of geographical factors, such as distance, landlockedness and population, as determinants of bilateral trade flows. He also included regional trading blocs, such as APEC, NAFTA and Mercosur, in his gravity equation in order to estimate the impact of regional integration on bilateral trade flows. In a similar way, [17] tried to analyze the impact of economic integration, as embodied by the LAIA, the Andean Pact, and CACM, in Latin American countries' Intra-regional trade flows, based on the gravity-type equation.

Furthermore, they do not present a broader comparison with other regions. Such comparison would bolster the results and put them in perspective. However, with the increasing importance of geographical factors in international trade theory, the gravity model started to attract a re-awakening interest in the 1980s [18].

Works by [19], [20], [4] and [21] greatly contributed to the establishment of a theoretical foundation for the gravity model by showing that the gravity equation can be derived from a number of different international trade models.

There are two competing models of international trade that provide theoretical justification for the gravity model. They are the Differentiated Products Model and the Heckscher-Ohlin Model. [5] and [19] tried to identify the relationship between the bilateral trade flows and the product of two countries' GDPs by utilizing the Differentiated Products Model. According to Krugman

& Helpman, under the imperfect substitute model, where each firm produces a product that is an imperfect substitute for another product and has monopoly power in its own product, consumers show preference for variety. When the size of the domestic economy (or population) doubles, consumers increase their utility, not in the form of greater quantity but of greater variety. International trade can provide the same effect by increasing consumers' opportunity for even greater variety. Therefore, when two countries have similar technologies and preferences, they will naturally trade more with each other in order to expand the number of choices available for consumption.

In this paper, we use the log-linear form to estimate bilateral import flows among some economic blocs over average 2008-2010, to give an order of magnitude for the impact of the main factors often advanced in explaining the weakness of Intra-Arab trade.(2) Thus, the gravity equation to be estimated is as follows: (3)

Log(Mij)= ββ1Log(GNPi*GNPj) + β1Log(GNPi*GNPj) +β3Log(DISTANCEij) + β4Log(INEQGNPC) + β5PARTNER + β6COSINEij + β7POLFACT +β8Log(XRCi) + β9Log(Mji) + β10ATFD81 + β11BORDER + CONSTANT

Mij: Flow of imports of country j from country i, in millions of U. S. dollars.

GNP: Gross National Product of country i or j in millions of U.S. dollars.

GNPC: GNP per capita in millions of U. S. Dollars.

DISTANCE: Distance in kilometers between the capitals of countries i and j. BORDER: Dummy variable taking the value of unity if i and j share a common border and zero otherwise.(4)

PARTNER: Dummy variable taking the value of unity if i and j are members of GCC or AMU and zero otherwise.

INEQGNPC: Measure of GNP per capita inequality between countries i and j.(5)

POLFACT: Dummy variable taking the value of unity in case of border closing, political disagreement or event affecting normal diplomatic and commercial relations between countries i and j.

COSINE: Measure of trade correspondence between the export structure of country i and the import structure of country j.(6)

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(2) Arab countries, excluding Palestine, are: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, U.A.E. &Yemen.

(3) Frankel et al. (1995) and Cyrus (1996) followed a closer specification.

(4) GCC stands for the Gulf Cooperation Council formed in 1981 grouping Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, and the United Arab Emirates. AMU stands for the Arab Maghreb Union formed in 1989 and grouping Algeria, Libya, Mauritania, Morocco, and Tunisia.

(5) Balassa (1986), Balassa and Bauwens (1987), and Bergstrand (1990) used this measure of inequality. For a given variable x it is given by: 1+[xlog(x)+(l-x)log(l-x)l/log(2). It has the advantage of depicting relative rather than absolute inequality and falls between zero and one.

(6) The cosine measure indicates the cosine of the angle between the export vector of country i and the import vector of country j and is given by:

$$CONSINEij = \sum_k E_{ik} M_{jk} \sqrt{\sum_k E^2{}_k \sum_k M^2{}_{jk}}$$

where E_{ik} stands for exports of commodity k by country i and M_{jk} for imports of commodity k by country j.

XCR: Export Concentration Ratio of country i measured as the share of the three most important commodities in the total value of its exports.

ATFD81: Dummy variable taking the value one if both countries, i and j, have signed the Arab Trade Facilitation and Development agreement of 1981, and zero otherwise.

Mji: Flows of imports of country i from country j, in millions of U.S. dollars.

4. Results & Discussion

I- Description of GM variables:

The country was proved (i) Egypt, with changes of countries (j = 1, 2, ... n) in gravity equation. Also was used all variables in the form of the natural logarithm without dummy variable.

(1) Multiplying GDP: multiplying GDP represent the economic size of the two countries, also was as representative of the productive possibility and market size, so the larger countries - with large production possibility - are the most likely to reach economies of scale leading to increased exports of competitive advantage. Also have large domestic markets possibility to absorb more imports, so the increase multiplied GDP is possibility to lead to increase the volume of bilateral trade and it is expected that the coefficient is estimated to be greater than zero. Since the GDP of Egypt remained constant, multiplying GDP depends upon GDP of the partner countries (j) and this included the lack of impact or influence of the domestic market neutral (internal).

(2) Multiplying GDP Per Capita: the variable GDP Per Capita represent the level of income and/or the purchasing power of imported and exported countries, with the installation of GDP per capita in Egypt, will this variable to explain what If the flow of Egyptian trade depends upon the level of income of trading partners.

(3) Geographical Distance: the distance is a variable resistant to a trade where represent trade barriers such as transportation costs, time, cultural differences and barriers to market access…etc. And the distance used in this study is (Great Circle Distance) between the Egyptian capital and the capitals of countries (trading partners). It is worth noting that many previous studies have been translated coefficient of geographical dimension, it's flexibility of trade in respect of the absolute level of the geographical dimension, where is the volume of trade greater between pairs of countries that are far from the rest of the world [22]. And coefficient distance measures the relative distances of the States, where the lack of distance coefficient refer to trade with nations far more than compared with the more closer. While the increase refer to trade with the more convergence faster than those away. And it is noted that the notion of relative distance (relative dimension) is significant in the case of States (N×N). whereas, in the case of the model used in this study. (N×1) measured all distances in absolute terms for Egypt, so it is expected that the coefficient of the distance be less than zero.

(4) Border: it's a dummy variable illustrated that the whether the countries share the same or contiguous borders, and this variable takes the picture the correct one if two countries share a common border and zero otherwise.

Table (1), illustrated that the GM variable definition.

Variable	Definition
ln Tij Aggregate trade balance	Aggregate trade balance of source country (Ti) to & from (Tj) host one.
ln Country GDP	Logarithm (ln) of GDP (Ti) × GDP (Tj)
Ln Country GDP Per Capita	Logarithm (ln) of Per Capita (Ti) × Per Capita (Tj)
Ln Distance	Logarithm (ln) of distance between Source country and the host one
Border	Dummy variable for Border between Source country and host one (1,0)

Table 1. GM Variables Definition

II- Descriptive Statistics for the Basic Sample:

While, table (2) showed that the Descriptive Statistics for the Basic Sample: Average 2007-2009.

Variable	Units	Obs.	Mean	Std. Dev.	Min	Max
Ln (Y) Tij	000 $	21	12.188	2.451	4.007	15.287
Ln (X_1) GDP	Million $	21	22.373	1.770	18.276	25.057
ln (X_2) Per Capita	Mill. $/000 per.	21	2.283	1.462	0.214	4.961
(X_3) Distance	Kilometers	21	2137.667	1057.122	680	4599
(X_4) Border	Dummy variable	21	0.190	0.402	0	1

Source: Compute from Unified Arab Economic Report 2010.

Table 2. Descriptive Statistics for the Basic Sample: Average 2007-2009

III- Empirical Results of GM:

The empirical results showed that in table (3). The first column in the table represents estimates for coefficient. Results obtained from running T-Statistics are re-ported in columns two.

The aggregate performance of the model in this table looks good value for the coefficient of determination was estimated at about 0.86 in the case of the agreement with AFTA, which means that GM, efficient in explaining the flow of bilateral trade to Egypt.

Results indicated that the GM to study the most important variables affecting on the volume of Egyptian bilateral trade in framework AFTA.

	AFTA		COMESA		EU	
	Coeff.	T-stat.	Coeff.	T-stat.	Coeff.	T-stat.
Constant	-7.697	-2.055	-8.781	-2.021	-6.478	-1.436
	(3.746)		(4.344)		(4.511)	
ln (x_1) GDP	0.991	5.681**	1.098	5.468	0.918	4.267
	(0.174)		(0.201)		(0.215)	

	AFTA		COMESA		EU	
	Coeff.	**T-stat.**	**Coeff.**	**T-stat.**	**Coeff.**	**T-stat.**
ln (x_2) GDP Per Capita	-0.038	-0.185	0.781	2.664	-0.794	-1.880
	(0.204)		(0.293)		(0.422)	
ln (x_3) Distance	-0.001	-4.389**	-0.001	-5.229	-0.00008	-0.224
	(0.0002)		(0.0003)		(0.0004)	
Ln (x_4) Border	-0.277	-0.478	-2.147	-1.207	0	65535
	(0.578)		(1.778)		(0.000)	
No. of Observation	21		22		27	
R-squared	0.89		0.82		0.45	
R-Adjusted	0.86		0.78		0.34	
F- test	31.381		19.469		6.284	

** Significant at level 0.01 * Significant at level 0.05" ( ) refers to standard Error

Source: Compute from Unified Arab Economic Report 2010.

Table 3. Results of GM for some Economics blocs: Average 2007-2009

(1) The Egyptian bilateral trade with AFTA was increased about 1% by increased of GDP of the partner countries by about 1% (equivalent). While the trade volume bilateral Egyptian with COMESA and EU were estimated about 1.1, 1% respectively, indicating the importance of EU as major trade partner for Egypt.

(2) The variable GDP per capita is not significant in the case of the three agreements, which refer to the flow of Egyptian trade does not depend upon the income level of trading partners, but depends on the economic size of trading partners even more.

(3) The distance variable or geographic dimension was statistically significant and corresponding with economic logic in influencing the volume of Egyptian trade bilateral in framework AFTA. But it is not significant in the case of the agreement with COMESA and EU, which requires the development of land, sea and air transportation networks between ACs, including more than the speed of passage of goods and reduce transport costs, where the results indicated that increasing the distance between Egypt and its trading partners within the framework of AFTA was estimated about 1% would lead to a reduction of the flow of the bilateral trade by about 1.9%.

(4) The border variable was not statistically significant which led to decline from important of common border between in framework AFTA as factor, determined of trade exchange.

5. Summary and conclusion

This paper has reviewed most recent factors in Egyptian Trade with some Economic blocks. It was discussed that GDP & Distance only approach that maximizes the trade between Arab countries. It is yet anticipated future works are required to find the statistical significant of AFTA sample size using the other approaches to achieve this on the rest of Economic Blocs. Furthermore, the current approach may be extended for the rest of other factors of Egyptian trade such as GDP per capita, Border, and Language.

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