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The Effect of Corruption on Trade Volume of Selected Countries in the Middle East and Latin America (2002-2008)

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Abstract:

Some of the economists believe that current volume of international trade is less than the volume that has been predicted by the conventional trade theories. Unobserved barriers (i.e. Corruption) are one of the factors that can reduce the volume of trade from the amount that has predicted by these conventional theories. This research has studied the role of corruption in the trade volume of selected countries in the Middle East and Latin America. In this study we have used an augmented gravity model of trade and panel data. In addition for estimating the model, we have used fixed effects vector decomposition method. The results show that the trade is inverted-U shape function of corruption and the little amount of corruption in both regions initially helps the amount of trade to increase but when it reaches the threshold, the volume of the trade reduces in the studied countries. In addition, the results indicate that the existence of corruption in the importing country has a negative effect on the trade volume of the studied countries and it can reduce the amount of the bilateral trade.

JEL classification**: F10, F19, P37, C23**

Keywords: Corruption, Gravity Model, Panel Data, Fixed Effects Vector Decomposition

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1. Introduction

Focused by many studies and surveys on international trade, the quality and efficiency of organizations and their effectiveness on bilateral trade is a quite novel subject. Various indices, defined by The World Bank and other private and non-private organs have been used in order to study quality of organizations in the recent papers. Corruption is a major factor that is considered in qualifying institutions and evaluating their efficiency. Therefore studying corruption can lead to the determination of its effect on institutions. The most common definition provided for corruption is to possess public power and facilities for personal benefits. Public power is applied by officials (customs in the concepts of international trade) and politicians. Accordingly, incorrect usage of this power is recognized by deviation from the official duties meant for official agents and organs. In the concept of international trade, corruption is usually declared as bribery or the customs officials and organizations usage for personal advantages. Corruption is the reflection of regulations, economy, culture and organizations of a country and is brought about in response to detrimental or beneficial regulations.

According to various studies, corruption can cause reduction in economic growth (Mauro, 1995; Knack and Keefer, 1995; Campos et al, 1999; Mendez & Sepulveda, 2001). In addition, corruption causes digression of governmental expenditures from its normal path (Mauro, 1998; Tanzi and Davoodi, 1997), delays trade reform (Azfer and Lee, 2001), to retard investment (Wei, 2000), and also reduces the effectiveness of foreign aids (PSRA,[1] 2003). Furthermore, according to previous studies undertaken by De Jong-Udo (2006) and Dutt-Traca (2009), corruption may lead to a decline in the trade between countries. Contrary, some researchers deem corruption can efficiently adjust the supply and demand. In their point of view, in bidding competitions, companies that are the most efficient may also offer the highest bribes, thus ensuring that the most efficient firm with the least costs will carry out the contracts (Beck & Maher, 1986;

[1] Princeton Survey Research Associates

Kaufmann, 1997; Lien, 1986). On the other hand, in economies with governmental organizations and high tariffs for customs and trades, corruption can expedite the trade by eliminating the governmental barriers that the economy faces hence corruption can be viewed as "grease in the wheels" of commerce and trade (Rose-Ackerman, 1997; Leff, 1964; Huntington, 1968; Lui, 1985) and in countries that strict regulation is imposed, paying bribes helps firms escape from such limitations. As an example, by studying the various corruption indices indicated by the verified organizations, it can be observed that although corruption in China has been estimated considerable (scoring 3.5 out of 10 in the year 2007 according to the Transparency International), it ranked the position of 72 by possessing 8.8 percent of the total volume of the global trade in the year 2007; which is 3.5 percent more than the total trade of all countries in the Central and Southern America (according to official statistics provided by the UN).

The main purpose of this paper is to discuss the corruption and its effect on the trade volume of selected countries in Latin America and the Middle East throughout the years 2002 to 2008.

2. Literature review

The effect of corruption on trade volume is a quite novel issue that has been approached by many researchers in the recent two decades. In comparison to the literature on the international trade, the impact of corruption on international trade volume has received relatively little attention. Most indices defined to measure and analyze corruption have only been documented in recent years.[2] Hence, due to the lack of precise statistical information on corruption, quantitative studies have seldom been undertaken.

Kaufmann and Wei (2000) were the first researchers that examined the "efficient grease" hypothesis. This hypothesis asserted that corruption can improve economic efficiency.

[2] e.g. the control of corruption index provided by the World Bank, since 1996 which is evaluated annually

Kaufmann and Wei (2000) examined the relationship between bribe payment, management time wasted with bureaucrats and cost of capital. Contrary to the "efficient grease" theory, they found that firms that pay more bribes are also likely to spend more, not less, management time with bureaucrats negotiating regulations, and face higher, not lower, cost of capital.

De Jong and Udo (2006) have studied the impact of corruption on the international trade by using cross-sectional data for the year 2002 and the gravity model. In this paper, first the general effect of corruption has been studied by the means of the CPI,[3] declared by the Transparency International and by the Control of Corruption index, declared by the World Bank. In regard to the corruption indices previously applied, it has been concluded that by considering other variables such as the quality of customs, frequency of payments to custom authorities, the number of days to import goods and the predictability of payments to governmental institutes, better results can be obtained. Based on the estimation results; in general, corruption is detrimental to international trade. However, bribe paying may be beneficial in countries with very long waiting-times at the border or low-quality customs. Moreover, the nature of corruption matters: more uncertainty in advance about the bribe to be paid reduces trade.

Thede and Gustafson (2009) have performed a detailed examination of corruption effects on trade based on a set of corruption characteristics that affects economic exchange in the corruption literature. These corruption characteristics are the level, prevalence, function, predictability and border location of corruption.[4] The multifaceted corruption effect on trade is empirically examined using a corruption-augmented gravity equation. The estimation results show that corruption is more significant in comparison to the trade effect of other economic

[3] Corruption Perception Index (CPI)

[4] In some countries strict regulations are set upon customs, corruption in some can lead to avoid such strict regulations and facilitate the trade. But in other countries, corruption will increase the exchange costs and thus will decline the trade.

and distance variables and its presence will consequently lead to trade decline.

In another paper, Dutt and Traca (2010) have studied the impact of corruption on bilateral trade flows, highlighting the dual role of corruption in terms of extortion and evasion. While corrupt customs officials in the importing country may extort bribes from exporters they may also allow exporters to evade tariffs barriers. They have chosen the ICRG[5] index since more countries have been considered in its estimation rather than other indices and because the index is available for a longer time period. Therefore a non-linear relation between corruption and trade has been determined via the following model:

$$\ln X_{odt} = a_1 \Psi_{dt} + a_2 \Psi T_{odt} + a_3 \Psi^2 T_{odt} + a_4 T_{odt} + \Theta Z_{odt} + b_1 \ln Y_{dt} + b_2 \ln Y_{ot} + b_3 D_t + c_1 \ln \gamma_0 + c_2 \ln p_d + c + \varepsilon_{odt}$$

Where X is the volumes of the export of country o to country d at time t. T_{od} measures the legal tariff rate in country d to imports from country o. ΘZ captures a host of traditional gravity variables that are related to transport costs, such as geographical, cultural and linguistic distance. Y represents the national income. The indices Y_0 and P_d are the domestic price index and the foreign price index, respectively. Ψ is the level of corruption and Dt is a dummy variable representing the time, which is included in order to study the impact of the global income. In this paper, a negative relation between corruption and trade is assessed, such that one percent rise in corruption leads to 0.102 percent decline in the trade. Furthermore, the results provided by applying this model and utilizing econometrics emphasize that the relation between trade and corruption is non-linear. Thus, although corruption is a barrier to trade, but in conditions that domestic production is highly supported by the government, the incidence of minor corruption can even ascend the trade. But even in such circumstances, if the corruption levels precede a significant threshold, then the overall affect will lead to trade decline. In

[5] International Country Risk Guide

addition, according to the results provided by this article, in high tariffs the trade flow is an inverted-U shape function of the corruption.

Musila and Sigue (2010) have studied the effect of the corruption on the bilateral trade flows of 47 African countries between 1998 to 2007. They believe that the level of corruption in both importing and exporting countries would determine the cost of doing business between African countries. They have used a gravity model presented below:

$$\log(trade_{ij}) = a_0 + a_1\log(gravity_{ij}) + a_2\log(CB_{ij}) + a_3\log(CL_{ij}) + a_4\log(CC_{ij}) + a_5\log(RTA_{ij}) + a_6\log(COR_i) + a_7\log(COR_j) + \log(\varepsilon)_{ij}$$

Where $trade_{ij}$ takes on the US dollar value of exports of country i to country j; $gravity_{ij}$ is the product of GDP in current billion dollars of country i and country j divided by the distance in kilometres between the capital cities of countries i and j; CB_{ij}, CL_{ij} and CC_{ij} are dummy variables that take the value 10 if there are common border, official language and common currency between countries i and j and take the value 1 otherwise; RTA_{ij} is the dummy variable that captures exports or imports from one member of a regional trade agreement (RTA) to another member of the same RTA (i.e. intra-institutional trade) and takes the value 10 if countries i and j are members of the same RTA, and takes the value 1 otherwise; COR_i and CORj are corruption in country I and j respectively; and is the log normally-distributed error term. Musila and Sigue (2010) obtained negative and statistically significant correlations between the values of exports and imports and the levels of corruption in Africa and trading partners. Based on the estimation results, if a country with Africa's average corruption perception index of 2.8 were to improve its corruption level to Botswana's 5.9, its exports would improve by about 15 per cent and imports by about 27 per cent.

We have shown the authors, the variables that they have used in order to study corruption and the results of their studies in table 1.

Table 1: Summery of the studies about the effect of corruption on trade

Researchers	Proxy for Corruption	The Effect on Trade
Lambsdorff and Graf(1998)	CPI	Negative (For most countries)
Kaufmann & Wei (2000)	WBES	Negative effect
Anderson & Marcouiller (2002)	Transparency and Enforceability ratio	Negative effect
De jong & Udo (2006)	Quality of Customs	Negative and linear effect
Abe & Wilson (2008)	Illegal Payments	Negative effect
Thede & Gustafson (2009)	WBES	Negative effect
Dutt & Traca (2010)	ICRG	Inverted-U effect, final effect is negative
Lavallee (2010)	ICRG	Inverted-U effect, both negative and positive
Musila & Sigue (2010)	CPI	Negative effect

3. Corruption Perception Index

In this paper we have used Corruption Perception Index as a proxy in order to estimate the effect of corruption on trade. The extent of illegal activities is always hard to estimate. Corruption is illegal worldwide and so institutions and firms always try to cover up such activities. Obviously corruption cannot be measured by the number of the newspaper headlines or the judicial decisions taking place on the subject. In addition the judicial system may not have the capacity to address all the corruption occurrences and more likely are the newspapers to be banned to reveal the actual depth of corruption in the society by the officials. One of the methods to measure corruption is to

collect perceptions and personal information about the extent and the influence of corruption in the country from local people, from business people that frequently operate in a specific market , from country analysts and experts who are able to compare the situation in different countries (Soreide, 2003). This results to the Corruption Perceptions Index, one of the indices introduced by the Transparency International which has been estimated ever since 1995. This index is more popular in the media and reflects the corruption rate of the official institutions and politicians. The Corruption Perceptions Index is based on 17 different polls and surveys from 13 independent institutions. This index is estimated for countries that have been included in at least three polls or surveys and scores them a value from 1 to 10. If a country is scored higher it is a less corrupt. According to the provided statistics in the year 2010 Denmark, New Zealand and Singapore were the cleanest societies.

4. The Gravity Model

In the 1860s, H. Carey first applied Newtonian physics to the study of human behavior, and the so-called "gravity equation" has since been widely used in the social sciences (Cheng and Howard, 2005). In the content of international trade flows, the gravity model states that the size of trade flows between two countries is determined by supply conditions at the origin, demand conditions at the destination and stimulating or restraining forces related to the trade flows between the two countries. Tinbergen (1962) and Poyhonen (1963) were the first to use the gravity model to study international trade flows. Nowadays, the gravity model has become a robust method to estimate international trade. According to this model, exports from country I to country j are explained by their economic sizes (GDP or GNP), their populations, direct geographical distances and a set of dummies incorporating some kind of institutional characteristics common to specific flows (Zarzoso & Lehman 2003). In the basic form of the gravity model, the amount of trade between countries is assumed to be increasing in their sizes, as

measured by their national incomes, and decreasing in the cost of transportation between them, as measured by the distance between their economic centers. Following this work, Linnemann (1966) included population as an additional measure of country size, employing what we will call the augmented gravity model.

5. Econometrics specification

In order to study the effect of corruption on trade volume in Latin America and the Middle East and compare the results with other studies, the gravity model is proposed along with the panel data method. Because the statistics for exports of all Latin America and the Middle East countries are not available, 11 countries have been considered including Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, El Salvador, Mexico, Peru, Uruguay and Venezuela. Thus, 110 trade relations are possible. Also Bahrain, Iran, Jordan, Lebanon, Oman, Qatar, UAE, Saudi Arabia, Syria, Turkey, and Yemen have been considered as the selected countries in the Middle East in this study. In this model, language and land and sea borders have been defined as dummy variables; hence if two countries have sea or land borders or the same language, the corresponding variable will hold the value 1, otherwise 0. Moreover, we deduct CPI index from 10 in order to interpret the results more easily. Now if a country has more score in CPI index in compare with other countries, it means that this country is more corrupt. Subsequently, in order to precisely evaluate the effect of corruption on trade volume, the corruption index and its square have been considered for both exporting and importing country.

Our base corruption gravity equation equals:

$$\ln X_{ijt} = \beta_0 + \beta_{ij} + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} + \beta_5 \ln DIS_{ij} + \beta_6 Lan_{ij} + \beta_7 Bor_{ij} + \beta_8 Cor_{it} + \beta_9 Cor_{jt} + \beta_{10} Cor_{it}^2 + \beta_{11} Cor_{jt}^2 + \varepsilon_{ijt}$$

Where:

X is a dependent variable representing the bilateral trade between the country i and the country j.
$\ln GDP_i$ is an independent variable representing the national income of the exporting country.
$\ln GDP_j$ is an independent variable representing the national income of the importing country.
$\ln POP_i$ is an independent variable representing the population of the exporting country.
$\ln POP_j$ is an independent variable representing the population of the importing country.
DIS is an independent variable representing the geographic distance between the two countries.
Lan is a dummy variable to estimate the impact of common language.
Bor is a dummy variable to estimate the impact of common borders.
Cori is the corruption index to estimate the effect of corruption in the exporting country.
Corj is the corruption index to estimate the effect of the corruption in the importing country.
Cor_i^2 and Cor_j^2 are the squares of corruption index in order to estimate the inverted-U shape effect of the corruption in the exporting and importing country.
ε is the is the error term and is assumed to be well-behaved.

According to the theoretical basis of the gravity model the following assumptions are expected:

Both β_1 and β_2 are positive so that by the growth of the countries' economic size their trades will also increase. β_3 can be either positive or negative depending on whether the country exports less when it is big (absorption effect) or whether a big country exports more than a small country (economies of scale). β_4 also has an ambiguous sign, for similar reasons. Also we assume that β_5 always holds a negative value; thus, as the countries become more distant, the trade between them will

decline. In addition, β_6 and β_7 are expected to be positive because common border and language reduce the cost of transactions.

6. Data

As previously described, our empirical examination is restricted to the years 2002 to 2008. The bilateral trade data is acquired from the database of the UN[6] and statistics on the GDP of countries and their populations are obtained from the International Monetary Fund.[7] In addition, statistics for the Corruption Perceptions Index, distances and borders are founded at the Transparency International[8] and timeanddate.com respectively.

7. Tests of Fixed Effects, Random Effects & Pooled OLS models

In order to estimate the given model, the panel data method has been applied. The term panel data typically refers to data collected across units and over time. By combining time series of cross-section observations, panel data give "more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency" (Gujarati, 2004; 637).

We can divide panel data into the three types of model, the Pooled OLS, Fixed Effects and Random Effects models. Pooled OLS model has constant coefficients; referring to both intercepts and slopes therefore we could pool all of the data and run an ordinary least squares regression model (in this model there are neither significant country nor significant temporal effects). The Fixed Effects regression models allows the unobserved explanatory variables (either cross-section fixed effects or time fixed effects) to be correlated with the observed explanatory variables. If the unobserved explanatory variables are strictly uncorrelated with the observed explanatory variables, then it might be appropriate to treat the regression model as a random

[6] Comtrade.un.org
[7] IMF.org
[8] Transparency.org

effect model, where cross-section specific constant terms (a different constant term for each cross-section unit) are randomly distributed across cross sectional units (Greene, 2003). In modern econometrics "Random Effect" is considered synonymous with zero correlation between the observed explanatory variables and unobserved explanatory variables (Wooldridge, 2002). We have used Fixed Effects Vector Decomposition (FEVD) method in order to estimate distance, common language and border effects in the model (Distance, common border and language are time invariant variables between countries and we cannot estimate them with the ordinary Fixed Effects models which consider a separate intercept for each country). FEVD method is three-stage procedure for the estimation of time-invariant and rarely changing variables in panel data models with unit effects. The first stage of the proposed estimator runs a fixed effects model to obtain the unit effects, the second stage breaks down the unit effects into a part explained by the time-invariant and/or rarely changing variables and an error term, and the third stage reestimates the first stage by pooled OLS including the time-invariant variables plus the error term of stage 2, which then accounts for the unexplained part of the unit effects (Plummper and Troeger, 2007). We have used F-test in order to select the Fixed Effects or Pooled OLS model. The null hypothesis of the fixed effect model is that all time dummy parameters are zero.

The results obtained from F-tests (for Fixed Effects) are presented in Table 2. These results indicate that the null hypotheses that we have to use Pooled OLS methods are rejected for the both groups of countries at significance levels of at most % 5. Therefore, as it is shown by the results, we cannot estimate the model by using Pooled Ordinary Least Squares method; hence Fixed Effects or the Random Effects must be applied. In order to select Fixed Effects or Random Effects, and also to make sure reliable results are obtained, the Hausman test has been used. Hausman Test is based on comparing the slope estimates of Random Effects regression model and Fixed Effects regression model (Greene, 2003 and Wooldridge, 2002). This test evaluates

the null hypothesis, both of Fixed Effect and Random Effect estimators are consistent, but Random Effects estimators are more efficient (has smaller asymptotic variance) than Fixed Effects estimators. Under the alternative hypothesis, one or both of these estimators is inconsistent. According to the result, the Hausman statistic is 70.22 for the Middle East group and 88.71 for Latin America countries and these two statistics are more than the critical value of 19.6751. Consequently, Fixed Effects method is chosen for both groups of countries.

Table 2: results of F and Hausman tests

Group	F-test	Hausman Test
The Middle East	10.51	70.22
Latin America	77.68	88.71

Notes:
Critical F value and Hausman statistic are 1.2624 and 19.6751 respectively for the Middle East and
Critical F value and Hausman statistic are 1.2586 and 19.6751 respectively for Latin America

8. Results

In regard to the test results stated above, the model has been estimated with the Fixed Effects Vector Decomposition method for both groups of countries separately. The results from both groups are presented in Table 3. The result shows that most of basic gravity model estimated coefficients are statistically significant at 5% level for both the Middle East and Latin America countries and compatible with the theory (except language variable which is not significant at 10% level for the Middle East group of countries.).

It can be resulted that a rise of one percent in the gross domestic income of the exporter and the importer countries in the Middle East causes a rise of 1.2 and 0.4 percent in the total volume of their trade, respectively. These results are compatible with the theory that an economic size growth will cause a rise in the trade volume. In addition, according to the obtained results, a growth of one percent in the population of the exporter will result into a 2.69 percent deduction in its trade. This can be due to the

absorption effect of population. Besides, as the population of the importer increases by one percent, the bilateral trade volume is expected to rise by 1.68 percent. Each percent of increase in the distance between the two countries causes 0.26 percent decline in their trade volume. Border and language, the dummy variables, are statistically insignificant at 5% level such that having a common language and common land or sea borders affect volume of trade in the Middle East region. The results obtained by this research reveal that trade is an inverted-U shape function of corruption at 10% level in the Middle East. In fact, the little amount of corruption in the selected Middle Eastern countries initially helps the amount of trade to increase but when it reaches the threshold, the volume of the trade reduces in these countries. In addition, the results show that the existing of corruption in the importing country has a variant negative effect on the trade volume of the studied countries and it can reduce the amount of the trade. Adjusted R^2 of the estimated model equals 0.99 and declares that 99 percent of the trade flows of the countries can be explicitly explained by the given variables.

The second model estimates the effect of corruption in Latin America. As shown in Table 3, most of estimated coefficients are statistically significant at 5% level (except coefficient of the square of corruption variable in the importing country). Based on the estimation results; a rise of one percent in the GDP of the exporter or importer will increase the bilateral trade by 0.54 and 1/83 percent, respectively. Similar to the first model, if the population of the exporting country rises by one percent, its trade will decrease by 3.37 percent (absorption effect) and also, one percent rise in the importer's population causes 5.78 percent increase in its demand for importing goods (economies of scale). Also, the coefficient of distance variable is negative and has a negative impact on trade volume; such that one percent increase in the two countries' distance causes a decline of 0.45 percent in their trade. Nonetheless, the dummy variables of language and border have a positive impact on the trade volume of the given countries; meaning having common language and border causes

2.81 and 1.96 percent increase in the trade, respectively. According to the estimated model, trade is an inverted-U shape function of corruption at 5% level in Latin America, meaning existing the little amount of corruption in this region initially helps the amount of trade to increase but the volume of the trade will reduces when it reaches the threshold. In addition, the results indicate that the existing of corruption in the importing country has a constant negative effect on the trade volume of the studied countries and it can reduce the amount of the trade.

Table 3: Results of the model for both the Middle East and Latin America

Variables	The Middle East	Latin America
$LnGDP_i$	1.2008*	0.5457*
$LnGDP_j$	0.4082*	1.8376*
$LnPOP_i$	-2.6936*	-3.3767*
$LnPOP_j$	1.6840*	5.7848*
$LnDis_{ij}$	-0.2639*	-0.4593*
Lan_{ij}	0.0550	2.8190*
Bor_{ij}	1.4823*	1.9658*
Cor_i	0.2743**	0.2234*
Cor^2_{jt}	-0.0221**	-0.0119*
Cor_j	0.1617	-0.0921*
Cor^2_{jt}	-0.02158*	-0.001
FEVD	0.9241*	0.9757*
C	-5.4012*	-54.3543*
Residual	396.776	231.501
Number of Observations	694	759
R^2	0.99	0.99

Notes:
*Significant at 5 %
** Significant at 10 %

9. Conclusions

According to the results obtained, corruption affects bilateral trade between countries of the Middle East and Latin America. The results indicate that trade is an inverted-U shape function of corruption and existence the little amount of corruption in the

exporting country can initially helps the amount of trade to increase but the trade volume will reduces when the amount of corruption reaches the threshold. Corruption can directly or indirectly impact the exchange costs. The bribe paid directly to customs agents or institutions who are involved in the trade of the product are considered the direct costs of corruption. Therefore, merchants seek to relieve from these direct costs by searching for healthy institutions. This can increase the uncertainty of transactions which in return will indirectly affect the transaction itself. Treisman (2000) believes that corruption can be reduced by increasing the wage paid to civil service, trade liberalization, and empowering the media. Svensson (2005) states that increasing the human capital, per capita incomes and encouraging competition between firms can lead to successful corruption decrement. This emphasizes the importance of economic growth in order to improve per capita income and economic welfare; and also the importance of the human capital which can be increased by providing appropriate educational facilities for all genres. However removing cumbersome regulations and avoiding high trade tariffs will provide a healthier economy and also is likely to increase the trade by reducing the corruption.

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