In His Name, the Most High

School of Economics and Management, Lund University
Department of Economics
Second year master thesis
Spring 2011

Does Corruption Mitigate Trade in the EU?

Author: Seyed Hamzeh Hosseini

Supervisors: Joakim Gullstrand and Karin Olofsdotter

Acknowledgement

I wish to express my sincere gratitude to Professor Joakim Gullstrand and Dr. Karin Olofsdotter, my supervisors, for their friendship guidance, intellectually stimulating comments and timely encouragement throughout the preparation of this essay. Most importantly, I learned from them a good deal about economics and critical thought, these are great gifts.

I am indebted to my wife and daughter Zeinab and Zahra for their continuous encouragements during writing this essay.

Above all I would like to thank my God for everything.

Abstract:

In this essay the impacts of corruption on the bilateral trade of 25 EU countries from 1999 to 2008 are investigated. Corruption is the result of malfunctioning institutions and it leads investment flows to be less productive. Hence corruption is expected to impose cost on trade and therefore we expect that corruption mitigate the amount of trade. The negative impact of corruption on trade is mostly observed in the customs and since the customs do not play significant roles in the intra-EU trade, corruption might not have impact on the bilateral trade of the EU members. However due to endogeneity problem which stem from the inclusion of corruption into the gravity model we apply instrumental variable method and found out that the level of corruption of exporting country significantly reduces bilateral trade flows, while the corruption level of importing country has no effect on intra-EU 25 trade flows. Furthermore, the validity of our results are confirmed by the estimation of model for EU 15 countries and the same results are reported for corruption of exporting countries, however the estimation results of EU-15 countries indicate that the corruption of importing country significantly decreases the intra-EU 15 trade.

Keywords: corruption, trade, European Union, the gravity model, instrumental variable, panel data.

Table of Contents

List of tables

1. Introduction

Corruption is the result of malfunctioning institutions and it distorts investment flows to be less productive. Hence corruption is expected to impose an extra cost on trade and consequently mitigate the amount of trade. There are more than a dozen of studies which use the gravity model to investigate the impacts of corruption on international trade and many of them conclude that it can be as effective as tariffs (Anderson and Marcouiller, 2002, Thede and Gustafson, 2009, Dutt and Traca ,2007) These studies also show that the negative impact of corruption on trade is mostly observed in the customs. Nevertheless, since the customs do not play a significant role in the intra-EU trade, corruption might not affect the bilateral trade of EU members at least in the case of tariff-related corrupt behaviours. However, studies show about 80% of the EU citizens believe that corruption is the major problem in their countries (Eurobarometer, 2009). This figure implies that corruption cannot be simply ruled out as a cost on international trade in the EU. Therefore, this essay investigates whether corruption has an impact on intra-EU trade or not. To answer this question the gravity model for 25 EU countries is used for the period of 1999 to 2008.

The aim of this essay is threefold. First, the main aim of this study is to test the hypothesis that the impact of corruption on intra-EU trade is minor. Second, the results of this essay contribute to the discussion on whether tariffs and customs stimulate corruption or not. Therefore this essay will have important policy implications for the EU policy makers. Third, the robustness of earlier studies using cross-section data will be investigated with the help of panel data methodologies.

At the best of our knowledge this essay is the first study specifically investigating the impact of corruption on intra-EU trade during after 1999.

In order to meet the aims of this essay, a gravity model will be used. The gravity model is estimated with country effects to control for multilateral trade resistances and also the time-invariant error terms. Moreover, time dummies are included in the model to control the effect of business cycles. Furthermore, the inclusion of corruption in the model can cause endogeneity problem. Hence, we will use instrumental variables to solve the endogeneity problem.

In this essay the results show that different specifications lead to different conclusions. The estimation results with the use of instrumental variables suggest that in the case of 25 EU

members corruption of exporting country significantly reduces the bilateral trade flows, while corruption of importing country has no significant effect on trade. Furthermore, using instrumental variables for the subsample of 15 EU members, the results indicate that both corruption levels of importing and exporting countries significantly decrease the bilateral trade flows.

The rest of the essay is organized as follow: in section 2 the previous studies are reviewed. In section 3 the theoretical discussions about the relationships between corruption and international trade, corruption and international trade in the EU and the specification of the gravity model are presented. In section 4 our data and econometric considerations are described. In section 5 the empirical results are presented, and finally section 6 presents and discusses the conclusions.

2. Literature Review

In this section most of the studies focusing on the impact of corruption on bilateral trade using the gravity models are reviewed. These studies are divided into two main groups; one that show negative direct effects of corruption on trade. And one that find positive, negative or unclear effects.

2.1. Corruption Mitigates Trade…

Using the gravity model, Shepherd (2009) investigates the impact of bribing at customs and the level of general corruption on international trade. The results of the gravity model indicate that the impact of corruption on international trade is significantly negative. He also concludes that if the duration of trade becomes longer than a certain time period, the amount of corrupt transactions will increase in international trade.

Jansen and Nordas (2004) study the impact of changes in institutions and infrastructures on bilateral trade flows. By taking openness as independent variable into account, their results imply that lower amounts of corruption cause higher integration in the world economy. Moreover the study's results illustrate that by lower corruption, trade policies are performed more efficiently. Result of the gravity model also illustrates that the importing countries import less from those exporting countries that have higher corruption levels.

The study of Groot *et al.,* (2003) is one of the most cited studies in the field of institutions and trade. The "control of corruption" is one of the variables they use in their gravity model. In this study the gravity model explain the bilateral trade flows (exports) between one hundred countries in the year 1998. The study focuses on the impact of institutional quality and their homogeneity. The authors discuss that in corrupt environments, transaction costs increase due to the fact that a "third party" will appear in the place. The results of this study indicate that if corruption decreases one standard deviation below the mean, the amount of trade will increase by 19% to 34%.

Anderson and Marcouiller (2002) model the impact of corruption on international trade. They show that corruption increases insecurity in international trade and this leads to higher transactions costs and hence trade reduction. It insecurity increases the price mark-up of traded goods. This study implies that corruption behaves as "hidden tax" and substantially decreases

trade flows. The study also concludes that the gravity model including per capita GDP and total expenditure share of traded goods, should take the institutional quality into account variations, otherwise it will create omitted variable bias. According to the authors, inclusion of corruption and contract enforcement into the gravity model can explain the disproportionate amount of trade between rich countries. In the case of corruption, the results indicate that a 10% increase in transparency leads to 5 % increase of imports. In addition, if the transparency level of Latin American countries was equal to the mean of transparency of European Union countries, trade would increase about 30% in Latin America.

2.2 … But Not Always

Although some studies suggest that corruption affects international trade in a negative way, there are some other studies which indicate different results. These studies can be divided into three groups: first, the studies concluding that corruption increases trade by its impact on the efficiency of transactions; second, the studies which illustrate that the negative impact of corruption on international trade is contingent on some other variables; third, the empirical works suggesting that corruption may both positively and negatively affect international trade.

A Grease for Trade

De Jong and Bogmans (2011)'s study reveals that corruption, in general, reduces international trade. In addition, they conclude that if the customs do not have good performances, bribing can increase the import flows. In another way they say "bribery compensates the low quality of customs" of importing countries (de Jong and Bogmans (2011, pp 391).

Dutt and Traca (2008) investigate the impact of corruption on bilateral trade flows. The authors use national corruption index as a proxy for the level of corruption at customs. The study emphasizes two aspects of corruption which are "extortion and evasion". The "evasion" will appear if there are severe regulations in the importing countries (e.g. high tariff rates). The results reveal that in the presence of high tariff rates (19%-43%), corruption is good for trade. In other words the authors believe that corruption and international trade have non-linear relationships.

de Jong and Udo (2005) consider different hypotheses about the impact of corruption on international trade. According to the authors, corruption is mostly observed as bribing rather than embezzlement or fraud in international trade. Their results show that corruption negatively

affects international trade, while in those countries where customs have low quality, bribing can ease international trade. The results of their gravity model indicate that corruption of the importing country has significant impact on international trade, while for exporting countries is otherwise.

Positive or Negative

Using a corruption-augmented gravity model, Thede and Gustafson (2009), investigate the impacts of "level, prevalence, customs location, function and predictability of corruption" (Thede, Gustafson (2009, pp: 1) on trade .The study concludes that corruption, in general, is equivalent to an extra cost for importing countries and reduces the amount of imports. However, corruption for those importing counties which are economically powerful has positive impact on trade. Moreover, they mention that if corruption is predictable, its negative impact on trade will reduce. Furthermore the prevalence of corruption at customs not only has negative impact on trade, but also neutralizes the impact of trade policies.

Lambsdorff (1999) investigates the impacts of corruption on market share of 19 biggest exporters of the world. The author uses the market share of these countries as the dependent variable in the gravity model in order to solve the problem of "mulitcollinearity" between disturbance term and corruption index. Moreover this study uses the lagged value of corruption because the author thinks that the corruption index is a perceived variable. The study concludes that corruption in importing countries increases the market share of some countries such as Belgium, France, Italy, Netherlands and South Korea, while it is a disadvantage for Sweden and Malaysia's market shares in the importing countries.

Negative but Contingent

Pomfret and Sourdin (2008) examine the costs of exporting to Australia during the years of 1997 to 2007. Their results suggest that higher amount of corruption increases the costs of trade and consequently the share of air-transported-goods. In general, the results illustrate that the impact of corruption on trade is contingent on the transportation method.

Lavallee (2005) uses the gravity model to study the impact of governance and corruption on bilateral trade flows. In general, the results of the study imply that those developing countries which have lower corruption and better quality of governance will have higher propensity to imports from developed countries. Lavallee discusses that corruption plays two roles in

international trade. On one hand, it behaves like a barrier and on the other hand when there are restrictive regulations it can facilitate international trade.

To sum up, the previous studies suggest that although corruption mostly has a considerable negative effect on international trade, there are some circumstances under which corruption may have a positive impact. In fact, some of the previous studies indicate that corruption increases bilateral trade flows in the presence of severe regulations. In addition, corruption may increase the international trade for some countries and decrease it for other countries. These different impacts of corruption depend on certain economic variables, such as the economic power of the trading partners, non-linearity of corruption and trade, the types of the traded goods and so on.

Table 2.1 provides general information about the previous studies showing the impact of corruption on international trade. Notice that there are some studies in the table 2.1 that are not mentioned in the text.

Table 2.1 Impact of corruption on international trade in previous studies

Author(s) and year(s) of study	Dependent variable	Corruption index	Data structure and sample	Period	Impact of corruption on trade in the gravity model
Anderson and Marcouiller (2002)	Imports	WEF	Cross-section for 48 countries)	1996	**Negative.** 10% decrease of corruption results in 5% increase in imports
Groot et al (2003)	Exports	COC	Cross-section for 100 courtiers	1998	**Negative** Semi elasticity interpretation: 19-34%
Jansen and Nordas (2004)	Imports	COC	cross-section	average of 1995-2001	**Negative**
Helble et al (2007)	Exports	Different measure	Cross-section. APEC	2004	**Negative**. Increase trade of APEC 7.5%
Cheptea (2007)	Imports	Different measure of institutions	Panel. 25 EU members	1993-2000	**Negative**
Francois and Manchin (2007)	Imports	COC	Panel	1988-2002	**Negative**
Musila and Sigue´ (2010)	Exports and Imports	CPI	Cross-section. Africa	Average of 1998-2007	**Negative**. 100% decrease of corruption increase exports by 15%
De Jong and Bogmans (2011)	Imports	CPI and COC	Cross-section	Average of 1999-2002	**Negative**. Contingent on quality of custom, bribing will increases or decrease the import flows
Thede and Gustafson (2009)	Imports	WBES	cross-section for dome eastern European, post-communist and sub Saharan countries	1999	**Negative**. Positive for those importing counties with economic power. Predictability of corruption reduces its negative effect. Prevalence of corruption at customs removes the impact of trade policies.
Shepherd (2009)	Exports	WEF	Cross-section for 100 countries	2005	**Negative**. Longer time of trade increases corrupt behaviour in international trade
Traca and Dutt (2008)	Imports and Exports	CPI	Panel	Different time periods for different models	**Ambiguous**. In presence of high tariff rates (19%-43%), corruption could be supportive for trade. (non-linear effect)
Pomfret and Sourdin (2008)	Imports	CPI	Panel. Australia	1997-2007	**Negative** for manufactured goods. Effective contingent on transportation method
Lavallee (2005)	Exports	IRIS III	Panel of 21 OECD countries and 95 developing countries	1984-1997	**Ambiguous**. Negative with non-linear corruption index
Lmasdorff (1999)	Market share of exporting in importing countries	Lagged CPI	Cross-section for share of 19 biggest exporters in 87 biggest importers	Average of 1992-1995	**Positive** for some and **negative** for some other countries

CPI: Corruption Perception Index. COC: control of corruption. WEF: World Economic Forum. WBES: World Business Environment Survey. IRIS: International Country Risk.

3. Theory and Model

3.1. Theory

3.1.1 The Relationship between Corruption and Trade

Economists define corruption as the abuse of public power for individual gaining (Bardhan, 1997, Ackerman, 2006, Lambsdorff, 2006). Corruption is, however, a complicated phenomenon with different aspects, causes and consequences. Using the studies of Bardhan (1997), Mauro (1995), Shleifer and Vishny's (1993), Ackerman (2006), Lambsdorff (2006), and Rousso and Steves (2006) corruption and its roles in international trade are discussed in this section. In general malfunctioning institutions increase the levels of corruption and consequently transaction costs of trade. In addition corruption may play the role of taxes and it may distort investments and trade flows. Therefore, corruption decreases the amount of international trade. However, some economists discuss that corruption may facilitate the international trade if there are restrictive regulations.

In the case of EU, corruption may not facilitate international trade, since customs and tariffs do not have significant roles anymore. Therefore it seems that corruption may not facilitate trade in the EU at least in the case of tariffs-related barriers. However it should be mentioned that there are some other regulations such as rules of origin, issuance of documents and permission rules of exemptions and exceptions and so on through which corruption may facilitate trade in the EU. Moreover, it seems that decentralized type of corruption in the EU countries could be observed. In addition the inclusion of corruption in the gravity model may lead to endogeneity problem. Table 3.1 indicates the summary of theoretical relationships between trade and corruption.

Table 3.1.The corruption's impacts on trade

Corruption and Institutional qualities	Corruption as Hidden taxes	Corruption and efficiency	Decentralized or centralized corruption
Corruption is the result of defective institutions So corruption decreases trade	Corruption is not always the same as hidden taxes so it may not have always a negative effect on trade	In general we expect the positive impact of corruption on trade, where there are troublesome regulations, however in the EU it cannot be applied	Decentralized corruption is more observable in the EU because of competitive environment. On the other hand decentralized corruption may reduce the impact of the EU formation on competition

Corruption and Institutional Qualities

Institutions are "the rules of game" which are designed to reduce the "transaction costs" (North, 1990). Therefore institutions can be determinants of international trade (Ackerman (2006) and Lambsdorff (2006)). And there are some reliable economic models which describe the association between the qualities of institutions and trade (Anderson and Marcouiller (2002) and Groot *et al.*, (2003)). Even Greif (1992) believes that "a comprehensive understanding of the factors that determine actual, rather than potential, international trade in the past, present, and future requires a detailed analysis of the institutions that govern the exchange relations that constitute or enable international commerce" (Greif, 1992, pp 132). The relationship between corruption and trade also is mostly considered in the institutional framework. However there are two important questions here, first, is corruption an institution? and second, if corruption is not an institution then what are the relationships between corruption and the institutions?

Institutions are devised to decrease transaction costs, so corruption cannot be an institution since it is mostly expected to increase transaction costs in international trade. Therefore it is reasonable to conclude that corruption is the result of malfunctioning institutions and it per se is not an institution. In fact, if the property rights or rules of law, as important institutions, do not perform well, then corruption can be one of the consequences. It means that corruption can be taken into account as a factor which increases transaction costs and therefore it will reduce demand for goods.

Corruption and Efficiency of Trade

Bardhan (1997) discusses that corruption may facilitate economic transactions where there are bothersome regulations in a country, meanwhile Mauro (1995) and Shleifer and Vishny (1993) reject this role of corruption. In fact a corrupt transaction can be taken into consideration in "Coasean bargaining" framework, where the recipient of bribe chooses the firm with the lowest-cost as the bribe payer. This argument is based on the fact that the bribe payer which has the lowest-cost and the highest efficiency level can pay more to the recipient of bribe (Bardhan, 1997). However, this assumption does not take into account some other aspect of a corrupt transaction. For example if a corrupt official considers other incentives or restrictions such as ethnical network, long-run relationship with specific customers, secrecy precaution, and so on, corruption cannot be considered in "Coasean bargaining" framework.

There are several studies which suggest that corruption may increase the efficiency of international trade where customs have bad qualities. Some of these studies argue that corruption may ease the international trade by decreasing the regulatory restrictions. They mostly refer to the problematic role of customs and trade policies. In other words, corruption is not always a negative determinant of trade and in the case of restrictive regulation it may have positive impact on international trade.

Corruption may also increase international trade in the case of speed money (i.e. if a corrupt official is paid to speed up the pace of an economic activity). For instance in custom an importer may bribe the custom official in order to increase the pace of trading

Corruption versus Taxation

In Anderson and Marcouiller (2002) corruption is considered as a "hidden tax" in international trade, while there are two differences between corruption and taxation. First, the illegitimacy of corruption and the risks of being corrupt can distort investments' flows (Bardahn (1997)). For instance a corrupt official can mislead the investment flows to less efficient activities, since they may have lower likelihood of detection and punishment. Second, some countries have encouraging and auxiliary policies by which they dispend the taxes for those investors that are in risk of bankruptcy and financial problems. In addition the decision makers design fiscal policies to direct investments to be more productive, while it cannot be applied to corruption.

These differences between corruption and taxation imply that not only corruption could play the role of "hidden taxes", but it can also have a distorting and discouraging impact on productive investments. Thereby, it can affect the international trade, such that corruption increases transaction costs and also it distorts investments and consequently the growth.

3.1.2. Corruption and Intra-EU Trade

The formation of custom union in the EU has successfully decreased tariff barriers between the EU members (Carrere, 2006). However, the non-tariff barriers may still be effective in intra-EU trade. Actually, in the EU, those corrupt behaviours related to tariffs and customs are no longer important. Yet we cannot completely ignore the presence of corruption in intra-EU trades, since there are some other sources of corruption which are mostly related to the issuance of documents and permissions for trade.

Bardhan (1997) distinguishes between centralized and decentralized corrupt behaviours. In the case of centralized corruption, we can refer to the members of a political party ruling a country

and abusing their in an organized way (e.g. the eastern bloc countries had centralized type of corruption).

In decentralized corruption most of the corrupt officials are not able to cheat easily due to the "veto power" of several officials in the bureaucratic processes. In other words decentralized corruption refers to individual corrupt behaviours. Nevertheless, in the case of decentralized corruption the officials can actually stop a file to limit the other competitors of the bribe payer. Hereby, it seems that decentralized corruption is more relevant to the case of EU members, since membership in the EU implies an increasing competition effect. This is initiated from the presence of custom union and the elimination of tariff-barriers in the EU. This increasing competition leads to the creation of a new political and economic environment in which the amount of centralized corruption decreases. This means that if an official wants to receive bribe he or she has to do this individually. In other words, the membership in the EU may decrease the negative impact of corruption on international trade. However, if the amount of decentralized corrupt behaviour becomes considerable in the EU, corruption can harm competition in the region.

Decentralized corruption in the EU also implies an endogeneity between trade and corruption. If the amount of trade increases between two countries, there are more chances for corrupt officials in the trading partners to extort bribe. In fact, because of decentralized corruption, the corrupt officials have to abuse their power more randomly than before in the EU, therefore with higher amounts of trade, their chances to extort bribe will increase. On the other hand in the same time corruption will decrease the amount of trade between two countries. This process in fact implies an endogeneity problem between corruption and intra-EU trade.

Some economists discuss that corruption can increase trade, because it improves the efficiency of trade. However since customs do not play significant role in the EU, this argument in the case EU may be ignored, at least for tariff-related corrupt behaviours.

3.2. The Gravity Model and Corruption

Following Anderson and Wincoop (2003) and Feenstra (2004), the gravity model including corruption is specified in this section. Anderson and Wincoop (2003) divide the trade barriers into three categories which are: bilateral trade resistance (BTR), multilateral trade resistance (MTRs) for importing country, and exporting countries. Equation (3.1) presents the gravity model driven by Anderson and Wincoop (2003).

$$M_{do} = \left(\frac{Y_o.Y_d}{Y^w}\right)\left(\frac{T_{do}}{P_d.P_o}\right)^{(1-\sigma)}, \quad (3.1)$$

Where σ is the constant elasticity of substitution, M_{do} is the imports of country d (destination) from country o (origin). Y^w Is the world GDP, Y_o and Y_d are the GDP of country o and country d in current prices respectively, T_{do} is bilateral trade barrier between o and d and P_d and P_o are price indices which are referred to multilateral trade resistances (MTRs). Taking natural logarithm of (3.1) gives (3.2) as follow:

$$\ln M_{do} = \ln(Y^w) + \ln(Y_o) + \ln(Y_d) + (1-\sigma)\ln(T_{do}) + (\sigma-1)\ln(P_d) + (\sigma-1)\ln(P_o) \quad (3.2)$$

Incorporation of Corruption into Gravity Model

Anderson and Wincoop (2003) suggest that there are four types of trade costs which have to be paid by importers: "information costs, design costs, various legal and regulatory costs and transport costs" (Anderson and Wincoop, 2003, pp 174). These costs are transferred from exporter to importer and thereby the prices become different in trading partners. In fact corruption can be considered as a part of information costs or legal costs.

T_{do} in equation (3.2) is the factor which includes corruption. More specifically if a firm in country d wants to import a good from country o, it has to cope with corruption as a trade cost. Thus, regarding the level of corruption in each country there are some probabilities that a private agent faces one or more extortions in the procedures that he or she has to pass for importing or exporting a good. Anderson and Marcouiller (2002) model these possibilities, and in the following some components of their model are explained. They assume that a corrupt official is the same as a thief which is settled in the borders of a country. On the other hand, the "exporter" and "importer" have to avoid looting in the borders. The thief randomly chooses his target since the shipments are defended by some strategies. Therefore the bandits' possibility of success (π) will be a function of the number of bandits in the borders, the defensive strategies of trading countries (institutional qualities) and a "technological parameter". If we assume that the thief is a profit maximizing agent he or she will settle where there are higher volume of trade and possibility of extortion (low qualified institutions).

In this model the impact of corruption on international trade is considered to be the same for importing and exporting countries; however, it seems that corruption affects international trade differently in exporting and importing countries. In other words, if a firm in an importing country wants to import some goods, corruption should be less effective in the importing country than the exporting country. This difference stems from the fact that the firm of importing country is more familiar with corruption in its own country and it will be able to solve this problem with lower costs.

If we assume trade costs (T_{do}) can be specified in a log-linear function we can denote it as following:

$$\ln T_{do} = a_1 \ln d_{do} + a_2 \ln t_{do} + a_3 \ln corr_o + a_4 \ln corr_d + \varepsilon_{do}, \text{ (3.3)}$$

Where d_{do} is the distance between o and d, t_{do} is the tariff barriers, $corr_o$ is corruption in exporting country, $corr_d$ is corruption in importing country and ε_{do} is the disturbance term which includes other trade costs that are not observable.

Asymmetric Trade Resistances

In equation (3.2) P_d and P_o are "multilateral trade resistances" (MTRs). The MTRs are function of trade barriers between all trading partners. If the bilateral trade barriers increase, MTRs will increase as well.

Anderson and Wincoop (2003) assume that trade barriers are symmetric between trading partners. This assumption, however, does not seem to be realistic. In addition, as it was mentioned before, there are different forms of trade costs, and it is hard to accept that they are identical between trading partners. Especially in the case of this essay since corruption is different in exporting and importing countries, we may not rely on the assumption of symmetric trade barriers. This means that we have to find another approach which relaxes the assumption of symmetric trade barriers.

There are several methods to take into consideration the impact of MTRs.

Following Anderson and Wincoop, MTRs are calculated on the basis of equations (3.4) and (3.5).

$$P_d = \left(\sum_d \left(\frac{T_{od}}{\Pi_o} \right)^{(1-\sigma)} . s_d \right)^{1/(1-\sigma)}, \text{ (3.4)}$$

$$P_d^{1-\sigma} = \sum_o P_o^{\sigma-1} . s_o . T_{od}^{1-\sigma}, \text{ (3.5)}$$

Where (3.4) is the solution for general price level in the basis of trade costs (T_{od}), world income share of exporting and importing countries ($s_d \; and \; s_o$) and the elasticity of substitution (σ). However, the problem is that price level of country o (Π_o) is inside the price level of country d (P_d). Anderson and Wincoop (2003) suggest a solution for this problem by assuming the symmetric trade resistances. It means $T_{od} = T_{do}$ implying that $\Pi_o = P_d$.

This assumption is not applicable in this essay and thus we have to use another approach to take into account MTRs. In fact this method has two problems. First, Anderson and Wincoop (2003) could only use the observable trade barriers (i.e. tariffs and distances) and the world income share of countries. Second these equations are non-linear and due to this non-linearity it is difficult to estimate MTRs.

The second approach that has almost the same results compared to Anderson and Wincoop (2003) is the "individual or country effect" method. In this method we use two types of dummy variables instead of equations (3.4) and (3.5). In other words, we use one dummy for exporting country and one for importing country (Feenstra, 2004). These dummies take the impact of MTRs into account and so we will be able to estimate the gravity model in the basis of simple OLS method. Anderson and Wincoop (2003) and Feenstra (2004) show that "fixed effect" method gives almost similar results as the approach of Anderson and Wincoop (2003). Furthermore, if we use these dummies, the assumption of symmetric trade barriers can be relaxed which is an advantage for this essay, because corruption as an extra cost on trade is not the same in trading partners.

The third approach is the implementation of remoteness variable, which is the distance between the trading partners and the rest of the world, weighted by GDP. Anderson and Wincoop (2003) point out that remoteness is not related to theoretical basis of the gravity model. Besides, remoteness can only explain those MTRs which are just related to transport costs. However, Carrere (2006) suggests that remoteness is a proper variable for the gravity model with panel data.

The fourth approach is "different-in-difference" method. This method has its advantage to solve the problem of omitted variable and it is almost the same as the "fixed-effect" method. However, it has a vital assumption, so called "parallel trend". This assumption is somehow difficult to be fulfilled due to the fact that we have to find very similar countries or states (Angrist and Pischke, 2008).

The Gravity Model Used

Regarding the discussion in section (3.2), the gravity model including corruption is specified as (3.6):

$$\ln m_{do} = \ln(Y^w) + \ln(Y_o) + \ln(Y_d) + (1-\sigma).\ a_1 \ln d_{do} + (1-\sigma).a_2 corr_o + (1-\sigma)\,.a_3 corr_d + (\sigma-1)\ln(P_d) + (\sigma-1)\ln(P_o) + a_4.euimporter + a_5.euexporter + a_6 euboth + a_7.comcurrency_{do} + a_8.comborder_{do} + a_t timedummy + (\epsilon_{do}) \quad (3.6)$$

Where *euimporter* is dummy variable which is equal to one if the importing country is the EU member and zero otherwise, *euexporter* is dummy variable which is equal to one if the exporting country is the EU member and zero otherwise, *euboth* is the dummy variable which is equal to one if both importing and exporting countries are EU members and zero otherwise, *comcurrency* is the dummy variable which is equal to one if the trading partners have the same currency (Euro), *comborder* is the dummy variable for common border, and *timedummy* is the dummy for each year of the study, and finally ϵ_{do} is error term.

To sum up, in this section the relationships between corruption and international trade are discussed. We tried to extend these relationships to the case of the EU members.

Corruption as a consequence of malfunctioning institutions increases transaction costs, price of traded goods and thus it decreases trade.

Corruption is different than taxation, due to its distorting effect on investment flows. Hence, we cannot completely rely on it as a "hidden tax" or "mark-up" over price of traded goods.

EU members are expected to face more decentralized corruption. This is due to the increasing competition in the region. Moreover decentralized corruption can put the competition at risk for the EU members. Due to this relationship between trade and corruption in the EU, we have to solve the problem of endogeneity through instrumental variable method.

Corruption can increase the efficiency of international trade in many cases; nonetheless, this is not true for the EU members.

4. Data and Econometrics Considerations

4.1. Variable Definitions

The dependent variable in the gravity model is total bilateral trade flows (imports) in the basis of the second revision of standard international trade classification (SITC Rev.2). The data for imports are obtained from "United Nations Commodity Trade Statistics Database" (UN COMTRADE) for the time period of 1999 to 2008. The number of countries in this essay is 25 and all of them are members of the EU and their names are presented in appendix one.

For total trade flows, 0.03% of observations are equal to zero. Since the number of zero trade flows are not considerable, we do not face serious selection bias problem and we simply take the natural logarithm of the trade flows plus one (Ln(imports+1)) to get rid of the zero values.

Data for GDPs of exporting and importing countries are collected from the "World Development Indicators & Global Development Finance" database of the World Bank.

Data for distances and common borders are gathered from institute for research on the international economy (CEPII) database. These data are provided by the CEPII up to 2006 and since they are time-invariant, we simply extended them to 2007 and 2008. Also data for EU membership are obtained from the European Union webpage.

Dummies for the EU membership are used in the gravity model to show the impact of membership in a custom union. Therefore, three dummies for the EU membership are added such as a dummy if the importing country is the EU member, the same dummy for exporting country, and a dummy if both are the EU members.

Data for the instrumental variables are obtained from the CIA (Central Intelligence Agency) factbooks.

Data for corruption are obtained from "Transparency International" (TI). TI provides a set of data, so called "Corruption Perception Index" (CPI). CPI is available from 1995 up to 2010 for most of the EU members and it is measured in the basis of questionnaires, answered by businessmen and other experts of the countries. CPI is ranged from 0 (completely corrupt) to 10 (no corruption). Regarding the number of sources, the "confidence level" of CPI data is varied between 5% and 10%, such that the higher the number of sources, the more accurate CPI scores

are (Lambsdorff, 2005 a). These differences in the number of sources actually lead to the creation of measurement error bias in our estimations and therefore the use of instrumental variable will become more necessary.

4.2. Descriptive Data

Table 4.1 shows the mean values of corruption from 1999 to 2008 in the EU. This table reveals some points. First of all, the mean value of corruption in the countries of our sample has increased after 2004, when some eastern European countries with high level of corruption were accepted as the new members. Second of all, if we take into account the minimum and maximum values we can see that the most corrupt countries are better off and the least corrupt countries are worse off especially after 2004. Finally the standard deviations indicate that the level of corruption in the EU is becoming less dispersed. To sum up, table 4.1 illustrates that there is a tendency of convergence between the EU members regarding their corruption level, from 1999 to 2008.

Table 4.1 Descriptive statistics of corruption perception index for 25 EU members.

Year	Mean	Std. Dev.	Min	Max
1999	6.27	2.14	3.3	10
2000	6.23	2.14	2.9	10
2001	6.23	2.05	2.8	9.9
2002	6.25	2.10	2.6	9.7
2003	6.32	2.12	2.8	9.7
2004	6.37	2.08	2.9	9.7
2005	6.46	2.04	3	9.6
2006	6.54	1.95	3.1	9.6
2007	6.59	1.78	3.7	9.4
2008	6.50	1.75	3.6	9.3

CPI is ranged from 0 (the most corrupt) to 10 (no corruption)

To indicate the points mentioned in theory section about corruption and the costs of trade in the EU, a set of data provided by the World Bank is used. These data can be found in the database of "doing business". A part of "doing business" indicators is about "trading across borders" in which there are information about the number of documents, times and the costs to export and import in several countries. Table 4.2 indicates the correlation between "corruption perception index" (CPI) and the indicators of "ease of trading", for 25 EU members during the time period of 2006 to 2008.

Table 4.2 correlation between CPI and the indicators of ease of trading across borders

	Documents to export (number)	Time to export (days)	Costs to export (US$ per container)	Documents to import (number)	Time to import (days)	Costs to import (US$ per container)
Correlation with CPI	-0.55	-0.72	-0.34	-0.51	-0.76	-0.38

CPI is ranged from 0 (completely corrupt) and 10 (no corruption)

Regardless of causation direction, table 4.2 illustrates that more corruption is positively correlated with the number of documents, the number of days and the costs to exports and imports. In addition both times to exports and imports are more correlated with CPI than the number of documents and the days to exports and imports, while the costs to export and import per container have less correlation with CPI. From the latter we can conclude that corruption could be a significant factor in trade costs. In other words we expect that higher corruption is associated with higher costs to trade.

4.3. Econometric Considerations

In this essay we estimate the gravity model in the basis of different econometrical methods. Since we have the panel data, country effect (fixed-effect) method will be used in this study. Furthermore, two stages least square (2SLS) method will be used for the use of instrumental variables.

Country-Effects and Fixed-Effect Methods

As it was mentioned in section three, the impact of MTRs can be measured by a simple OLS model in which there are two types of dummy variables. One of these dummies is related to the exporting country and the other one is related to the importing country.

If the coefficients of a model are estimated by OLS models, there is one important assumption that has to be fulfilled, so called "zero conditional mean" (ZCM). ZCM means that if we want to estimate $Y_t = a + bX_t + u_t$, $E[u|X]$ should be equal to 0 or covariance of X (independent variables) and u (error term) are equal to zero. In fact the failure of ZCM leads to biased estimation of a and b.

The problem of $E[u|\boldsymbol{X}] \neq 0$ (endogeneity) stems from the presence of omitted variable and measurement error. Endogeneity therefore reveals the correlation between independent and dependent variables and not the causal relationship between the variables (Angrist and Pischke, 2008).

One way to cope with the omitted variable problem is the use of panel data methods and since we have "strongly balanced" panel data, these methods can be used without a significant problem.

Now if we have a linear model with panel data such as $M_{it} = a + b\boldsymbol{X}_{it} + u_{it}$ where $i = 1,2, \dots N$ and $t = 1, .T$ the error term u_{it} is divided into two parts, where one part is unobserved and time-invariant, and the other part is unobserved as well but it is time-variant such that $u_{it} = \omega_{it} + \rho_i$. For instance in the case of gravity model we can mostly observe some variables such as bilateral distances and common borders which do not vary over time, however there may be some other time-invariant variables which are not observed, and these variables are included in ρ_i.

There are two different assumptions about ρ_i which determine the type of panel data estimation method. Firstly, if we assume $E[\rho_i|X_{i1} + \cdots X_{iT}] \neq 0$ the "fixed effect" method is used and secondly if we assume $E[\rho_i|X_{i1} + \cdots X_{iT}] = 0$ the "random effect" method is used, and the former seems to be more realistic. In fact, the "fixed effect" method can help us to cope with the failure of ZCM. The solution for this problem is the elimination of ρ_i by the use of "fixed effect" method. One of the ways to control for ρ_i is the implementation of dummy variable for each *i* (individual) that is already suggested by some of the empirical works (Feenstra, 2004) to measure the effect of MTRs as well. Nonetheless, if *i* (individual) is too large the use of dummies to control ρ_i is not possible and in this case the "fixed effect" method has to be used. Actually, the "fixed effect" method is based on a trick in which the average of our model's

variables over time are calculate and then the averages from the real values will be subtracted. In this situation ρ_i is eliminated because it does not vary over time and its average is equal to itself, therefore ρ_i will be removed with the "fixed effect" method (for more information see at Stata Manual release 10, 2007).

The Random Effect versus the Fixed Effect

If we assume ρ_i is uncorrelated with independent variables, therefore the "random effect" method can be used, however, this assumption cannot be realistic because the data belonging to countries, states or cities are actually correlated with ρ_i (Wooldridg, 2009). This implies that in the case of the gravity model, the "random effect" method does not result in a consistent estimation.

Reserve Causality and Instrumental Variable

Due to the increase of transaction costs, corruption decreases international trade. However, more international trade flows in the EU region may increase or decrease the corruption. These different impacts are due to decentralized corruption and the anti-corruption EU policies.

The problem of endogeneity related to decentralized corruption was mentioned in section three. In addition, the problem of endogeneity is related to anti-corruption policies of the EU as well. In fact if a country is a member of the EU it will have more trade with other EU members. Moreover the membership in the EU implies that the members have to follow those policies which are against corruption. This implies that membership in the EU arises an endogeneity problem in the gravity model which including corruption.

Endogeneity leads to an important problem for our estimations. This problem is initiated from the failure of zero conditional mean (ZCM) assumption.

Since in this essay the panel data is used, an important part of the endogeneity could be solved by the "fixed effect" method. Nevertheless, panel data method can just solve that part of the problems related to time-invariant error term and not time-variant part. Hence, we can use another important solution called instrumental variable (IV) to heal the non-zero covariance of disturbance term and some of the independent variables.

A suitable instrumental variable is a variable which is correlated with the independent variables of interest, but has zero correlations with other independent variables.

Now, if we want to estimate $Y_t = a + a_1 X_t + u_t$ and $E[u|X] \neq 0$, an instrumental variable may solve this problem. In fact, if we choose a proper instrumental variable, it will divide X into two parts, where the first part is uncorrelated with u and the second part is correlated with u. This in fact gives a consistent estimation of coefficient a_1. This consistent estimation is obtained through a process, called two stage least squares. 2SLS is an econometric method in which, firstly X (e.g. in this essay X is CPI of importing and exporting countries) is taken into account as the dependent variable in a model in which instrumental variable and other explanatory variables are used as independent variables and the coefficient of the instrumental variable should be significant. This is called the "first stage" and as a rule of thumb, if F-value is more than 10, we can conclude that the chosen instrumental variable is proper. Another important characteristic of a proper instrumental variable is the "exclusion restriction" (Angrist and Pischke, 2008). Actually a good instrumental variable implies that the only way that instrumental variable can affect the dependent variables is through its effect on the endogenous variable.

At the "second stage" the fitted values of population of the "first stage" is used as one of the independent variables. This in fact should result the causal relationship between X and Y.

In addition, there are some tests for 2SLS by which one can examine the underidentification, endogeneity of endogenous variable and so on. An extensive description of these tests and their implications can be found in Stata manual 10, yet we briefly represent some of them in this part.

Underidentification test

The LM test of underidentification, (UI) tests whether the instrumental variable is a good instrument or not. In fact if the test is rejected we can say that the instrumental variable is good. This test is the "test of the rank of a matrix" and has Chi-squared distribution with degree of freedom equal to (IV-EV+1), where IV is the number of excluded instrument and EV is the number of endogenous variable. In addition, regarding the type of error terms we have to use different statistics for this test. For instance in the case of this essay since we have panel of data we report robust standard errors. Thereby the UI is tested by Kleibergen-Paap (2006) "rk" statistic belonging to the non-iid standard errors (Stata Manual 2010).

Endogeneity test

The validity of the variables considered as endogenous can be tested in many statistical packages, for instance in Stata we have a test in which the null hypothesis is: the endogenous

variables are in fact exogenous. Therefore if the test is rejected, our choice of endogenous variable is confirmed. The test is obtained by the difference between "Sargan-Hansen statistics" of two different models. In the first model we estimate the model with the endogenous variable as endogenous and in the second model we estimate the model with the endogenous variable, considered as exogenous. The test has chi-squared distribution and its degree of freedom is equal to the number of tested regressors.

To sum up in this essay we will estimate the gravity model by country effect and also instrumental variable method which they are supposed to solve the failure of ZCM. In addition "country-effects" is a better method than fixed and random effects. The explanations behind the choices of the instrumental variables are presented in section five.

5. Empirical Results

5.1. Estimation Results

Table 5.1 provides the results of estimations of the gravity model with four different specifications. All models include time and country effects (to control for individual and multilateral trade resistances) and their standard errors are corrected for heteroscedasticity (robust standard errors).

In the first column of table 5.1 a simple gravity model without corruptions' scores of importing and exporting countries is estimated. The coefficient of GDP of exporting country is 0.68 implying that 1% increase in the GDP of exporting country increases imports flows by 0.68%. In addition, the coefficient of GDP of the importing country means that 1% increase in the GDP of importing country increases the imports flows by 0.97%. Therefore the imports flows are more sensitive to changes in the economic size of importing country. Moreover, 1% increase in the transportation costs decreases the imports flows by more than 1.5%. Furthermore, since some of the countries were accepted in the EU after 2004, we include three dummies for the EU membership and interestingly the membership in the EU does not have any significant impact on the volume of imports for trading partners. Moreover the presence of common currency is not trade creative for intra-EU trade. Also as we expected, having common borders increases the intra-EU trade. This model can explain 91% of the imports variations which is a considerable explanatory power by R-squared.

In the second column of table 5.1 we include the corruptions' scores of exporting and importing countries. The coefficients of GDPs, EU membership, common currency and having common borders have the same sizes and signs as the first column. Furthermore the coefficients of corruptions' scores are not significant.

Although the zero impact of corruptions' score of importing and exporting countries are somehow close to our predictions, as it was discussed in section three and four we are suspicious of endogeneity in our estimations.

To solve the problem of endogeneity, we use two set of instrumental variables. The first set of instrumental variables is a dummy variable showing if the importing or exporting countries are transshipment points for Southwest Asian drugs. The second set of instrumental variables is

dummy variables which are equal to one if the "government type" in exporting or importing countries are "constitutional monarchy" and zero otherwise. The results of our estimations with instrumental variables and 2SLS are presented in column three and four of table 5.1.

A good instrumental variable should have two characteristics; first of all it should be only correlated with the endogenous variable of interest (corruption) and second of all it should fulfil the "exclusion restriction" (i.e. the only channel by which instrumental variable can affect the dependant variable (import values) is the endogenous variable). In the following we will describe the reason behind our choices.

Transshipment Point for Drugs

If a country is a transshipment point for drugs coming from a region like Southwest Asia, therefore we can expect that there are a considerable number of corrupt officials overlooking this transshipment. In this country, corruption will be increased, since the custom officials or the narcotic police forces that feel the drug-related activities are profitable will have incentives to take part in the smuggling. Referring to the model explaining the "prevalence of corruption", we can say that there is a significant association between the levels of corruption in a country and being a transshipment point for drugs.

These instrumental variables can fulfil the conditions for being a good instrumental variable. First, several of these countries used as transshipment point for drugs are amongst the largest economies in the world (e.g. Germany, France and Italy), while there are several other countries with smaller economic sizes used as transshipment point as well. Furthermore, since being transshipment point for drugs is an illegal activity, it will not have any impact on the size of economy and vice versa.

Second in the case of "exclusion restriction" we can use the same reasoning as above and say that being a transshipment point for drugs coming from Southwest Asia cannot affect trade directly. An example can clarify our point here. If a cargo of drugs is smuggled under a legal cover (i.e. where drugs are hidden in a load of legal commodities) and it can pass the boarders there will be new recorded trades in a country, however the possibility of passing the boarders is strongly associated with the level of corruption in that country. In other words the only channel that the instrumental variables can affect trade is corruption.

Table 5.1: the gravity models' estimations for total imports values of 25 EU members for period of (1999-2008)

Dependant variable: Total imports values of EU25	1	2	3	4
Independent variables	**AW (excluding corruption)**	**AW (including corruption)**	**IV (1)**	**IV (2)**
Corruption of importer		-0.01 (-0.33)	0.09 (1.65)	0.18 (1.03)
Corruption of exporter		-0.02 (-0.70)	0.23*** (4.69)	0.09** (2.42)
Ln (GDP of exporter)	0.68*** (6.26)	0.70*** (6.28)	0.51*** (3.55)	0.62*** (4.67)
Ln (GDP of importer)	0.97*** (9.45)	0.97*** (9.51)	0.90*** (6.41)	0.83*** (3.63)
Ln (bilateral distance)	-1.59*** (-37.66)	-1.59*** (-37.66)	-1.59*** (-37.74)	-1.59*** (-37.81)
Importer is EU member	0.04 (0.56)	0.04 (0.58)	0.02 (0.28)	0.00 (0.05)
Exporter is EU member	0.04 (0.60)	0.04 (0.65)	0.00 (-0.06)	0.02 (0.34)
Both are EU member	0.03 (0.48)	0.03 (0.47)	0.03 (0.55)	0.03 (0.53)
Common currency	0.04 (1.29)	0.04 (1.29)	0.04 (1.23)	0.04 (1.26)
Common border	0.16*** (3.03)	0.16*** (3.03)	0.16*** (3.04)	0.16*** (3.04)
Constant	10.70*** (5.20)	9.76*** (4.71)	12.12*** (5.17)	11.93*** (5.13)
R2	91	91	91	91
F-Value	1311	1272	1264	1288
Endogenous variable			Corruptions of importer and exporter	Corruptions of importer and exporter
Excluded instrument			Transshipment points of Southwest Asian drug	Government type (constitutional monarchy)
Endogeneity test of:				
importer's corruption			Not Rejected	Not Rejected
exporter's corruption			Rejected***	Rejected**
Joint endogeneity test			Rejected***	Rejected*
First stages tests:				
Underidnetification			Rejected***	Rejected***
2SLS test:				
Underidnetification			Rejected***	Rejected***
No. Observation	6000	6000	6000	6000

The t-values are in parentheses. *, **, *** show the significancy levels at 10%, 5% and 1% respectively. Corruption scores are Between 0 (completely corrupt) and 10 (no corruption), therefore positive sign of corruptions' scores imply negative Impact on the dependant variable.

Government type

As a robustness check, we also use another set of instrumental variables to estimate the gravity model. These instrumental variables are dummy variables showing if the type of government is "constitutional monarchy". Regarding North's (1990) discussion transition of political power in Western European countries form "monarchy" to "constitutional monarchy" led to introduction of new political interests groups in the countries of this region. These changes in the political environment of Western European countries imply that there are more people who can affect the decisions. For instance, Norht (1990) mentions the case of England in which the King had to share his power to gain more economic recourses. This process in fact led to changes in the political institutions and increased the amount of property rights in England (North, 1990, North and Weingast, 1989). This point is more observable in those countries, ruled by "constitutional monarchy". In fact in these countries the longer life-span of some institutions implies that these institutions have been evolved to perform better and better in comparison with other counties in the region.

Therefore there are two channels through which the "constitutional monarchy" type of government can affect the level of corruption in a country. Firstly, in a country with "constitutional monarchy" the institutions have been evolved to result in better qualities. Thus as we discussed in section three, a country with constitutional monarchy is expected to have lower corruption, since corruption is the result of malfunctioning institutions. In other words we can conclude that there are fewer corruptions in those European countries that have "constitutional monarchy". Nonetheless, it should be noticed that this instrumental variable can only be extended to case of our sample and for any other sample of courtiers this instrumental variable might not be proper. In fact those countries in the EU, governed by "constitutional monarchy" are Denmark, Sweden, United Kingdom, Luxemburg and Nederland and all of these countries have low levels of corruption.

In addition this set of instrumental variables cannot be problematic for "exclusion restriction" because those countries ruled by "constitutional monarchy" do not necessarily have the highest levels of imports. Therefore any association between imports flows and "constitutional monarchy" is initiated from the relationships between the IVs and corruption level.

Using instrumental variable in both cases the coefficients of corruption's score of exporting countries' become positive and significant. These positive signs imply that corruption of exporting country reduces trade in the EU. In addition the coefficients of importing countries' corruption become positive and insignificant.

These two results are consistent with theories and most of the previous empirical studies, reviewed in section two. Moreover the results of column three and four in table 5.1 indicate that corruption of exporting countries reduces the imports from these countries. Furthermore as it was discussed in section three and four, the insignificant impacts of corruption of importing countries on the imports flow are theoretically acceptable. This is due to the fact that the importing countries are informed better about corruption-related barriers.

The results of the tests, both in the first stage and 2SLS, strongly reject underidentification of our equations. Furthermore, in both equations the endogeneity of corruption's score of importing country is not rejected (i.e. H0: corruption of importing country can be treated as exogenous), while the endogeneity tests of exporting country's corruption and the joint tests of endogeneity are rejected. These results also confirm our assumption about the fact that corruption of importing country is a less important factor.

5.2. Robustness Checks

In this part we estimate the gravity models for the EU 15 countries as a subsample to check for validity of our results. These countries have longer history of membership in the EU and therefore the dummies for EU membership are eliminated in the estimation of these models. In table 5.2, columns one and two are the same as columns one and two in table 5.1. In addition in column three of table 5.2 we estimate our model with transshipment instrumental variables.

The results of 2SLS estimations indicate that even if the custom-related barriers are eliminated in these countries in the period of our studies, corruption is still an important trade barrier for both exporting and importing countries. Nevertheless, the size of corruption impacts on the imports flows consistently is higher for exporting countries.

The coefficient of corruption's score for exporting country is larger for EU 15 countries in comparison with EU 25; in addition coefficient of corruption's score of importing country is larger and significant for EU 15 countries. These are interesting results, due to the fact that most

of EU 15 countries have low levels of corruption. However these results can be explained by the higher sensitivity of these countries to corruption, therefore the corrupt behaviours in the bilateral trade of EU 15 countries face more sensitive reactions.

Table 5.2: the gravity models' estimations for total imports values of 15 EU members

Dependant variable: Total imports values of EU 15	1	2	3
Independent variables	**AW (excluding corruption)**	**AW (including corruption)**	**A-W with IV (1)**
Corruption of importer		-0.01	0.09**
		(-0.26)	(2.02)
Corruption of exporter		0.00	0.45***
		(-0.12)	(6.41)
Ln (GDP of exporter)	0.97***	0.96***	1.33***
	(2.97)	(3.09)	(3.69)
Ln (GDP of importer)	0.55***	0.54***	0.63***
	(3.00)	(2.88)	(4.10)
Ln (bilateral distance)	-1.08***	-1.08***	-1.08***
	(-11.60)	(-11.64)	(-11.52)
Common currency	0.21***	0.20***	0.29***
	(4.27)	(4.00)	(5.72)
Common border	0.34***	0.34***	0.34***
	(3.53)	(3.53)	(3.54)
Constant	9.77	9.65*	0.54
	(1.63)	(1.83)	(0.10)
R2	91	90	90
F	1250	1192	1077
Endogenous variables			Corruptions of importer and exporter
Excluded instruments			Transshipment point of Southwest Asian drug
Endogeneity test of importer's corruption			Not Rejected
Endogeneity test of exporter's corruption			Rejected***
Joint endogeneity test			Rejected***
First stages tests:			
Underidnetification			Rejected***
2SLS test:			
Underidnetification			Rejected***
No. Observation	2100	2100	2100

The t-values are in parentheses. *, **, *** show the significancy levels at 10%, 5% and 1% respectively. Corruption scores are Between 0 (completely corrupt) and 10 (no corruption), therefore positive sign of corruptions' scores imply negative impact of corruption on the dependant variable (imports flows).

6. Concluding Discussions

This study has investigated the impact of corruption on intra-EU trade for the period 1999 to 2008. Since tariffs and customs have no longer significant impacts on intra-EU trade, we expected that corruption does not affect the intra-EU trade. The initial gravity model with country and time effects was estimated with the method of OLS and its results were consistent with our expectations. However, because of the endogeneity problem we used instrumental variable methods and we achieved different results. In fact, for the EU-25 countries, the corruption of exporting country significantly reduces the intra-EU 25 trade, while the corruption of importing country had no impacts on the bilateral trade flows of EU-25 countries.

In addition, the gravity model with country and time effect (and without instrumental variable) for EU-15 countries was estimated by OLS method. The results did not show any significant impacts of corruption of exporting and importing countries on the bilateral trade flows of EU-15 countries. Nonetheless, the gravity model with instrumental variable instrumental variable was estimated and the results reveal that corruptions of exporting and importing country significantly reduce the intra-EU 15 trades. The sensitivity of the EU-15 countries to corruption implies sever reactions to the presence of corruption.

In both samples it was revealed that corruption in the importing country has lower impact on bilateral trade flow. This is consistent with our expectations and Anderson and Wincoop (2003)'s assumption, in fact they assume that the exporting countries impose the costs of trade on importing countries. Therefore corruption of exporting country should be more effective than importing country on imports flows. This also is confirmed by rejection of the endogeneity of corruption of importing country. In addition our results imply that the estimation of the gravity model including corruption's score with panel data need to be based on a method which controls the endogeneity bias, otherwise the reliable results could not be achieved.

The results of this study imply that the EU trade policies have not been successful to reduce non-tariff barriers. In the case of EU-25, the membership in the EU does not create any advantages for the members. However corruption as the variable of our interest reduces the amount of intra-EU 25 trade. Even in the case of EU 15, although common currency increases the intra-EU 15 trade flows, corruptions of exporting and importing countries offset this positive impact of common currency. Therefore, the EU members cannot rely on the current trade policies and they

have to find a way to cope with corruption as an important barrier to trade. Our results also imply that, although the customs and tariffs can affect the levels of corruption effectiveness, there are other processes during which corrupt officials can extort bribes and reduce the trade flows. Therefore an anti-corruption policy in the EU needs to be implemented in line with this point.

The answer to the main question of our study, posed in the introduction is: corruption considerably mitigates trade in the EU. Furthermore the results of this essay show that, although tariff barriers and the role of customs have been removed in the EU, corruption (of exporting country) decreases the volume of trade in the EU. Thus we can conclude that there are other variables than customs and tariffs which stimulate corruption in international trade. Moreover the results of this essay confirm the findings of previous studies estimated by cross-section data.

In the future studies one can investigate the impact of corruption on bilateral trade of different commodities such as manufactured and agricultural goods in the EU. Especially in the case of agricultural goods the common agricultural policy (CAP) of the EU can be an important source of corruption in the region. Thereby a detailed analysis of corruption's impact on trade of agricultural commodities is vital. In addition in the future one can focus on different measures of corruption with panel data, for instance corruption in taxing of traded goods, issuance of permissions and documents for trade, exceptions and exemptions of some commodities such as tobaccos and beverages. Moreover one can study the impact of corruption on the trade of the EU countries and the rest of the world.

References

- *Amemiya, T., and T. E. MaCurdy. 1986. Instrumental-variable estimation of an error-components model. Econometrica 54: 869–880.*
- Anderson, James E and Marcouiller, Douglas. 2002. "Insecurity and the Pattern of Trade: An Em-pirical Investigation." *Review of Economics and Statistics*, 84 (2): 345-52.
- Anderson, James E. and Eric van Wincoop (2003), "Gravity with Gravitas: A Solution to the Border Puzzle," *American Economic Review, 93, 170-192*
- Angrist, J., and S. Pischke (2008), Mostly Harmless Econometrics: An Empiricists' Companion, *Princeton University Press, Princeton,*
- Bardhan, Pranab. 1997. "Corruption and Development: A Review of Issues," *Journal of Economic Literature, 35(3) 1320-1346.*
- Cheptea, A. 2007. "Trade liberalization and institutional reforms" , *Economics of Transitions ,.15(2), 211-255*
- de Groot, Henri L. F., Gert-Jan Linders, Piet Rietveld & Uma Subramanian. 2004. "The Institutional Determinants of Bilateral Trade Patterns." *Kyklos* 57(1): 103-124.
- de Jong, E. and Bogmans, Ch. 2011. "Does corruption discourage international trade? ", *European Journal of Political Economy, 27(2) 385-398*
- de Jong, E. and E. Udo. 2005. "Is Corruption Detrimental to International Trade?" , *Radboud University Nijmegen, manuscript, Nijmegen*
- Directorate-General for Communication, *2009. Eurobarometer: Attitudes of Europeans towards Corruption, Full Report, Brussels: European Commission*.
- Dutt, P. and D. Traca. 2007. "Corruption and Bilateral Trade Flows: Extortion or Evasion?" , *mimeo, NSEAD – Economics and Political Sciences and Universite Libre de Bruxelles – Solvay Business School.*
- Emmanuelle Lavallée. 2005. "Governance, Corruption and Trade : a North-South Approach" , *EURIsCO, Université Paris Dauphine*
- Feenstra, Robert C. 2004. Advanced International Trade: Theory and Evidence, *Princeton University Press, 2003*
- Francois, Joseph F. and Miriam Manchin. 2007. "Institutions, Infrastructure, and Trade", *Policy Research Working Study No. 4152, The World Bank.*
- Greif, Avner. 1992. "Institutions and International Trade: Lessons from the Commercial Revolution." *American Economic Review* 82, 128-33. Studies and proceedings of the hundred and fourth annual meeting of the American Economic Association
- *Hausman, J. A., and W. E. Taylor. 1981. Panel data and unobservable individual effects. Econometrica 49: 1377–1398.*
- Helble, Matthias, Ben Shepherd, and John S. Wilson, 2007, "Transparency and Trade Facilitation in the Asia Pacific: Estimating the Gains from Reform", *Washington, D.C.: The World Bank.*
- *History* 49:4, 808-32 (December)
- Institutions Governing Public Choice in Seventeenth Century England." *Journal of Economic*

— Jansen, Marion; Nordas, H. 2004. "Institutions, Trade Policy and Trade Flows". *Economic Research and Statistics Division, World Trade Organization (WTO) Staff Working Study ERSD-2004-02.*

— *K*aufmann, Daniel, Kraay, Aart and Mastruzzi, Massimo, (2010) The Worldwide Governance Indicators: Methodology and Analytical Issues. *World Bank Policy Research Working Study No. 5430. Available at SSRN: http://ssrn.com/abstract=1682130*

— Khan M.A. 2006. "Determinants of corruption in developing countries: the limits of conventional economic analysis" In Rose-Ackerman, S. (ed.) 2006. *International Handbook on the Economics of Corruption. Cheltenham UK: Edward Elgar Publishing*

— Lambsdorf, J. G. 2006. "The Causes and Consequences of Corruption: What do we know from a cross-section of countries?" In Rose-Ackerman, S. (ed.) 2006. *International Handbook on the Economics of Corruption. Cheltenham UK: Edward Elgar Publishing.*

— Lambsdorff J. 2005a. The methodology of the 2005 Corruption Perceptions Index. *Univ. Passau. http://www.transparency.org/policy research/surveys indices/cpi/2005/methodology*

— Lambsdorff, Johann Graf.1998, "An empirical investigation of bribery in international trade", *European Journal of Development Research,* 10(1): 40 - 59.

— Mauro, Paolo. 1995. "Corruption and Growth," *Quarterly Journal of Economics, 110, 681–712.*

— Musila, J.W and S.P. Sigue. 2010 . "Corruption and International Trade: An Empirical Investigation of African Countries." *World Economy 33(1), 129-46*

— North, Douglass and Barry Weingast (1989). "Constitutions and Commitment: The Evolution of

— North, Douglass, C. 1990. "Institutions, Institutional Change and Economic Performance", *Cambridge University Press,*

— Pomfret, R., & Sourdin, P. 2008. "Why do trade costs vary?" *University of Adelaide School of Economics Working Study 2008-08*

— Rose-Ackerman, S. (ed.). 2006. *International Handbook on the Economics of Corruption. Cheltenham UK: Edward Elgar Publishing.*

— Rousso and Steves. 2006. "The effectiveness of anti-corruption programs: preliminary evidence from the post-communist transition countries" In Rose-Ackerman, S. (ed.) 2006. *International Handbook on the Economics of Corruption. Cheltenham UK: Edward Elgar Publishing.*

— Shepherd Ben, A. 2009. "Speed Money: Time, Corruption, and Trade", *Working Study.*

— Shleifer, Andrei and Robert W. Vishny. 1993. "Corruption," Quarterly Journal of Economics, 108(4), 559-617.

— Stata Press. 2007. *Stata Longitudinal/Panel Data Reference Manual, Release 10*. College

— Station, TX: Stata Press.

— Thede and Gustafson. 2009. "The Multifaceted Impact of Corruption on International Trade", *Department of Economics Working Study Series, Lund University, No 13/09.*

— Wooldridge, J. M. 2009. Introductory Econometrics: A Modern Approach. 4th ed. *Cincinnati, OH: South-Western*

Appendix 1.

The names and ISO codes of countries of the study's sample:

No	Name	ISO Cod	EU 15
1	Austria	AUT	Yes
2	Belgium	BEL	Yes
3	Bulgaria	BGR	-
4	Czech republic	CZE	-
5	Germany	DEU	Yes
6	Denmark	DNK	Yes
7	Spain	ESP	Yes
8	Estonia	EST	-
9	Finland	FIN	Yes
10	France	FRA	Yes
11	Great Britain	GBR	Yes
12	Greece	GRC	Yes
13	Hungry	HUN	-
14	Ireland	IRL	Yes
15	Italy	ITA	Yes
16	Lithuania	LTU	-
17	Luxemburg	LUX	Yes
18	Latvia	LVA	-
19	Netherland	NLD	Yes
20	Poland	POL	-
21	Portugal	PRT	Yes
22	Romania	ROM	-
23	Slovakia	SVK	-
24	Slovenia	SVN	-
25	Sweden	SWE	Yes