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The impact of debt crisis on export performance

NEKP01 Master Essay within International Economics



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Abstract

The purpose of this essay is to empirically examine the impact of euro debt crisis in Greece, Ireland, Italy, Portugal and Spain in terms of their trade patterns relative to the export performance of OECD countries. Panel data for 34 OECD countries are investigated with fixed effects within a gravity model framework for period 1992-2012. In such a way, the benchmark model of the paper contains the logarithmic value of economic mass, dummy variables of the GIIPS after the crisis year of 2008, and year dummies. The benchmark model shows that one percentage point increase in logarithmic mass gives approximately 1.07 percentage rise in exports, meaning that the larger the countries the larger their export volumes. Regarding the debt crisis effects on the GIIPS trade performance there is export decrease of 22%, and import decrease of 27% after the crisis. In addition, robustness checks illustrate that the economic mass effect hold approximately the same impact as in the benchmark model, but the GIIPS dummies crisis effects are negative and vary from 17% to 29% depending on the year of specification as the year of the crisis. Lastly, the benchmark model is robust to an EMU effect in view of the fact that a regression with a respective dummy variable gives insignificant coefficients.

Key words: debt crisis, GIIPS, OECD, export performance, gravity model

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1. Introduction

Since the mid-1970s crises originating from government debts, financial and banking systems have been very regular incidents in the global economy with obstructive effects on it (Abiad et al., 2011). As Arghyrou and Kontonikas (2012) argued, the most recent global financial crisis of 2008 was transformed into a “sovereign debt crisis” in the euro area that started in Greece in November 2009 and had crucial effects on goods’ demand and trade. Besides, the depth of the crisis was worsened by the fact that European Monetary Union had already existed in the European economic panorama with imbalances among its members (Arghyrou and Kontonikas, 2012 p.658).

From the bottom of the European Monetary Union’s creation, imbalances could be noticed among its members, since the euro common currency required from the member countries new demands in their economic policies which could not be successfully accomplished by some of them. These demands were related to the EMU entry rules which required the budget deficits not to be higher than 3%, and the national debts not to be larger than 60% of GDP. For instance, Greece and Spain faced difficulties of adopting their policies according to the new demands after their EMU entry, and inflation increase was noticeable. Further, between the EMU countries unevenness connected to “current accounts, public finances, competitiveness and the development of property prices” was created and existed even before the hit of the crisis (Monetary Policy Report, p.43, 2012).

During the time when the global economic activity was in a good path and developed well, the problems of imbalances occurred in the EMU could not be seen until the sudden arrival of the American rooted financial crisis of 2008, which brought the problems into light (Monetary Policy Report, 2012). Particularly, the EU periphery countries as the most vulnerable members; mostly known as GIIPS¹ countries, claimed to be the source of the spread of the crisis to the whole European Monetary Union; as a sovereign euro debt crisis. The development of the crisis in each of the GIIPS may differ; nevertheless its understanding is important so as to investigate

¹ The abbreviation GIIPS refers to Greece, Ireland, Italy, Portugal and Spain respectively to their initial letters

structural changes in the trade patterns of the GIIPS relative to the export performance of OECD countries due to the debt crisis, as this being the main purpose of this paper. In Greece, the debt crisis was derived by the fear of its creditors regarding country's capability to pay the already huge debt of the state. In particular, the combination of the global financial crisis with the country's high debt and deficit resulted into the Greek crisis. The reason of the Irish crisis was very dreadful debts of stated owned banks which accounted as one of the largest "debt/GDP ratio" close to 70 billion euro that the Irish state was not able to cover. The Portuguese crisis cannot be directly related to the high debt or deficit since Portugal had the lowest debt and deficit in 2010 among the GIIPS countries. The summation of mainly three reasons led to the Portuguese crisis, and these are the less desirable and slow growth of the output, poor policies during monetary integration and the "lack of accountability and transparency of political governance". Spain was brought up in the crisis scene when its credit rate was decreased, as well as Italy was affected by the crisis from Portugal and Greece as a domino effect together with some pressure in the country's political environment (Trabelsi, 2012, p.426)

In a general sense, it can be understood that the euro zone sovereign debt crisis is rooted in the uneven growth performance of the different euro countries, the unsustainably large public debts of some EU periphery countries and the incompleteness of the euro projects. All these existed already before the hit of the crisis but were not obvious, and gradually deteriorated with the crisis's emergence (Editorial, 2013). In this sense, the crisis's effects were deepened by the imbalances and defaults within the EMU. Moreover, for countries with huge public debts; such as the GIIPS, it is also historically proved that they face speculative attacks with subsequent consequences on the financial markets around the world as well as negative effects including devaluation of the euro currency, change of the stable exchange rate policy and increase in global risk aversion. These negative effects transferred as well to trade patterns through economic links that exist among euro area countries and the rest of the world (Monetary Policy Report, 2013; Stracca, 2013).

Based on the important link of trade as an essential economic transaction which can be affected by any possible negative effects of a debt crisis, the purpose of this paper is to analyze the effects that debt crisis euro area countries; Greece, Italy, Ireland, Portugal and Spain faced on their trade performance in comparison to OECD countries export patterns. It is of particular interest to look at the trade performance of GIIPS since these countries had a deeper crisis compared to the other OECD and EMU countries, and hence the trade performance may have been hit by a structural change. For this reason the trade patterns before and after the crisis year of 2008 with the use of gravity model are analyzed for the period between 1992 until 2012. The investigation of any effect on the trade pattern is particularly interesting since the understanding of the way that trade behaves is an essential factor that can affect economic welfare and growth of an economy (Abiad et al., 2011). In such a way, this paper contributes as a complement to the general existing literature which uses the gravity model in order to investigate the effects that crises and different shocks have on trade. Specifically, the present paper seeks out impacts from the existence of crisis in five European monetary members on trade by empirically measuring its amount in relative terms of OECD countries export performance.

The disposition of the paper is as follows. In section 2 previous researches which analyzed the effects of a crisis are mentioned. In section 3 the main purpose of the paper is developed, that being the relationship between debt crisis and export performance. This relationship is developed by placed into a gravity model equation, and as such the theoretical model slightly extended is used so as to progress with the empirical specification of the paper. In section 5, the results of the empirical model are presented and discussed as well as some robustness checks. Section 6 contains the summary and concluding remarks.

2. Previous research

There is a variety of studies which examine the effects on trade that are created by different kinds of bumps in the economy e.g. the effects of wars, violence and financial crises. From the spectrum of economic crises it has been shown that there are negative effects in asset markets, output, employment and explosion of governments' debts. The real prices of houses decrease on average 35% for six years and equity prices fall by 55% for three and a half years. Output on average can decline by 9% for two years and unemployment rises by 7% for over than four years time. Government debts experience an outburst by increasing on average 86% because government cannot collect tax revenues due to output's constant decrease (Reinhart and Rogoff, 2009).

In addition, previous studies on the matter of crisis effects do not support one common effect that a crisis can have on trade, meaning that there is no mainstream effect on exports and imports. Ma and Cheng (2003)² and Abiad et al. (2011)³ support that the effect of a crisis on imports is negative. This negative effect can be elucidated from the side that a crisis provokes a recession in the macro economy which makes the domestic demand fall by negatively affecting consumers' consumption of importable goods. Furthermore, the imports of a crisis country can be decreased due to policies of protectionism e.g. increase the tariffs of imported goods so as to stimulate domestic production of goods. In addition, the crisis gives rise to exchange rate volatility, in other words it is more costly for the country which is in crisis to import from somewhere else. Simultaneously, the exchange rate depreciation makes the crisis country more attractive for other countries since it is now cheaper for them to import from the crisis country. Hence, an increase in the exports of the crisis country and as such a structural change in export patterns can be noticed.

In the case of the empirical studies which examined firm level data, Iacovone and Zavacka (2009) analyzed data from 23 banking crises for period 1980-2000, and corroborated that a

² Ma and Cheng (2003) studied the effects of banking and currency crises for 52 countries during the period 1981-1998

³ Abiad et al. (2011) used an extensive version of gravity model with 179 crises episodes for 1970-2009

crisis has negative outcomes on “manufacturing exports” especially for those sectors which depend to a larger extent on external finance. In this situation, exports are negatively affected by a crisis which exists in another country because exporters cannot cover sunk or fixed costs that are needed so as to get into the foreign markets. These costs can usually be covered when exporters finance their investment externally and not from their origin economy, since there is “delay between investment and revenue collections” that are not known to them as “outsiders”. Therefore, there is a tighter relationship between exporters and the crisis country that can make the crisis effect on exports more severe (Iacovone and Zavacka, 2009, p.5).

Amiti and Weinstein (2011) additionally investigated firm level Japanese data from 1990-2010, and found that the effect of a crisis on exports is conditional on how healthy the financial institutions such as banks are. It is supported that there is a “trade finance channel between banks and exporters” as well as “exports are more sensitive to financial shocks” because for exporters there is a “higher default risk and higher working capital requirement”. “Credit default risk” exists because the exporters usually trust banks so as to have the “payment insurance and guarantees” that are needed for them in order to enter a foreign market, since they do not by themselves have the “capacity or willingness” required to measure any default risk. What is more, the exporters necessitate “more working-capital finance” comparing to the domestic firms because their transactions are longer, considering that there is some time needed for goods to be transported to the foreign markets. Therefore, when the firms rely on healthy institutions for their trade finance their exports can be higher comparing to those firms that resort to non-healthy institutions for their trade finance (Amiti and Weinstein, 2011, p.1842).

Regarding the load of the effects that can be passed through a crisis country to another country, Berman and Martin (2012) produced evidence that exports of Sub-Saharan countries negatively reacted to a crisis existed in developed economies with which African countries had trade transactions, by using a gravity model equation for period 1976-2002. The negative reaction of African exports is mainly due to the undeveloped financial system of African countries which required a tough reliance of the African exporters in terms of their trade

finance, from their partners' financial institutions. Income is also claimed to be negatively affected as a matter of contagion from the export decrease.

From the spectrum of the sequels of debt crisis, Furceri and Zdzienicka (2012) observed an output decrease because a debt crisis country is kept out from "international capital markets", "the cost of borrowing" augments as well as the debt crisis country is thrown out from international trade since it does not have a good reputation as a reliable and trustful partner. This bad reputation negatively affects the debt country's creditors towards not providing trade credit as well as the existence of new trade partners. By force of circumstances and in such a suffocated environment there is no other space for the output but to decrease. The output decrease was estimated to be 10% eight years after the occurrence of a debt crisis as the examination of data from 154 countries for 1970-2008 showed (Furceri and Zdzienicka, 2012, p.727).

Stracca (2013) proved that debt crisis increases global risk aversion and triggers depreciation of the euro. The increase in risk aversion comes from the rise in "government bond yield spread" within the European Monetary Union, which affects the attitudes of the markets regarding the feasibility of the union. As such, in this negative economic environment exchange rate value is affected and the euro follows an orbit of devaluation as the use of the event study approach with the combination of debt crisis episodes from January 2010 until March 2013 reveals (Stracca, 2013, p.4). The following table 1 presents the background studies that explored the effects of different crises.

Table 1- Studies covering the effects of crises

Authors	Type of crisis	Trade Effects		
		Imports	Exports	Other effects
Ma & Cheng (2003)	banking crises	-	+	4 N.E -
	currency crises	-	+	
Iacovone & Zavacka (2009)	banking crises	N.E	-	N.E
Abiad et al. (2011)	banking crises	-	Return back after one year	N.E
	debt crises	-		
Amiti & Weistein (2011)	financial crisis	N.E	+/-	N.E
Berman & Martin (2012)	banking crises	N.E	-	income -
Furceri & Zdzienicka (2012)	debt crises	N.E	N.E	output -
Stracca (2013)	debt crises	N.E	N.E	risk aversion - euro depreciation

⁴ N.E is an abbreviation for No Effect

3. Debt crisis and exporting

3.1 Gravity model

The gravity model's name is taken from the famous law of gravity in physics which says that the bigger the mass of objects and the lower the distance, the higher the attraction is. In resemblance to our application, attraction is the trade flow between two countries; the mass is the economic size between two trade partners and the distance is the business distance. The "standard gravity framework" says that "commercial distance" and "economic mass" are the most important factors that explain a large amount of trade flows between countries (Greenaway & Milner, 2002, p.575). Hence, in its simple form the gravity model says that trade flows between two countries depend on their GDP product and distance in a positive and negative way respectively. In such a way the variables that are usually included in a gravity equation are GDP per capita or population as well as distance. It is likely that a dummy variable, which refers to whether two trading countries share common border, common language or common membership in a free trade agreement, can be also included (Micco et al., 2003).

The use of gravity model allows the identification of the factors that determine trade flows between countries as it supports the existence of a relationship between the characteristics of the importing and exporting countries and the amount of "bilateral trade flows". It also supports the inclusion of country pair characteristics such as distance, common border or common currency (Abiad et al., 2011, p.6).

The basic gravity equation has two important building blocks. All goods are differentiated by place of origin and the preferences are identical across countries (Anderson & Wincoop, 2003). From the supply side there are economies of scale in production so that each firm gathers its resources of production in one location and chooses to produce a unique variety in order to reap the market. There are also differentiated products implying that each firm produces a unique product and that there is a monopolistic competition market. In the demand

side there is a love for variety, preferences are homothetic and identical across countries. Therefore, after some calculations⁵ the gravity equation becomes as follows:

$$X_{ij} = \frac{Y_i Y_j}{Y_{\text{world}}} * \left(\frac{t_{ij}}{P_i P_j} \right)^{1-\sigma} \quad (1)$$

X_{ij} : nominal imports or “the nominal value of exports from country i to j”

$Y_i Y_j$: the economic mass, real GDPs

P_i : price index for exporting country i⁶

P_j : price index for importing country j⁶

t_{ij} : trade costs, such as information costs, design costs, legal and regulation costs⁷

σ : elasticity of substitution between all goods⁸

Equation (1) shows that bilateral trade “after controlling for size, depends on the bilateral trade between i and j, relative to the product of their multilateral resistance indices”, and the critical inference of the theoretical gravity equation is that “trade between regions is determined by relative trade barriers” (Anderson & Wincoop, 2003,p.176).

3.2 Gravity model and debt crisis

The way that debt crisis enters the gravity model specification; as shown in equation (1), can be through a fall in output and a rise in trade costs that a crisis can provoke. Debt crisis causes the output to decrease because a constrained economic environment does not give the opportunity for output to develop. The constrained environment is related to the exclusion of debt crisis country from international capital markets, the increased cost of borrowing and

⁵ In more detail the calculations can be found in Anderson & Wincoop (2003)

⁶ The price indices are usually called multilateral trade resistance

⁷ t_{ij} is referred as bilateral trade resistance

⁸ Note that $\sigma > 1$

none provision of trade credit from its creditors (Furceri and Zdzienicka, 2012). In other words, debt crisis countries do not have new trade partners and trade credit from their creditors, because they have to deal with bad reputation due to mainly their continuous inability to pay back their debts. As a result, from the difficulty of the provision of trade credit and existence of new trade partners, capital is impeded to flow into a debt crisis country's economy. Lack of trade credit together with the stop of capital inflows inevitably lead to the abolishment of debt crisis countries from international trade markets and trade deterioration with structural changes in trade (Rose, 2005).

In the constrained environment that crisis causes with output or income decrease, effects on trade costs cannot be avoided. Everything that has an impact on moving goods, or investing movements between countries can be considered as trade costs e.g. tariffs, "international border" existence, "logistics, administration, and regulation" (Taylor and Wilson, 2009 ; Anderson and Wincoop, 2003,p.178). Debt crises can affect trade through their effect on trade costs in the following ways:

- a) Policies of Protectionism
- b) Pause of trade finance
- c) Exchange rate depreciation

It has been noticed that during crises countries adapt policies of protectionism. Hitherto, a country which suffers from the crisis can be engaged into protectionist policies e.g. by increasing the tariffs for imported goods, so in this way it will have as few imported goods as possible flowed into its economy, and gradually stimulate domestic production and the subsequent demand of goods. At the same time, the country which does not directly face a crisis might also reconcile itself to protectionist policies so as to protect its economy from a massive import of goods from the crisis country which likely becomes more competitive. Therefore, in both ways there is increase in trade costs which is related to protectionist policies that directly affect trade with an impact on imports and exports (Abiad et al., 2011)

There is an adjournment of trade finance for the exporters as a crisis outcome, which affects the sunk or fixed costs. Exporters finance their investments in foreign markets with

external finance because as being outsiders they are not in the position of knowing the existing costs in foreign markets. As well as there is no other way to acquire their revenues considering that there is some time needed between an investment or the transportation of goods and the gathering of profits. Hence, with the crisis in a country the exporters cannot finance their investments into this country as they cannot have the required finance to cover any fixed costs. As a result, fixed costs are getting larger which obstruct the exports of trade partners as such the imports of the crisis country with subsequent disruptive effects on trade (Iacovone and Zavacka, 2009; Amiti and Weistein, 2011).

Exchange rate depreciation is fostered by a debt crisis. This kind of depreciation means that it is more expensive for the crisis countries to import but concurrently it is less costly for other countries to import from the crisis countries since the prices of goods in the crisis countries are now cheaper for the other countries. The lower values of the prices can counteract any trade costs that are related to the transportation of goods between countries. In this sense the trade costs become less for the importers which enhances exports from the crisis country, leading to increase in trade.

However, at the same time the crisis applies to the banking system of the crisis country which is problematic for the “country’s export capability”, and in this sense the effect on exports is an empirical question (Ma and Cheng, 2003, p.2). For that reason, in the scope of the present paper is to see the trade performance of debt crisis countries; more commonly known as GIIPS, and in particular investigate whether there is a structural break in the propensity of trade in 2008. Gravity model is exploited since it had been very commonly used so as to assess the effects of international trade, and in general to test the empirical application of trade theories (Grauwe and Skudelny, 2000). Towards this direction, the construction of empirical gravity model contains the logarithmic values of exports, GDPs, as well as the specification of the beginning of the year of observation as the year 1992, and dummy variables for the debt crisis countries which embody trade costs effects.

3.3 Model specification and Data

In general, gravity model is considered to be a very successful model in terms of its empirical power in economics; nevertheless any empirical gravity equation is short of “theoretical foundation”. This can make the results that are derived from an estimation biased due to the existence of omitted variables problem, as well as the inability of performing “comparative static exercises”(Anderson and Wincoop, p.170, 2003). A correct model specification requires that when using cross-sectional data and do not include specific characteristics of each country the resulting estimates are biased into showing for instance the effects of a regional trade agreement on trade.

Nevertheless, the use of panel data models with the inclusion of importer, exporter and time effect gives a better account of countries’ heterogeneity, and as such one can better segregate “country- pair specific effects” that can be related to “geographical, historical, or political contexts”(Carrère,2006,p.230;Egger,2000,p.27). Additionally, the panel data models allow seeing the evolution of the examined variables over time and subsequently distinguishing time or country’s explicit effects (Gómez-Herrera, 2013).The panel data treatment further permits the explanation of the reason that different observable countries behave in a different way as well as clarifying the rationale that different countries act in a dissimilar way through different time stages. It is of significant importance of this paper to observe the changes over different periods such as before and after the year of the crisis for a variety of countries; hence the use of a panel data model can attribute to more efficient estimators than cross-section models, and for this reason a panel model is preferred (Verbeek, 2012).

The panel data framework within a gravity equation that is used to be tested empirically in the present paper is the one which is analytically specified by Anderson & Wincoop (2003). In the empirical model, the dependable variable is the logarithm of export volumes and the “explanatory variables vary over two dimensions” which are countries and time (Verbeek, 2012, p.374). The regression equation looks as follows:

$$\text{Log}(\text{exports}_{ijt}) = \alpha_{ij} + \lambda_t + \beta_1 * \text{log}(\text{mass}_{ijt}) + \beta_2 * \text{gipsxcriseffect}_{ijt} + \beta_3 * \text{gipsmcriseffect}_{ijt} + u_{ijt}$$

(2)

The variable exports_{ijt} represents export volumes from country i to another OECD country j in US dollars, at year t which covers period 1992-2012. The α_{ij} is “country-pair specific fixed effects” which “captures all (un)observables time invariant differences across” countries e.g. price indexes and geographical distance. A year variable (λ_t) as a dummy explanatory variable is included in the empirical model and its value ranges from 1992-2012 in order to see the effect of each year on bilateral exports as it is also associated to “the common business cycle or globalization process over the whole sample of countries” (Egger, 2000, p.27). The mass_{ijt} variable is the product of the GDP of country i and j at year t , reflecting to the economic mass. The gipsxcriseffect is a dummy variable which takes the value 1 if a country is an export debt crisis country after the year of the crisis and zero otherwise; where debt crisis country reflects to Greece, Ireland, Italy, Portugal and Spain and the crisis year is 2008, whereas the gipsmcriseffect is a similar dummy variable with the only difference that the debt crisis country is an importer.

The coefficients of gipsxcriseffect and gipsmcriseffect dummies should mirror the structural changes in trade of the GIIPS after the crisis year 2008 compared to OECD countries export performance. Thus, β_2 and β_3 are the coefficients of interest which allow studying the impact of debt crisis countries on trade. The error terms u_{ijt} “are assumed to be i.i.d with zero mean and constant variance across all” i, j, t (Serlenga & Shin, 2007, p. 363).

Regarding the use of fixed effects, it is preferred because “an unobserved heterogeneous component that is constant over time and which affects each pair of countries of the panel in a different way” can be considered, e.g. “unobserved price indexes”, population, religion (Feenstra, 2002, p.502 ; Gómez-Herrera, 2013, p.1091). Additionally, the fixed effects method is favored because the trade pattern between a certain sample of OECD is examined, and as a result the problem of sample selection can be alleviated. More reasons that support the selection of “fixed export effects” include tariffs, taxes, “bureaucratic legal requirements” and

“geographical and historical” variables whose effect cannot be considered as random (Egger, 2000, p.26).

The sample contains panel data for 34 OECD⁹ countries over the period 1992-2012, with 13826 observations and 702 bilateral trade groups of countries that are examined. The data is bilateral trade so as to separate any outside effects that can exist between countries, such as the fact that a country and its trading partner simultaneously face a crisis, and a country’s trade volumes may be affected by inner and outer surprising events. In addition, bilateral trade data gives the opportunity to use crisis dummies as independent variables for exporters and importers and in such a way keep away wrongly specified dummy variables that bias the results; particularly when looking over “aggregate trade data” (Ma & Cheng, 2013, p.13). More specifically the GDP¹⁰ yearly data for each country (in current U.S. dollars) is taken from the World Development Indicators and the numerical code which gives each country an id number is taken from the geographical region and composition given by the United Nations (United Nations, 2012;The World Bank Group,2014).

Table 2 with the descriptive statistics is provided below so as to give a description about the essential characteristics of the data, and offers more information about the general size of the sample regarding economic mass and trade patterns (Trochim, 2006). As shown below 4% of the observations are represented by GIIPS after the crisis year 2008.

⁹ The countries are listed in Appendix A

¹⁰ “GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources” more information can be found in : http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators#s_g

Table 2

Variables	Obs	Mean	Std. Dev.	Min	Max
<i>exports</i>	13837	1.893.307	2.390.457	6.953.684	2.491.555
<i>mass</i>	13826	5.203.418	210.309	4.461.483	5.795.385
<i>gipsxcriseffect</i>	13837	0.0375804	0.190186	0	1
<i>gipsmcriseffect</i>	13837	0.0375804	0.190186	0	1

4. Results

The “econometric specification” of the gravity model that is used has “both a time and bilateral dimension”, and this “focuses on the short-run determinants of bilateral trade flows” (Egger & Pfaffermayr, 2003, p.578). In this sense the results from the estimation cannot be generalized for long period. The results from the regression of equation (2) are depicted in column (1) of table 3 below and are the outcomes of the benchmark model of the present paper. The logarithmic variable of economic mass has the expected effect on the logarithm of exports, it is positive and significant; as the gravity model states that “trade between a pair of countries is proportional to their combined incomes” (Glick & Rose, 2002, p.1126). One percentage point increase in the logarithm of mass gives approximately 1.07 percentage points increase in bilateral exports, meaning that the larger the countries in terms of economic size, the larger the export volumes as well as it is evident that “the total volume of trade should be higher, the larger the overall economic space”(Egger,2000,p.27).

The coefficients of interest of both dummies are negative and significant. In particular, the coefficient of *gipsxcriseffect* (*gipsmcriseffect*) “measures the relative difference” in trade between GIIPS as exporters (importers) after the crisis year 2008 compared to OECD countries. The difference between GIIPS exporters and other OECDs is -0.2534 as well as between GIIPS importers and other OECD countries is -0.3121 after the crisis. In addition, “it is common in loglinear models to make the direct transformation from the estimated coefficients to percentage changes” by applying the $(\exp(\beta)-1)*100$ rule. In this way, the coefficient of -0.2534 is “interpreted as an expected” export decrease in the GIIPS of approximately 22%, which shows that the exports of the GIIPs experienced a severe drop after the crisis. Respectively, the coefficient of -0.3121 can be explained as an expected severe import decrease of approximately 27% of GIIPS after the crisis comparing to the rest of OECDs (Verbeek, 2012, p. 84). Apparently, the crisis situation which existed in the first place in the global financial economic context and transmitted in the debt crisis countries economic environment created a restrictive effect on trade.

In addition, the year variables have mainly a statistically significant impact on exports after year 2000, which reveals that as the years pass there should be an effect on exports and subsequently on general trade performance. The coefficients of the year dummies before 2000 are statistically insignificant and for this reason are not presented in table 3 below. The largest negative significant effect is seen in year 2009 where GIIPS trade relative to OECD exports decreased by approximately 50%. This shows that the effects of the global financial crisis were mostly felt by the GIIPS economies a year after the crisis's hit in 2008. The largest negative effect in 2009 reveals also that one year after the global financial crisis the effect on trade still pertained, and one can also notice mainly a continuous decrease in relative trade volumes after 2003.

From the empirical model I get a “within estimator” which “exploits variation over time” and “answers the policy question of interest” that is what the effect on trade is after the crisis for the GIIPS countries. A “robust fixed effects within estimator” is favored since it “adds a set of country pair specific intercepts to the equation, and thus exploits only the time-series dimension of the data set around country-pair averages” (Glick & Rose, 2002, p.1127-1131). An economically significant impact of the crisis on GIIPS trade is shown since this varies from 22% to 27%, revealing that the debt crises countries faced a considerable problem associated with a decrease in exports and imports due to the debt crisis. The R^2 of the model is also quite high since it can explain 64% of the variation in exports, showing at the same time a good model concerning the explanation of relative export patterns of the OECDs.

4.1 Robustness checks

Robustness checks are performed in order to see the way that the coefficients of interest β_2 and β_3 “behave when the regression specification is modified in some way, typically by adding or removing repressors” and in such a way further check for “evidence of structural validity” of the model (Lu and White, 2014). Columns (2), (3), (4), and (5) in table 3 below include the results from the different robustness checks that were performed. Initially, a dummy variable that accounts for the EMU creation during the period of investigation is added to equation (2) which becomes:

$$\text{Log(exports}_{ijt}) = \alpha_{ij} + \lambda_t + \beta_1 * \text{log(mass}_{ijt}) + \beta_2 * \text{gipsxcriseffect}_{ijt} + \beta_3 * \text{gipsmcricieffect}_{ijt} + \beta_4 * \text{Emudummyeffect}_{ijt} + u_{ijt} \quad (3)$$

The *emudummyeffect* is a combination of two variables, one of which is a EMU dummy variable that takes the value one if a trade country is a member of the EMU, and zero otherwise. The other variable which also composes the additional variable of EMU effect dummy is a year variable that is specified by the year of the EMU creation and takes values after year 1999.

In column (2) of table 3 it can be seen that with the inclusion of the new variable; *emudummyeffect*, there is a slight change in the coefficients of the *logmass* and *gipsxcriseffect*, while the coefficient of the dummy *gipsmcricieffect* remains exactly the same as in the benchmark model. The formentioned coefficients continue to be statistically significant. However, the *emudummyeffect* seems to have no effect on trade pattern of the GIIPS since it is statistically insignificant. By taking a closer look at column (2), when the economic mass increases by one percentage point the exports increase by approximately 1.07 percentage points as it is also expected from the theoretical underpin of the gravity model. Regarding the coefficients of interest, when debt crisis countries are exporters, this negatively affects their export patterns relative to OECD countries by approximately 0.2588 which is 23%, and when the debt crisis countries are importers it as well affects their imports in a negative way by approximately 27%, both for the crisis year 2008. The R^2 of the robust model however is similar to the one of the benchmark's model, meaning that the benchmark model gives a good account of the exports variation.

Moreover, the insignificant result of the *emudummyeffect* is opposed to previous empirical research as the one of Micco et al. (2003). In that paper it was shown that the monetary union increased trade within EMU as well as for non EMU members by exploring panel data for 22 developed countries for the period 1992-2002 with the use of gravity model. It is further supported that there are different ways with which the monetary union can affect trade. The most important one is through the removal of transaction costs in the course of the decrease of "exchange rate volatility", since with a common currency a fixed exchange rate exists. A fixed

exchange rate regime can increase markets' transparency as well as competition between firms that are located in different countries. Besides, when having a common currency it is equivalent as adopting a "more liquid currency", with which the monetary union can give its members the opportunity to have less exchange rate risk when they trade with other countries, and as a result trade can be possibly increased (Micco et al., 2003, p.322). The difference in the significance of the EMU effect in the present essay comparing to the finding in Micco et al. (2003) can be possibly attributed to the different periods of investigation; since here more years are considered as well as a crisis hit of the economic system is also accounted when extending the periods of research.

The crisis effects on debt crisis countries seem to be so strong that cover any positive effect the EMU creation can have on trade. Even though debt crisis countries are EMU members this gives the impression to worsen the effect on relative exports to OECD countries. One reason for that, which had been also supported by the literature, is that monetary unions may have a cost for member countries since they are not allowed to have their national monetary policy with which they can smooth business cycles (Rose & Wincoop, 2001).

What is more, a second robustness check is performed by changing the crisis year in the construction of the main dummies of observation *gipsxcriseffect* and *gipsmcriseffect*. In column (3) the crisis year is after 2008, in column (4) after 2009, and in column (5) after 2010. The coefficients of the logarithm of economic mass in all the robustness checks vary from 1.06% to 1.07%. Comparing to the benchmark model, in the robust model as presented in column (3), the coefficients of *gipsxcriseffect* and *gipsmcriseffect* decrease to 17% and 26% respectively. The year dummies before year 2000 continue to be insignificant, and the coefficients for 2002 and 2003 are statistically insignificant as well. The largest negative effect can be seen in 2008 by an export decrease of 52%. The R^2 is very close to the benchmark's model, explaining approximately 64% of the exports variation.

The robust results in column (4); comparing to column (1), show that when debt crisis countries are exporters, the negative effect on exports is now less with a decrease of 15 percentage points. In the case of the debt crisis countries being importers, this affects imports

as reducing them by approximately 27%. Additionally, the year dummies before 2000, year 2002 and 2003 are statistically insignificant with the largest negative effect on exports observed in 2009, when exports decreased by approximately 58%. The R^2 of the model though is the very similar to the one in the benchmark model, explaining 64% of the exports' variance.

In column (5) the coefficient of the *gipsxcriseffect* dummy is statistically insignificant suggesting a short lived effect in exports due to the debt crisis, whereas the coefficient of the dummy *gipsmcriseffect* is significant and negatively affects imports of the GIIPS by approximately 29%. The year dummies before 2000 and year 2002 are statistically insignificant in addition to the largest negative effect of approximately 59% which is observed in 2009.

To sum up, with the robustness checks; as presented in the last three columns of the table below, it is tried to capture the incoming effect for the debt crisis countries on exports and imports or in other words when the effect actually kicked in. It seems that when the start of the crisis year is 2008 (column 1) the effect for the debt crisis countries both as importers and exporters persists. As soon as the year of the crisis is set to 2009 (column 3) the negative effect for debt crisis countries on exports and imports is less comparing to the case when the crisis year is 2008 as it decreases from 22% to 17% and from 27% to 26% respectively. When the crisis year is set to 2010(column 4) the effect for the GIIPS exports is getting even smaller, as it is 15%, but the negative impact for the GIIPS as importers actually increases to 27%. By setting 2011 as the year of the crisis (column 5) the effect on GIIPS exports is insignificant in contrast to the one on imports which increases to 29%. Thus, the largest negative effect on exports for GIIPS is kicked in year 2008 and on imports in 2011.

Table 3- Benchmark model and Robustness checks

logexports					
Variables	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)
<i>logmass</i>	1.695 (0.000)	1.686 (0.000)	1.676 (0.000)	1.639 (0.000)	1.684 (0.000)
<i>gipsxcriseffect</i>	-0.2534 (0.000)	-0.2588 (0.000)	-0.1939 (0.000)	-0.1655 (0.013)	-0.0694 (0.183)
<i>gipsmcriseffect</i>	-0.3121 (0.000)	-0.3121 (0.000)	-0.3055 (0.000)	-0.3195 (0.000)	-0.3394 (0.000)
<i>Emudummyeffect</i>		0.0152 (0.735)			
Year					
<i>2000</i>	0.1842 (0.000)	0.1794 (0.000)	0.1826 (0.000)	0.1823 (0.000)	0.1799 (0.000)
<i>2001</i>	0.2103 (0.000)	0.2055 (0.000)	0.2087 (0.000)	0.2084 (0.000)	0.2050 (0.000)
<i>2002</i>	0.0717 (0.142)	0.0670 (0.208)	0.0704 (0.151)	0.0709 (0.151)	0.0665 (0.179)
<i>2003</i>	-0.1146 (0.050)	-0.1189 (0.054)	-0.1152 (0.050)	-0.1134 (0.056)	-0.1194 (0.045)
<i>2004</i>	-0.2183 (0.001)	-0.2222 (0.002)	-0.2182 (0.001)	-0.2152 (0.002)	-0.2227 (0.001)
<i>2005</i>	0.2773 (0.000)	-0.2811 (0.000)	-0.2769 (0.000)	-0.2732 (0.000)	-0.2915 (0.000)
<i>2006</i>	-0.3044 (0.000)	-0.3081 (0.000)	-0.3037 (0.000)	-0.2994 (0.000)	-0.3084 (0.000)
<i>2007</i>	-0.4527 (0.000)	-0.4560 (0.000)	-0.4513 (0.000)	-0.4459 (0.000)	-0.4563 (0.000)
<i>2008</i>	0.4417 (0.000)	-0.4441 (0.000)	-0.5238 (0.000)	-0.5178 (0.000)	-0.5299 (0.000)

2009	-0.4988	-0.5014	-0.5075	-0.5764	-0.5864
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2010	-0.4571	-0.4596	-0.4655	-0.4679	-0.5444
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2011	-0.4797	-0.4821	-0.4878	-0.4895	-0.5063
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2012	-0.4376	-0.4400	-0.4458	-0.4478	-0.4643
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2 -within	0.6436	0.6436	0.6419	0.6408	0.6401
Observations	13826	13826	13826	13826	13826

p-values are in parentheses and significance level is 5%
There is no * to indicate the significant variables because most of them are significant and the insignificant ones are stated in the text.

5. Summary and conclusions

This paper offers an empirical investigation of the GIIPS debt crisis effects relative to the OECD countries in terms of trade. The analysis covers the period 1992-2012 by using panel data estimation techniques with the use of gravity model, which is extended with dummy variables so as to gather the crisis effects in the most efficient way. Robustness checks regarding the European Monetary Union's effect as well the investigation of the kicked in year effect of the debt crisis in GIIPS trade performance were performed so that additionally test the validity of the paper's benchmark model.

The empirical results discovered in the present paper answer the research question about the effect of debt crisis euro area countries on their trade patterns relative to the export performance of OECD countries. According to the estimators' momentous negative values which vary from 17% to 29%, the debt crisis in GIIPS showed to significantly deteriorate its trade patterns, revealing that the debt crisis in GIIPS was severe. In addition, the robustness checks captured that the incoming effect for the debt crisis countries on exports is kicked in year 2008 and disappears later, but for imports the negative effect persists throughout the whole period of investigation and kicked in 2011. Additionally, the fact that GIIPS countries are EMU members is an unimportant component for the crisis effect on GIIPS trade performance. Last but not least, the papers' findings regarding the effect of economic mass on trade patterns go in line with the theoretical foundation of the gravity model because during the whole period of research the combination of the GDPs of the trade partners; known as economic mass, gives a positive and significant effect on exports, and hence the larger a country is the more exports it has. To summarize, there is a considerably large effect on the debt crisis countries' trade patterns which shows a structural break before and after the crisis.

Lastly, the period of investigation was chosen to be 1992-2012 mainly because data was not available after year 2012 which restricted the exploration of more years to see and compare the effects of crisis. Therefore, as an aim of further research could be to extend the period of observation and in such a way distinguish possible stronger and long lasting effects of debt crisis on trade patterns. As a purpose of further research, it can as well be considered to

investigate the transmission of the effects from debt crisis countries to the rest of OECD countries. As Forbes (2012) argued that a crisis can be mitigated to a trade partner of a crisis country through economic and trade connections in an easier manner. An event of a crisis is shown to infect debt crisis country's income which consequently influences the respective demand for imports. Accordingly, these imports which are simultaneously the exports of a trade partner decrease since bilateral trade transactions exist. This in fact can have negative effects to a trade partner whose economy is not in crisis. As a result, trade can be the important channel through which a crisis is contaminated from one country to the other. Debt crisis's transmission influence on trade can be evident as exports or imports may decline in both crisis and non-crisis countries, and this can be an empirical question for further research.

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7. Appendix – Countries in Sample¹¹

Australia	Germany	Mexico	Switzerland
Austria	Greece	Netherlands	Turkey
Belgium	Hungary	New Zealand	United Kingdom
Canada	Iceland	Norway	United States
Chile	Ireland	Poland	
Czech Republic	Israel	Portugal	
Denmark	Italy	Slovak Republic	
Estonia	Japan	Slovenia	
Finland	Korea	Spain	
France	Luxembourg	Sweden	

¹¹ The list was taken from <http://www.oecd.org/about/membersandpartners/list-oecd-member-countries.htm>