

# The effects of joining the EU on value-added trade

An empirical analysis

## Abstract

This paper aims to find the effects of joining the European Union and the Euro area on value-added trade and 'openness' of the countries towards international trade, using panel data of the 12 countries that joined the EU in 2004 and 2007, of which 7 also joined the Euro area. The research period is from 1995 to 2011, and control variables on education, unemployment and the countries' gdp were used. Loosely based on the 'five stylized facts' from Johnson (2014) and Johnson and Noguera (2014), four hypotheses were used to assess the effects of joining the EU and the Euro area on value-added trade, in absolute terms and as a percentage of total GDP of the respective countries. The results show that the effects of joining the European Union and the Euro area seem to be positive, but there are big differences across sectors, which coincides with findings of the existing literature.

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Date: 16 August 2016  
Word count: 7417

## **Introduction**

With Great Britain's vote on leaving the European Union, the issue of the positive and negative consequences of being in, or joining, the European Union seems to be as relevant as ever. Citizens of many other countries have voiced their concern about the extent to which a country should be involved in an agreement of such magnitude. An example of this is the Netherlands voting not to accept the European constitution in 2005, with 61,5 percent of the voters voting 'no' (Europa Nu, 2016). This result was seconded by the French population, with 56 percent of the voters rejecting the European constitution (Washington Post, 2016). A more recent example was the referendum for the association agreement with Ukraine which, again, was voted on negatively by the Dutch people, with an overwhelming majority of 64% (The Guardian, 2016). These results may be exemplary of the general opinion of the European citizens towards the European Union and its degree of integration, but the fact is that the European Union tends to ignore these results and expand anyway. Evidence of this, regarding the first referendum, was the Lisbon Treaty, a slightly watered down version of the European constitution many citizens rejected (Europa Nu, 2016).

One of the reasons many politicians are proponents of an integrated union is the supposedly positive effect on international trade. Abolishing trade barriers, both tariff and non-tariff, has influenced the involvement of the European countries in international trade greatly (Nitch, 2000). With international trade increasing and the European countries more open than ever, vertical trade, or the share of trade in inputs, has been increasing significantly (Daudin, Riffart, & Schweisguth, 2011). Value-added trade, which will be elaborated on further in the theoretical framework, captures the value that is added within a country's borders. This way, a better understanding of the 'real' size of the economy can be seen, more than when one only looks at final expenditure. For instance, a country can have a large manufacturing trade sector, but if only a small part of this value is added within the country the final expenditure shows an artificially inflated size of the sector. Especially when countries are small and have open economies, such as The Netherlands or Belgium, these numbers can differ quite significantly.

The aim of this research is to find if joining the European Union and the Euro area has an effect on the value-added trade, both in absolute terms and as a percentage of total GDP of the respective countries. The ratio of value-added trade to GDP is a measure of 'openness', as it represents the portion of the added value that is traded internationally. By this, the paper aims to find if countries have become more 'open' towards international trade since joining the European Union. Since 2004, 13 countries have joined the European Union. Of those 13, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic and Slovenia joined in 2004, Bulgaria and Romania in 2007 and Croatia in 2013. Due to the short period since joining, Croatia was not included in this research, thus focusing on 12 countries. Of these countries, five (the Czech Republic, Hungary, Poland, Bulgaria and Romania) did not join the Euro area, the others did.

There are several interesting papers on the subject of value-added trade, on the trends of it and the effects of joining trade agreements. For instance, Johnston and Noguera (2014) find there are five by them called ‘stylized facts’ to be seen in the trends of value-added trade. Using a sample of 42 countries, highly involved in international trade from 1970 to 2009, they find that the ratio of value-added trade to gross exports has been falling on average by 10 percent worldwide over this period. They also find a negative effect of joining (bilateral) trade agreements and that the effect varies greatly across sectors (Johnson & Noguera, 2014). Daudin, Riffart and Schweisguth (2011) and Johnson (2014) highlight ways to calculate the value-added export correctly and find that the closer countries are to other countries, the greater the difference between value-added and regular GDP. This papers aims to test these facts and findings on two different ways of measuring value-added trade, being in absolute terms and relative to GDP. On the basis of this, the following research question was chosen:

*What is the effect of joining the European Union on the value-added export of a country?*

This question was answered by using panel data of the 12 countries that joined the European Union in 2004 and 2007 over a period of 17 years, from 1995 to 2011. This way, it was possible to use at least 9 years before and at least 4 years after joining the European Union for every country in the sample. The effect was researched in several ways. First, the absolute effect was measured by using the absolute value of the value-added trade as the dependent variable. Second, the effect on the ratio of value-added exports to GDP, explained previously, was measured by using the absolute value of the value-added trade divided by the respective year’s and countries’ total GDP as the dependent variable. Third, the difference between only joining the European Union and joining both the European Union and the Euro area was measured. And last, the difference between the effects on value-added export across sectors was measured by using four different sectors, being agriculture and non-machinery, manufacturing, transport and services. Only in absolute terms, because ‘openness’ of a sector is not such a relevant issue and the same effect when one divides by, and controls for, a country’s total GDP.

The research was done with panel data (fixed effect) regressions, which isolates both year-specific and non-country-specific conditions by using year- and cross section dummy variables, to find the effect of joining the European Union and Euro area. This was done using data from the World Input-Output Database on the value-added export of the countries used (Timmer, Dietzenbacher, Stehrer, & de Vries, 2015). Control variables on education and unemployment within a country were obtained from the Worldbank database. Using these variables, several fixed effect OLS regression models were built for each of the researched effects. The data and methodology sections will elaborate more on this.

This papers aims to add to the existing literature on the effect of joining the European Union on value-added trade, by looking at both the effects on value-added trade in absolute terms and relative to GDP. These were both thought to be interesting, but several papers only focus on the ratio of value-added Exports total exports. As it seems obvious that more international trade could both benefit a

country and influence the mentioned ratio negatively, the effect on the absolute value of value-added trade could add something to this literature. Furthermore, no studies were found which examine the recent additions of the 12 countries to the EU with respect to value-added trade. Furthermore, the analysis of the effect on the different sectors includes four different sectors, as opposed to the two sectors that are usually used, manufacturing and service (Johnson, 2014). This way, the paper aims to highlight the difference between the effects on for instance the agriculture and transport sectors.

The next section of the paper will entail a theoretical framework, in which some theoretical concepts will be explained further and a literature review will be presented. After that, data and methodology will be elaborated on. Then, the results will be presented, including the best-fitting models that were found. The last section will be a conclusion, in which the research question will be answered and the limitations of the paper and recommendations for further research will be discussed.

## **Theoretical Framework**

This section aims to clarify several concepts to the reader, present a more complete overview of the research that has already been done and presents the hypotheses which will be used to answer the research question. First, a few theoretical concepts.

### **Value-added trade**

Value-added trade is defined as it is in the paper ‘Accounting for Intermediates: Production Sharing and Trade in Value Added’ by Robert C. Johnson and Guillermo Noguera (2012) which states: “Value-added exports measure the amount of domestic value-added embodied in final expenditure in each destination” (Johnson & Noguera, 2012). It highlights the fact that the ‘real’ value of what is produced in a country, as opposed to what is only imported and quickly exported again, is the amount of value that is created and added to a product within the borders of a country. This way, products that have value that is exported but created almost entirely abroad do not weigh as heavy as they do in the final expenditure. In times of increasing international trade, especially when countries are relatively small and close as they are in EU, this can be quite a difference. For example, the Netherlands are one of the biggest exporters in the world, but in 2010 the value-added was only 46,25 percent of total exports (World Input-Output Database, 2016).

Moreover, to show why value-added might be important to focus on, a nice real-world example taken from Benhamou (2005) about Burberry: “Burberry sends perfume bottles from France to Shanghai to be decorated with a Scottish pattern before bringing them back to be sold on the French market. Standard trade statistics suggest that France is exporting perfume bottles to China and China is exporting perfume bottles to France. Yet France does not export anything for Chinese consumption, as the perfume bottles are consumed in France. China simply exports decoration for French consumption. Suppose the pigments used for the decoration of the perfume bottles are imported by China from Japan. This Japan-

China trade flow does not mean that China consumes Japanese products, as the final consumer is in France” (Benhamou, 2005). This example highlights how complex vertical international trade is today and why final expenditure does not show the value that is actually created within a country. Value-added trade can be calculated in several ways, but the most common is by using Input-Output tables, which register the intermediate products that enter and leave the country within a year. By calculating the differences for each sector, one finds the value that was added in the country itself in that year. For this research, existing data on value-added exports were used so no such calculations were needed.

### **The European Union and the Euro area**

The European Union is an economic and political union between, at the moment, 28 European countries. Created in 1958, it aims to work together on several issues not only on trade but also the environment, security and migration. The single or 'internal' market is the EU's main economic engine, enabling most goods, services, money and people to move freely (European Union, 2016). The Euro area is comprised of the countries that wanted to not only be part of the union but also adopt the single currency, the Euro. As mentioned before, seven of the twelve countries in the sample have chosen this option, five have not.

### **Literature Review**

Several papers have been written about value-added trade and what influences it, mostly taken as a ratio to gross exports. Johnson (2014) writes about five ‘stylized facts’ of which some will be examined in a different setting in this paper. Johnson and Noguera (2014) further elaborates on these facts, while Daudin, Riffart and Schweisguth (2011) describe the importance of using value-added exports instead of gross exports as the measure of international trade and wealth. Because these papers all use the ratio of value-added exports to total exports and to highlight the importance of the absolute value of the value-added export, the following first hypothesis was chosen:

*H<sub>1</sub>: Absolute value-added export increases after joining the European Union*

The first stylized fact that Johnson (2014) writes about is that the ratio of bilateral value-added to gross exports has declined significantly. He uses the same database as this paper uses, the World Input-Output database and concludes that since 1970 the worldwide ratio of value-added to gross exports has declined on average by 10 percent (Johnson, 2014). Johnson and Noguera (2014) find that the decline has mostly come after 1990 and that trade agreements do worsen the ratio. This paper, as explained before, uses the ratio of value-added trade to GDP to measure the ‘openness’ of a country. Because this openness is expected to increase after joining the European Union, the following second hypothesis was formulated:

*H<sub>2</sub>: The ratio of value-added export to GDP increases after joining the European Union*

Johnson and Noguera make a distinction between six different kinds of trade agreements, ranging from preferential trade agreements to economic unions, in order of shallow to deep (Johnson and Noguera, 2014). They find that the ‘deeper’ agreements have a stronger effect than the shallower agreements. This paper assumes that being both a member of the European Union and the Euro area could be defined as a ‘deeper’ agreement than only being a member of the European Union, thus the third hypothesis is:

*H<sub>3</sub>: The effect of joining the EU and the Euro area on the absolute value-added trade and the ratio of value-added trade to GDP is bigger than the effect of only joining the EU*

The third stylized fact by Johnson (2014) states that there is a large difference in the ratio of value-added exports to gross exports between different sectors. Of course, these sectors also have different weights within the GDP, as each country has its more and less important sectors. This results in different compositions of sectors which have different ratios of value-added trade to both gross exports and total GDP for every country. That is also the reason for stylized fact number five, which states that the “changes in value-added relative to gross exports have been heterogeneous across countries and bilateral trade partners” (Johnson, 2014). Thus, there may be different effects, even within close and open countries such as the ones who joined the EU and the Euro area. Moreover, for the world as a whole the share of gross export of manufacturing is 67 percent, but of value-added only 39. Services account for 20 percent of gross exports, but 41 percent of value-added (Johnson, 2014). Johnson and Noguera (2014) also conclude that the ratio of value-added to gross exports has fallen for manufacturing and total value-added trade, but actually risen outside of manufacturing. On the basis of these results, the following fourth and final hypothesis will be used to answer the research question:

*H<sub>4</sub>: The effect of joining the EU and Euro area on the absolute value-added trade differs between the exporting sectors agriculture and non-machinery, manufacturing, transport and services*

## **Data**

As stated in the introduction, data from the World Input-Output Database was used to obtain the values of the value-added exports of the 12 countries. The World Input-Output Database (WIOD) is a public database that provides time-series of world input-output tables for forty countries worldwide, covering the period from 1995 to 2011 (World Input-Output Database, 2016). This data is obtained for 35 different sectors ranging from agriculture, construction and inland transport to education. All sectors together add up to the total of value-added trade in a year. The data on value-added are presented in millions of 2012 dollars, which makes it easy to compare them between countries.

To test the first hypothesis, the total value-added export had to be calculated. This was done by aggregating the value-added export of the different sectors into the total value-added export, for every country and every year, creating the panel data needed for the analysis with 12 countries and 17 years, amounting to 204 observations per variable. To test the second hypothesis, the ratio of value-added to

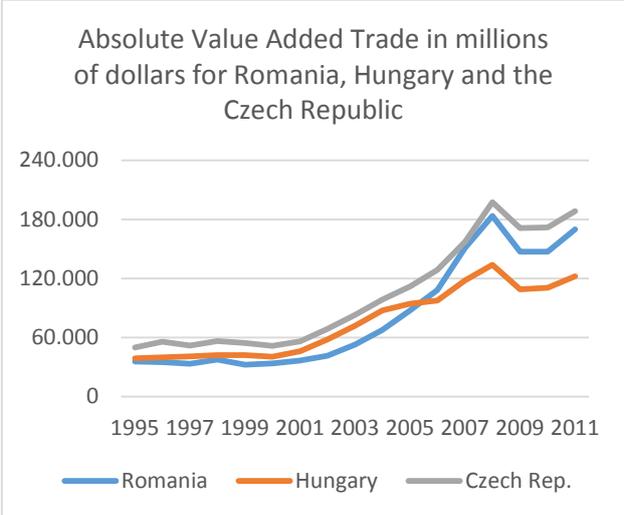
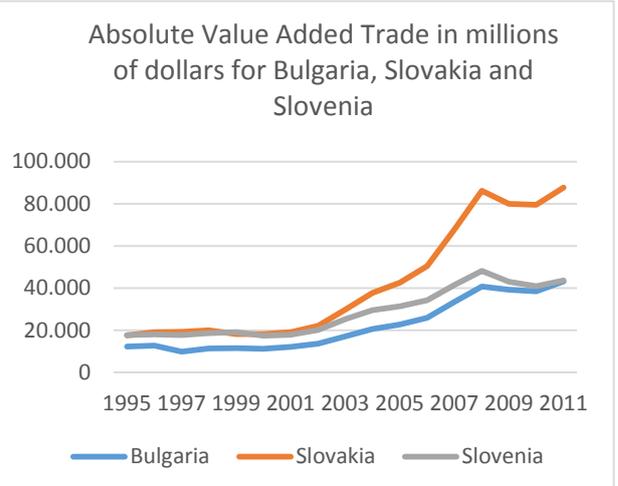
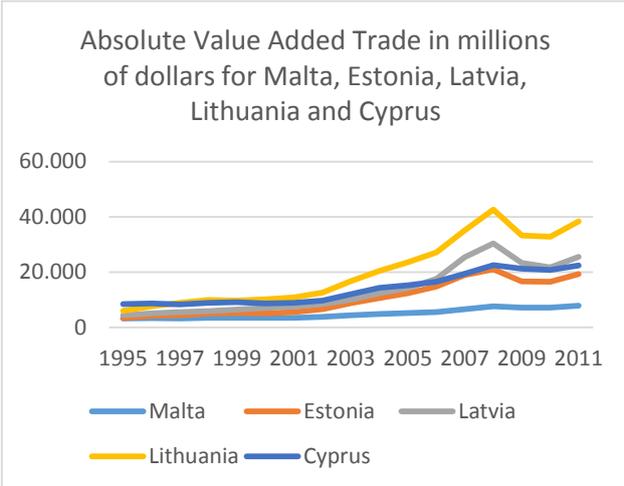
GDP was calculated by dividing the value-added exports by the respective GDP of every country and year. To test the third hypothesis, the same variables were used with respect to the value-added trade, so no extra calculations had to be made for the dependent variables.

To test the fourth hypothesis, the value-added trade was divided into four categories, being agriculture and non-machinery, manufacturing, transport and services. Other papers use only manufacturing and services, but agriculture and non-machinery and transport were included because there are large differences between the relative sizes between the countries. In appendix 1, there is a table with the complete division of the sectors. For each of these categories, for each country and year, totals were calculated.

Figures 1 through 4 show the absolute value of the value-added trade for the countries, divided in four groups on the basis on their size. The difference between Poland and the rest of the countries, in terms of the absolute value-added trade, is so large that this country required its own graph. These graphs show, for each country, what growth their absolute value-added trade has been through since 1995, the start of the research period.

**Figure 1: Absolute value-added trade for the 5 smallest countries**

**Figure 2: Absolute value-added trade for 3 smaller countries**



**Figure 3: Absolute value-added trade for 3 bigger countries**

**Figure 4: Absolute value-added trade for Poland**

What becomes clear from looking at the graphs is that all countries grew in their value-added trade over time, since 1995. Keeping the large globalization in mind, this is not such an unexpected finding. But, for instance by looking at graph 1, some countries have grown significantly faster than others. As an example of this, in 1995 Cyprus had a higher (but relatively comparable) value-added trade than Lithuania, but between 1995 and 2011 Lithuania's value-added trade grew to almost double that of Cyprus. Furthermore, looking at graphs 2 and 3 it can be seen that Romania and Bulgaria, the countries that entered the European Union in 2007 rather than 2004, started growing later than the others. Then again, these two countries did eventually grow comparably fast and in some cases faster, for instance when comparing Hungary and Romania in graph 3. All countries do seem to have a comparable growth path, with a positive growth from the turn of the century until the start of the global economic crisis, followed by a dip and a return to positive growth rate again in 2011. To provide an even clearer picture of the data, appendix 2 shows descriptive statistics of the value-added trade over time, for each of the countries in the sample.

As the primarily used method of this paper, which will be elaborated on further in the methodology section, is a fixed effect OLS regression, control variables were needed. These will be described in the next section.

### **Control variables**

The control variables were obtained from the Worldbank open database. This database has data on a wide variety of indicators of several socio-economic variables of which the variables regarding education, GDP and unemployment were used in this paper (Worldbank, 2016). As the method that was used was a fixed effect OLS regression (which will be explained further in the next section), there was no need to control for non-country specific variables such as the world GDP, world education level and world unemployment, as these are equal for all countries, given the year. To control for other socio-economic states, three different educational variables were used.

First, the gross enrolment in both primary and secondary school as a percentage of the population was used. This way, the general level of education could be assessed. Second, the ratio of workers with a tertiary education to the total labor force was used, so the significance of the ratio of high-skilled laborers could be calculated. These educational control variables were added in the research because the general education level can be a factor in determining the value-added trade. For instance, a country with a higher educational level will generally produce more in the manufactured sector, which normally has a lower percentage of value added, due to for instance a lot of vertical trade. This will influence the value-added trade, but has nothing to do (at least not directly) with joining the European Union or Euro area.

Third, unemployment as a percentage of the total labor force was used to account for the country-specific business cycle because, especially on the absolute value-added trade, the business cycle can have a strong influence. Unemployment is here thus used as a proxy for the business cycle, which is certainly not uncommon. Moreover, as the economy goes up or down, the absolute value trade will generally follow suit. And last, the countries' GDP was added as a control. As does the business cycle, it goes without saying that a country's GDP has a strong influence on at least the absolute value-added trade. When the percentage of added value does not change but GDP goes up, the absolute value-added trade will also rise. If GDP would not be controlled for, this might end up wrongly being interpreted as effects of joining the European Union or Euro area.

## Methodology

This section elaborates on the methods that were used to test the hypotheses, with which the aim was to answer the research question sufficiently.

To test the first hypothesis, which states that the 'absolute value-added export increases after joining the European Union', the aforementioned panel data on the absolute value of total value-added exports was used as the dependent variable. Using panel data OLS regressions, several models were estimated. To simplify the interpretation of the dependent variables which, in the case of the absolute value-added trade, are of course very large numbers, the dependent variable was transformed to a logarithm. All of the equations thus have the following form:

$$\log(TiVA\_absolute)_{i,t} = \beta_0 + \beta_1 * joining\_EU_{i,t} + \beta_2 * joining\_Euro\_area_{i,t} + \beta_x * X_{i,t} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

where  $\beta_0$  is the constant,  $\beta_1$  and  $\beta_2$  are the effects of joining the EU and Euro area, respectively, and  $\beta_x$  is the effect of all control variables which are here pooled in X, and error term  $\varepsilon$ . Moreover,  $\alpha_i$  and  $\alpha_t$  depict the fixed effects of the country and year, and terms  $i$  and  $t$  depict the country and the year, respectively. This was deemed to be the most effective model in testing all the hypotheses with panel data and the multiple control variables. For each of the hypotheses several regression models were built, first trying to show the effect of joining the European Union and the Euro area by only controlling for GDP, then with all the control variables added. GDP was added in all models because it has such a strong influence on trade that it was thought not to be interesting to show the models without that control variable. To show the difference between the controls for education and unemployment, the first model with control variables only shows controls for education and the last model also includes unemployment. For significance the levels of 1-percent, 5-percent and 10-percent were used. Only the coefficients of the significant control variables can be interpreted, but for completeness also the insignificant control variables were shown in the models. The effect of joining the European Union and the Euro area were

always shown, to indicate the (in-)significance of the effect. To evaluate the predictive power of the models, the  $R^2$  was used.

To assess the effect of joining the European Union and the Euro area, two dummy variables were created. The dummy for joining the European Union takes value 1 from the year that the countries joined the European Union and 0 before that year. This means for ten countries it takes 1 from 2004 onwards and for the other two from 2007. As stated in the introduction, this is the case for all countries except for Bulgaria and Romania. The dummy for the Euro area takes value 1 from the year that the country joined the Euro area, and 0 before that year. As stated in the introduction, all countries joined both the EU and the Euro area except for the Czech Republic, Hungary, Poland, Bulgaria and Romania, which did join the European Union but not the Euro area.

To test the second hypothesis, which states that ‘the ratio of value-added export to GDP increases after joining the European Union’, was tested in a similar manner. Again, (fixed effect) OLS regression models were built with the logarithm of the ratio of value-added to GDP as a dependent variable. To test the third hypothesis, which states that ‘the effect of joining the EU and the Euro area on the absolute value-added trade and the ratio of value-added trade to GDP is bigger than the effect of only joining the EU’, the best-fitting models of both the absolute value of value-added trade and the ratio of value-added trade to GDP were compared. By comparing the coefficients of joining the EU and the Euro area within and between the models and their significance, the difference between joining the EU and the Eurozone and the EU was discussed. The effect of only joining the Euro area, by estimating a model without including the dummy variable for joining the European Union, was omitted from the research because it is not possible for countries to be in this situation. There are (to date) no countries that have joined the Euro area but did not join the European Union. Because of this, the effect of joining the Euro area is defined as being conditional on the fact of joining the European Union. Because it is possible for countries to only join the European Union, these effects were chosen to be represented as separate dummy variables.

To test the fourth hypothesis, which states that ‘The effect of joining the EU and Euro area on the absolute value-added trade differs between the exporting sectors’, several models were built, for each of the sectors, the paper presents and discusses the ones with all control variables for every sector and dependent variable. These models were compared on the effect of joining the EU and Euro area and their respective significance and predictive power. Moreover, significant control variables were compared, which proved to differ quite a bit between the different sectors.

## Results

In this section, the results of the testing of the four stated hypotheses are presented and discussed. To begin, the first hypothesis was:

$$H_1: \text{Absolute value-added export increases after joining the European Union}$$

This was tested by using panel data fixed effect OLS regression models with the logarithm of the absolute value-added trade as the dependent variable, dummy variables for joining the European Union and the Euro area and several controlling variables for education and unemployment. The results of this analysis are presented in table 1.

	Logarithm of Trade in Value- Added (absolute)			
Model number	1.1	1.2	1.3	1.4
Joining the EU	.060** (.026)	.031 (.025)	.039* (.021)	.040* (.021)
Joining the Euro area		.063*** (.016)	.052*** (.016)	.051*** (.016)
Gross enrolment – primary education (ratio to population)			.003*** (.001)	.003*** (.001)
Gross enrolment – secondary education (ratio to population)			.002 (.001)	.002 (.001)
Tertiary education finished (ratio to labor force)			.002 (.002)	.002 (.002)
Unemployment (ratio to labor force)				-.001 (.002)
Logarithm of GDP	.965*** (.043)	.988*** (.016)	.946*** (.005)	.946*** (.005)
Observations	204	204	204	204
R <sup>2</sup>	.998	.998	.998	.998

Table 1: panel data regression models for the absolute value of value-added trade. Significant at \* = 10%, \*\* = 5%, \*\*\* = 1%. Heteroskedastic-robust Standard-errors (White) in parentheses.

The results seem to show that there is a significant, although only just, positive effect of joining the European Union on the absolute value-added trade, also when controlling for the joining of the Euro area. Model 1.4, the model with all available control variables, shows a positive effect of joining the European Union at the 10 percent level of 0.040. This means that, on average, the absolute value-added trade of a country is approximately 4 percent higher after joining the European Union, controlling for joining the Euro area, education, unemployment and GDP. This seems to indicate that, at least in absolute terms, joining the European Union can have sufficient positive effects on absolute value-added trade, thus that after joining the European Union more added value will be exported. Intuitively it is to

be expected when, for instance, all trade barriers are abolished between member countries after joining the Union. Already here it is obvious that there is an additional positive effect of joining the Euro area on absolute value-added trade, which will be further discussed at the third hypothesis.

The significance of the control variables seems to indicate that, as expected, GDP has a strong influence on the absolute value-added trade, but it is (at least in this dataset) not influenced by education or unemployment, as all the effects of these control variables are insignificant. The best-fitting model has a  $R^2$  of 0.998, which indicates that 99,8% of the dependent variable can be explained by the independent variables.

As the effect of joining the EU has a significant positive influence on value-added trade, the first hypothesis is confirmed, joining the European Union does have a significant positive effect on the absolute value of value-added trade, with and without controlling for joining the Euro area. Next, the results regarding the second hypothesis are presented.

*H<sub>2</sub>: The ratio of value-added export to GDP increases after joining the European Union.*

Table 2 presents the results of the models built for the purpose of testing this hypothesis.

	Logarithm of Trade in Value-Added (relative to GDP)	Logarithm of Trade in Value-Added (relative to GDP)	Logarithm of Trade in Value-Added (relative to GDP)	Logarithm of Trade in Value-Added (relative to GDP)
Model number	2.1	2.2	2.3	2.4
Joining the EU	.052** (.023)	.029 (.023)	.035* (.019)	.036* (.019)
Joining the Euro area		.050*** (.013)	.039*** (.013)	.039*** (.013)
Gross enrolment – primary education (ratio to population)			.003*** (.001)	.003*** (.001)
Gross enrolment – secondary education (ratio to population)			.002 (.001)	.002 (.001)
Tertiary education finished (ratio to labor force)			.002 (.002)	.002 (.002)
Unemployment (ratio to labor force)				-.001 (.001)
Logarithm of GDP	-.036 (.041)	-.018 (.039)	-.046 (.369)	-.051 (.338)
Observations	204	204	204	204
R <sup>2</sup>	.489	.520	.544	.545

Table 2: Panel data regression models for the ratio of value-added trade to GDP. Significant at \* = 10%, \*\* = 5%, \*\*\* = 1%. Heteroskedastic-robust Standard-errors (White) in parentheses.

The models in table 2 show the effect of joining the European Union controlling for, amongst others, joining the Euro area. Again, in the complete model 2.4 there is a significant positive effect, but only just significant at the 10 percent level. This means that, on average, the ratio of value-added trade to total GDP is 3,6 percent higher than before joining the European Union. So, after joining the European Union, countries transfer 3,6 percent more of their added value abroad, instead of consuming it at home. This seems to show that the admission to the European Union has a significant positive effect on the ‘openness’ of a country, at least on international trade. Of course one cannot say that on the basis of these results a country will always be better off, but international trade, at least in terms of the trade in value-added products, seems to increase.

The models with the effect of joining the Euro area all have similar  $R^2$  values, with a value of 0.545 of the complete model number 2.4. That means that the models do explain about half of the variation in the dependent variable, which is a lot lower than in the models explaining the absolute value. This can be explained by the fact that all control variables except for gross enrolment in primary education do not have a significant effect, which points towards the possibility that there are other variables, not included in this research, that do explain part of it. As the hypothesis stated that there would be an increase in the ratio of value-added trade to GDP and the found effect is significant and positive, the second hypothesis is confirmed. This seems to indicate that although (as was found in previous literature) the ratio of value-added exports to total exports declines, this is not the case when looking at the ratio of value-added exports to GDP. This means that although a country may, on average, add proportionally less value to its own exports after joining the European Union, it does become more open to international trade. These two findings together make the previous finding, that joining the European Union has a positive effect on the absolute value-added trade, a probable one.

This section presents the results regarding the third hypothesis, which was stated as the following:

*H<sub>3</sub>: The effect of joining the EU and the Euro area on the absolute value-added trade and the ratio of value-added trade to GDP is bigger than the effect of only joining the EU.*

This hypothesis was tested by comparing the effects of joining the European Union and the Euro area in the models that were built for the testing of the last two hypotheses, namely model 1.4 and 2.4, which can be found in the previously presented tables 1 and 2. The complete models with all control variables are used to compare, to give the most extensive view as possible. This way, the effect of joining either only the European Union or both the European Union and the Euro area could be examined on both the absolute value and the ratio of value-added trade to GDP.

When comparing the model 1.4 and 2.4, what strikes most is the fact that in both models, as discussed before, there is a similar just significant positive effect of joining the European Union to be found. Both

effects are of similar magnitude, 0.040 and 0.036 in models 1.4 and 2.4 respectively, both significant at the 10 percent level. In both models, however, the additional effect of joining the Euro area is positive (0.051 and 0.039 in models 1.4 and 2.4) and significant at the 1 percent level. This indicates that there seems to be quite a strong additional influence on both the absolute value-added trade and the ratio of value-added trade to GDP of having the Euro as a currency, additionally to being a member of the European Union. This means that when a country joins both the European Union and the Eurozone it becomes, on the basis of this research, more open to international trade and increases its value-added trade in absolute terms. Overall, this means that the hypothesis, which expected a bigger effect when a country joins both the European Union and the Euro area, has to be confirmed.

### **Differences between sectors**

The last three hypotheses were used to research the effect of joining the European Union and the Euro area on the value-added trade of a country as a whole. It found overall positive significant effects of joining, on the absolute value-added exports and the ratio of value-added exports to GDP. As stated in the introduction, however, on the basis of the existing literature, these results may well differ between sectors. In this section, the last hypothesis addresses these differences. The fourth hypothesis was formulated as follows:

*H<sub>4</sub>: The effect of joining the EU and Euro area on the absolute value-added trade differs between the exporting sectors agriculture and non-machinery, manufacturing, transport and services.*

Table 3 (on the next page) shows the models, with all control variables, which show the effect of joining the European Union and Euro area on absolute value-added trade for each of the four chosen sectors, which were manufacturing, agriculture and non-machinery, services and transport. Immediately it becomes obvious that there are differences across the sectors. When looking at the effect of joining the European Union, the manufacturing and agriculture and non-machinery sectors are affected significantly positive, but the services and transport sectors are not. This means that, on average, joining the European Union has a positive effect on the value-added trade of approximately 8,3 and 9,3 percent of the absolute value-added trade on the first two sectors, but no significant positive or negative effect on the last two. This might be explained by for instance the demand for international services and transport being more rigid and not that dependent on trade barriers whereas the trade in manufactured goods is. Also, the manufacturing and agriculture sectors will export proportionally more, so will probably use the new possibilities more than the transport and services sectors. Concluding, there seems to be a positive effect for two sectors, but no negative effects for the other two.

Contrastingly, the effect of joining the Euro area seems to be negative for at least one sector, being the transport sector. After joining the Euro area, the value-added trade in this sector is approximately 8,3

percent lower than before joining. This may be a little counterintuitive, as an open market relates to more transport of goods, but it may very well be that there are only a few big transport companies that profit of such a trend, and many smaller companies that do not. Or it may be that transport companies move altogether from for instance Romania to the western European countries, thus influencing the effect of the value-added in Poland, seeing this effect has not been taken into account in the analysis, which focuses only on the countries that entered the European Union after 2004.

The services industry, however, seems to have been influenced positively by joining the Euro area. This could be explained by the fact that the services industry, although it is traded less than manufactured goods, does profit from being denominated in a larger and more trusted currency like the Euro, as opposed to the currencies used before joining the Euro area. Furthermore, it is interesting to see that the different control variables have the expected effects in the models, such as a significant effect of the ratio of tertiary educated to the labor force on manufacturing and a non-significant effect on agriculture.

	Logarithm of Trade in Value-Added - manufacturing (absolute)	Logarithm of Trade in Value-Added - agriculture (absolute)	Logarithm of Trade in Value-Added - services (absolute)	Logarithm of Trade in Value-Added - transport (absolute)
Model number	3.1	3.2	3.3	3.4
Joining the EU	.083*** (.029)	.093*** (.033)	-.021 (.025)	-.065 (.048)
Joining the Euro area	.042 (.027)	-.026 (.024)	.061*** (.018)	-.084*** (.029)
Gross enrolment – primary education (ratio to population)	.005** (.002)	.002 (.002)	.003** (.001)	.001 (.002)
Gross enrolment – secondary education (ratio to population)	.002 (.002)	.002 (.002)	.002 (.001)	.006** (.002)
Tertiary education finished (ratio to labor force)	-.008** (.003)	.004 (.004)	-.001 (.003)	.024*** (.006)
Unemployment (ratio to labor force)	-.008*** (.003)	-.005* (.003)	.003** (.002)	.009*** (.003)
Logarithm of GDP	1.205*** (.069)	.751*** (.070)	.925*** (.064)	1.122*** (.077)
Observations	204	204	204	204
R <sup>2</sup>	.996	.997	.997	.993

Table 3: Four different sectors, best-fitting models for the absolute value-added trade. Significant at \* = 10%, \*\* = 5%, \*\*\* = 1%.

Heteroskedastic-robust Standard-errors (White) in parentheses.

What is apparent from the previous discussion, is that there are different net effects of joining both the EU and the Euro area, according to these models, with a positive net effect for manufacturing, agriculture and non-machinery and service sectors and a negative net effect in the transport sector. Based on these findings, the fourth hypothesis is confirmed. The effect of joining the European Union and the Euro area differs significantly between sectors. This concludes the results section; in the next section the conclusion of the paper will be presented.

## **Conclusion**

The aim of this paper was to analyze the effect of joining the European Union and the Euro area on value-added trade. This was done by using panel data for 12 countries that joined either the European Union or both in 2004 or 2007. The period that was used for the research was 1995 to 2011, creating ample opportunity to isolate the effect which was to be assessed. Several control variables were used to further this process, on education, unemployment and GDP. Four hypotheses were stated using the existing literature, for a large part (loosely) based on Johnson's Five stylized facts on value-added trade (Johnson, 2014). The first hypothesis, expecting an increase in the absolute value of value-added trade after joining the European Union, was confirmed. The effect was significant and showed that joining the European Union has a positive effect on value-added trade in absolute terms.

The second hypothesis stated that the ratio of value-added exports to GDP would increase after joining the European Union. This hypothesis was confirmed, a significant positive effect of joining the European Union was found. This showed the difference between the ratio to total exports, which measures how much of total exports was actually added within the country's borders, and the ratio to GDP, which measures openness to international trade. After joining the European Union, the openness of the countries, defined as the ratio of the added value that was traded internationally, increased. The third hypothesis, which stated that the effect of joining both the European Union and the Euro area on the absolute value-added trade and the ratio of value-added trade to GDP would be bigger than that of joining the European Union, was tested by comparing the coefficients in the best fitting models of the absolute and relative value-added trade. The additional effect of joining the Euro area was found to be significant and positive. Thus, the hypothesis was confirmed, as the effect of joining the Euro area was bigger than only the effect of joining the European Union. This confirmed the results, although not the sign of the effect, found by Johnson and Noguera (2014), who also found that 'deeper' trade agreements had bigger effects on value-added trade.

The fourth hypothesis tested whether there was a difference between the effect for different sectors of joining the European Union and the Euro area on the absolute value-added trade. This was confirmed as the effects differed, in significance and also even in sign. For instance, the effect of joining the European Union showed a significant positive effect on the ratio of the manufacturing and

agriculture and non-machinery sectors, but an insignificant effect on the transport and services sectors. Conversely, while joining the Euro area was found to have a positive effect on services, it showed a negative effect on the transport sector and an insignificant effect on the manufacturing and agriculture and non-machinery sectors.

With this, the research question, which was ‘What is the effect of joining the European Union on the value-added export of a country?’ can be answered. Overall, the effect of joining the European Union and Euro area on the absolute and total value-added trade seems to be positive, although they differ in significance, but the effects on specific sectors differ greatly and can be both positive and negative. Therefore, no clear answer can be given to the research question further than that it can have both positive and negative effects, depending on the measurement of value-added trade and the sector which is in question.

### **Limitations and recommendations**

As does every paper, this one has its limitations. For instance, comparisons with other large trade agreements such as ASEAN might be interesting. This research has of course a certain locality to it, focusing on only the countries that joined the EU in 2004 and 2007. Including other trade blocks in the research might improve the external validity of the model. What would also be interesting for further research is the effect of these countries joining the European Union and Euro area on the existing members of these institutions. For instance, going back to the Dutch referendum on the agreement with the Ukraine, apparently existing members’ citizens seem to think that they might be negatively influenced by the addition of more countries. This research has no conclusions for these questions, because the existing member countries at the time of these additions are not included in the research.

For further research, one could also argue for combining this research with for instance the public’s opinion towards the openness of a country. Seeing as this subject has high social relevance and the decision to join large trade agreements even more, the public’s feelings about international trade as opposed to producing at home could be interesting to research as well. This should be, in the end, what agreements like the European Union tend to envision, to improve conditions for a country’s citizens. As stated in the introduction, the goals of the EU and the opinions of Europe’s citizens do not always coincide, which is why it might be interesting to include in future research.

## Bibliography

- Benhamou, L. (2005). *Le grand Bazar mondial : la folle aventure de ces produits*. Paris: Bourin.
- Daudin, G., Riffart, C., & Schweisguth, D. (2011). Who Produces for Whom in the World Economy? *Canadian Journal of Economics*, 44(4), 1403-1437.
- Europa Nu. (2016, June 26). *Referendum over EU-grondwet in Nederland*. Retrieved from [https://www.europa-nu.nl/id/vgvqpnqs5qbn/referendum\\_over\\_eu\\_grondwet\\_in\\_nederland](https://www.europa-nu.nl/id/vgvqpnqs5qbn/referendum_over_eu_grondwet_in_nederland)
- European Union. (2016, July 2). *About the EU*. Retrieved from [http://europa.eu/about-eu/basic-information/money/euro/index\\_en.htm](http://europa.eu/about-eu/basic-information/money/euro/index_en.htm)
- Johnson, R. C. (2014). Five Facts about Value-Added Exports and Implications for Macroeconomics and Trade Research. *Journal of Economic Perspectives*, 28(2), 119-142.
- Johnson, R. C., & Noguera, G. (2012). Accounting for Intermediates: Production Sharing and Trade in Value Added. *Journal of International Economics*, 82(2), 224-236.
- Johnson, R. C., & Noguera, G. (2014). *A Portrait of Trade in Value Added Over Four Decades*. Unpublished manuscript, Dartmouth College.
- Nitsch, V. (2000). National Borders and International Trade: Evidence from the European Union. *The Canadian Journal of Economics*, 33(4), 1091-1105.
- The Guardian. (2016, June 28). Retrieved from Dutch referendum voters overwhelmingly reject closer EU links to Ukraine: <https://www.theguardian.com/world/2016/apr/06/dutch-voters-reject-closer-eu-links-to-ukraine-in-referendum>
- Timmer, M. P., Dietzenbacher, E., Stehrer, R., & de Vries, G. J. (2015). An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production. *Review of International Economics*, 23, 575-605.
- Washington Post. (2016, June 28). Retrieved from France Rejects European Constitution: <http://www.washingtonpost.com/wp-dyn/content/article/2005/05/29/AR2005052900644.html>
- World Input-Output Database. (2016, June 16). *WIOD Home*. Retrieved from [http://www.wiod.org/new\\_site/home.htm](http://www.wiod.org/new_site/home.htm)
- Worldbank. (2016, June 12). *The World Bank - Education*. Retrieved from <http://data.worldbank.org/topic/education>
- Worldbank. (2016, June 12). *Worldbank GDP*. Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=OE>

## Appendix

Appendix 1A, table of the division of the sectors:

<b>Agriculture and non-machinery</b>	<b>Manufacturing</b>	<b>Transport</b>	<b>Services</b>
Agriculture, Hunting, Forestry and Fishing	Machinery, Nec	Inland Transport	Post and Telecommunications
Mining and Quarrying	Electrical and Optical Equipment	Water Transport	Financial Intermediation
Food, Beverages and Tobacco	Transport Equipment	Air Transport	Real Estate Activities
Textiles and Textile Products	Manufacturing, Nec; Recycling	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	Renting of M&Eq and Other Business Activities
Leather, Leather and Footwear	Electricity, Gas and Water Supply		Public Admin and Defence; Compulsory Social Security
Wood and Products of Wood and Cork	Construction Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel		Education
Pulp, Paper, Paper, Printing and Publishing	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods		Health and Social Work
Coke, Refined Petroleum and Nuclear Fuel			Other Community, Social and Personal Services
Chemicals and Chemical Products			Private Households with Employed Persons
Rubber and Plastics			Hotels and Restaurants
Other Non-Metallic Mineral			
Basic Metals and Fabricated Metal			

Appendix 2A, descriptive statistics of value-added trade for each country in each year, absolute value.

	Average	Minimum	Maximum	Std. Dev
Cyprus	13.819	8.253	22.483	5.407
Czech Republic	103.183	49.985	197.452	53.076
Estonia	10.490	3.329	21.047	6.023
Hungary	76.143	38.823	134.008	33.627
Latvia	13.573	4.362	30.342	8.387
Lithuania	20.318	6.016	42.588	11.897
Malta	4.912	3.198	7.865	1.674
Poland	251.456	122.640	469.599	117.984
Slovakia	42.102	17.566	87.773	26.540
Slovenia	28.517	17.406	48.156	10.949
Bulgaria	22.145	9.851	43.163	11.494
Romania	82.531	32.608	183.466	52.826