

# Jacob Viner and Gottfried von Haberler, two theories of Custom Union, a precise answer for the European Union

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### **Abstract**

Jacob Viner and Gottfried von Haberler were two experts in International trade at the beginning of the twentieth century. In their works, they described the characteristics a customs union should fulfill, although they had somewhat different opinions on the matter. Taking as a reference the creation of a custom union in Europe, the aim of this paper is to study which of these two prominent economists succeeded in describing better the actual characteristics of the European custom union. In order to identify the results on trade of the European custom union we analyze two approaches of trade flow: a) the imports, including the Eastern countries and without them; b) the exports, through an econometric analysis of panel data and dummies including the 28-EU countries. The results suggest that Viner's theory is more accurate for the European Custom Union.

**Key words:** *Custom Union, European Union, Trade diversion/creation, Eastern Countries, Jacob Viner, Gottfried von Haberler, Econometric Model and Trade.*

### **Resumen**

Jacob Viner y Gottfried von Haberler fueron dos expertos en Comercio Internacional del inicio del siglo XX. En sus obras describieron las características que debería cumplir una Unión Aduanera a pesar de tener algunas opiniones distintas. Teniendo como referencia la creación de la unión aduanera en Europa, el objetivo de este trabajo es estudiar quién de los dos prominentes economistas ha descrito mejor las características actuales de la unión aduanera Europea. Con tal de identificar los resultados en el comercio de la unión aduanera europea hemos analizado dos enfoques de flujo de comercio: a) las importaciones incluyendo los países del Este y sin ellos; b) las exportaciones mediante un análisis econométrico con datos de panel y variables ficticias incluyendo los 28 países de la UE. Los resultados establecen como la teoría de Viner la más precisa para la Unión Aduanera Europea.

**Palabras clave:** *Unión aduanera, Unión Europea, Destrucción/Creación de Comercio, Países del Este, Jacob Viner, Gottfried von Haberler, Modelo Econométrico y Comercio.*



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## INTRODUCTION<sup>1</sup>

Gottfried von Haberler and Jacob Viner were two prominent economists at the beginning of the twentieth century. Haberler is the author of *The Theory of International Trade* published in 1936, whereas Viner is the writer of *Studies in the Theory of International Trade* and *Custom Union Issue* published in 1937 and 1950 respectively.

Both works have been extremely important regarding the theory of international trade. Haberler was one of the first economists which developed rigorous studies showing the increase in productivity and profit extensive from free trade without government restrictions. Viner contribution was relevant due to the introduction of the terms 'trade creation' and 'trade diversion' to the canon of international trade. The discrepancy between custom unions was the fact that Haberler saw the custom unions as something totally welcomed while Viner's theory differentiated between positive or negative custom unions, depending on the increase or decrease in trade.

This research will focus on the differences between Haberler's and Viner's theory of custom unions trying to show which of these two economists reflected more realistically the current custom union system presented by the EU. Taking into account that they had divergent opinions with respect to the impact of a custom union we will identify those differences and conclude through evidences which theory fits better with the European Union model. Hence, we will ensue with an analysis of the theories of international trade of Haberler and Viner, revealing the most important differences between them.

We will study the imports and exports gradual change of the EU countries through graphs and an econometric model respectively. The results obtained will be related with the custom union theories of Viner and Haberler. The period examined is from 2000 until 2014

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<sup>1</sup>Foremost, I would like to express my sincere gratitude to my advisor Prof. Javier San Julián Arrupe for the support on my Bachelor Project, for his patience, motivation, enthusiasm and immense knowledge. Besides my advisor, I would like to thank Prof. Germán Forero and Prof. Kristian Estevez for their advice and help with the econometric analysis. Last but not the least, I would like to thank my family and friends, especially to Erik Andres, for all the support and help with this Research.

and the database is from Eurostat, World Bank, and ComTrade. To conclude the research, we will answer the question stated above contrasting Viner's and Haberler's theories with empirical evidence.

The work has been structured in 4 chapters. The first chapter is a literature review of Gottfried von Haberler's and Jacob Viner's arguments regarding custom unions and the difference between their theories. The second chapter is a graphical analysis of the European Union imports from the rest of the world. We separated it in two subsections, including and excluding the imports of the Eastern countries. The third chapter presents an exports analysis of the EU-28 through an econometric model of panel data and multiplicative dummy variables. The aim is to identify the effect on Exports of GDP per capita and Consumer Price Index (CPI) from 2000 until 2014. Moreover, we will complement the regression with qualitative variables (such as being a landlocked, Eastern or EU member country) in order to see the effect on trade in different scenarios. Chapter four concludes the research.



## I. LITERATURE REVIEW

### 1. Gottfried von Haberler's theory of custom unions: Gains on trade

Gottfried von Haberler was born in Austria where he achieved his PhD in Economics at the University of Vienna and his school of tradition was the Austrian School of Economics. Later on, he started to teach at the University of Vienna but he moved to the University of Harvard where he taught International Trade. Haberler was one of the first critics of the theories of John Maynard Keynes. Moreover, he was one of the first economists who developed rigorous studies showing the increase in productivity and profit widespread from free trade without government restrictions. Inside this analysis and his critiques to the policy interventions recommended by Keynes, he developed models to analyze big volatilities of cycles, the so called '*boom and bust*'. Some of the most important publications of Haberler during his life were *The Theory of International Trade (1936)* where we can find his theory of custom unions analyzed in this project and *Prosperity and Depression (1937)*.

He was President of the International Economic Association (1950-1953), a non-Governmental Organization that was founded in 1950. Its purpose was to encourage research, publication and free discussion of economic topics. Moreover, in 1957, he was appointed Chairman of the General Agreement on Tariffs and Trade. Finally, in 1971, Haberler left Harvard to become a resident scholar at the American Enterprise Institute, a conservative think tank devoted to issues connected to politics, economics, and social welfare.

In Haberler's book *The Theory of International Trade (1936)* the term "custom union" is defined in his own words as: «The custom unions are to be wholeheartedly welcomed even when they are not between neighboring or complementary States»<sup>2</sup>.

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<sup>2</sup> Haberler, G. (1936), pp. 390

*A customs union must be especially advantageous for small States, since these are particularly injured if they exclude one another's goods. We must emphasise that the economic advantages of a customs union can be proved only by exact Free Trade reasoning as to the international division of labour and the Theory of Comparative Cost, and not by any reference to racial, cultural, and other relations. From an economic standpoint a general removal of duties by the States would be better than a removal of duties only between themselves retaining their duties against other countries.*

*Gottfried von Haberler (1936), The Theory of International trade, pp.390*

Hence, Haberler supported the custom union thanks to his improvement on the theory of comparative advantage. Bernhofen (2005) reformulated Haberler's (1930) doctrine regarding the comparative advantage. Haberler went from David Ricardo's labor theory of value to his modern opportunity-cost formulation. Haberler's work on international trade theory replaced the theory of comparative advantage within the framework of opportunity cost rather than real cost.

Furthermore, Haberler described a custom union as corresponding to a remove of duties between those countries forming the union and not between them and other countries<sup>3</sup>. Then, the removal of tariff walls between two States gives rise to general protectionist resistances. In addition, a custom union raises a host of very difficult political and administrative problems since two groups of interested people and organizations must agree upon a common Tariff Schedule which is laborious. Moreover, he mentioned that an agreement must be reached as to the partition of the custom revenue, as to questions of taxation, and as to measures of customs administration. It is important to remark that his theory was concluded in an extreme protectionist economic framework.

The economic background of Haberler's work was the United States after the Great Depression of 1929. Henn and McDonald (2010) explained that the American reaction to this crisis was the implementation of a tariff called Smoot-Hawley which was not supported by a large number of economists. Moreover, the other big economies started to depreciate substantially their currency, they imposed restrictions or created import quotas and implemented higher tariffs. The result of the previous measures, and more noticeable the increase of the tariff barriers, was a decrease of 25% in the world trade between 1929

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<sup>3</sup> Haberler, G. (1936), pp. 391

and 1933. Hence, the implementation of protectionist measures after the Great Depression aggravated the recovery of the economy.

Finally, another important point explained by Haberler was the fact that the extensive schemes for a customs union to hold for all of the European States were quite utopian and fantastic. They were completely ruled out by the spirit of nationalism and protectionism which prevailed at the beginning of the twentieth century. He was optimistic and he believed that countries will always continue to fight, despite the discouraging scenario. Haberler did not see any reason why the reduction of duties should stop at the frontiers of Europe. He considered that Western Europe stood much closer, spiritually and economically, to many overseas countries than to the East of Europe. He emphasized the fact that the geographic barrier to commerce in goods and in ideas is easier to overcome than the barrier of great stretches of land. Hence, all the political and administrative difficulties present obstacles to the formation of a customs union and they will remain as permanent sources of friction and conflicts after the formation. Haberler's solution to these difficulties was to face them by ordinary free trade propaganda with the aim of reducing duties and the protectionist thought. He saw it as a necessary preliminary for the establishment of a complete custom union and as for the establishment of free trade or of a general reduction in duties.

The idea of a preferential system, which is a way of increasing exports without importing more than before, was totally considered a failure by Haberler. He saw it as a failure since increasing exports involves an extension of the international division of labor, an increase in imports, and a reshuffling of home production. His way out or advice was to fight the spirit of protection and to spread far and wide correct ideas about international trade. Furthermore, it was the way to confront organized forces of sectional interests which support protection with a powerful organization drawn from those who suffer from it, essentially, from the vast majority of the people of the world.

Then, Haberler was against the protectionist system implemented during the thirties reflected in his own words mentioned<sup>4</sup>:

It is an error to think any radical demolition of duties can be brought about by small reforms in the technique of trade policy without a frontal attack upon the Protectionist outlook. Protectionism cannot be outwitted: it must be conquered. The weapons are not made more effective by speaking of custom unions and preferential duties instead of Free Trade and reduction in tariffs.

Gottfried von Haberler (1936), *The theory of international trade*, pp.392

Haberler arrived at this conclusion due to his explanation that even when one of two countries is absolutely more efficient in producing both goods, each country should still specialize in manufacturing and trading those commodities in which it has relatively greater efficiency. Through developing and reliably applying this reformulated theory of the benefits of international specialization, he was able to prove the continuing dominance of a policy of free trade over protectionism or autarkic self-sufficiency.<sup>5</sup>

In the years following World War II, Haberler (1979) argued forcefully against various forms of international trade restriction and protectionism, including artificial foreign exchange-rate regulations and manipulation, import and export quotas, and tariffs. While admitting that a number of hypothetical exceptions to the free trade doctrine can be formulated, he considered that in the real world both the theoretical and practical case for the greatest degree of international freedom of trade remains the main argument in any serious economic policy discussion.

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<sup>4</sup> Haberler, G. (1936), pp. 392

<sup>5</sup> Haberler, G. (1930), pp. 3-19

## 2. Jacob Viner's theory of custom unions: Creation and/or destruction of trade

Jacob Viner was born in Canada in 1892 and studied economics at the University of Harvard. Viner is considered one of the founders of the Chicago School of Economics which is a neoclassical school of economic thought characterized by its extreme liberal orientation. The main important fields studied by Viner were the history of economic thought and the theory of international trade. His fundamental work on the history of economic thought is *Studies in the Theory of International Trade* (1937). Viner criticized the theoretical analysis of Keynes regarding the liquidity preference since he considered it a simplistic theory of the aggregate demand. Moreover, other important microeconomic contributions of Viner were his studies on the market prices and the relations among cost and supply curves in the short and long run. Viner's important publication for this project is *The Customs Union Issue* (1950).

Oslington (2013) interpreted Viner's concept of custom unions as one of a number of arrangements for reducing tariff barriers between political units while maintaining barriers against imports from outside regions<sup>6</sup>. He defined a perfect custom union as the complete elimination of tariffs between the members, the implementation of a uniform tariff on imports outside the union, and the distribution of customs revenue between the members in accordance with an agreed formula. The ground-stones of Viner's theory of custom unions are concepts of trade diversion and trade creation effects of different arrangements of regional integration. Viner showed that the effects of custom unions can be positive or negative. All the processes of economic integration imply a system of custom discrimination among nations since the imports of the same product are subject to diverse tariffs and barriers depending on whether the country of origin belongs to the group of integration or not. That means, that whereas some countries benefit from the custom union, others will be harmed.

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<sup>6</sup> Oslington, P. (2013) pp.9

In his analysis, Viner (1950) introduced the concepts 'trade creation' and 'trade diversion' which became essential instruments for the analysis and understanding of the effects of an economic integration. Viner (1931) explained in his own words the trade diversion<sup>7</sup>:

*"A tariff that is high, but uniform in its treatment of imports regardless of their origin, may divert trade from the channels which it would follow if allowed freely to choose its own path much less than would a moderate tariff which applies different treatment to imports according to their country of origin. Suppose that under free trade country A would find it to its advantage to import a particular commodity from country B, and that even with a high duty it is still not possible to produce a commodity at home at a profit to its producers, so that it continues to be imported from B. While the tariff reduces the volume of trade, it does so only as a revenue measure, and still permits the commodity to be produced there where it can be produced most cheaply. Suppose, now, that the duty is reduced by half on imports from a third country, C, and that by virtue of this preferential treatment C can undersell B and capture A's trade. The result of the discrimination in favor of C is that the commodity which could be most cheaply produced in B, and would be produced the even if A had high tariff, provided it was non-discriminatory, is now produced in C, where the conditions for its production are comparatively unfavourable. The reduction in duty, because it is discriminatory and not uniformly extended to all, operates as a deterrent instead of a stimulus to the optimum allocation of the world's resources in production."*

*Jacob Viner (1931), The Most-Favored-Nation Clause, Index 61: 2-17*

Hence, trade diversion is the switch in trade from less expensive to more expensive producers.

Trade creation can be defined as the increment of the trade volume among countries when they agree to establish a custom union. In other words, it means to change from more expensive to less expensive producers.

In conclusion, the probability of having trade creation is higher than trade diversion<sup>8</sup>. The higher the elasticity of demand and supply of a country which wants to take part of a custom union, the greater the trade creation. The higher the previous tariff among countries which established the union the higher will be the trade creation. When the union is between two rival economies, the trade creation and benefit is superior. The trade diversion will be lower when the external tariff imposed to third countries by the new custom union is low. The higher the extension of the custom union the lower the probability of trade diversion.

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<sup>7</sup> Viner, J. (1931), Index 61: 2-17

<sup>8</sup> Coll, M. (2001)

Lipsey (1957) explained how professor Viner went on to conclude that trade creation may be said to be a 'good thing' and trade diversion a 'bad thing'. The previous statement implies a welfare judgment where the benefits resulting from the custom union are a key point to decide the goodness of the trade creation or the badness of the trade diversion. When a custom union is formed, relative prices in the domestic markets of the member countries are changed because the tariffs on some imports are removed. These price changes are likely to have two important initial effects. Firstly, they may influence the world location of production in the several ways carefully analyzed by Viner. Secondly, they will have a parallel effect to find the union members increasing their consumption of each other's products while reducing imports from the rest of the world. Changes of the first type will be classified under the general heading, production effects, and changes of the second type as consumption effects. It must be emphasized that even if world production is fixed, a custom union will cause some changes in patterns of consumption due to changes in relative prices in the domestic markets of the member countries. Therefore, the consumption effect may operate even if there is no production effect.

Johnson (1965) suggested that the concept of trade diversion and trade creation should be more precisely defined on the basis of welfare effects. On the one hand, the trade creation is the welfare change due to the replacement of higher cost of domestic production and/or higher cost of imports by lower-cost imports. On the other hand, the trade diversion is the welfare change due to the replacement of imports from a low-cost source of imports from a higher cost source. Therefore, in terms of world allocation of resources: trade creation is beneficial in terms of welfare, while trade diversion worsens allocation. Then, a custom union is economically justified if it leads to a trade creation, while a custom union generating a trade diversion leads towards a deeper protectionism and decrease of efficiency.

### 3. Disparity between theories of custom unions

Jacob Viner's and Gottfried von Haberler's intuitions about the customs union present similarities but also disparities. They agreed upon that a perfect custom union needs the complete elimination of tariffs between members. Moreover, the distribution of the custom revenue between the members may be done according to an agreed formula.

As for the differences between both authors, Viner writes further about the importance of the implementation of a uniform tariff on imports with the countries outside the union in order to be part of a perfect custom union. For Haberler, the custom union was always seen as something totally welcomed with no need to end at European borders, in other words, it should be implemented worldwide. Meanwhile, for Viner a custom union can be a "good thing" or a "bad thing". Viner explained this positive or negative view concerning the custom unions through the introduction of trade diversion (TD) and trade creation (TC). TC means an increase in trade between different states due to the complete elimination of tariffs. TD means a reduction in trade between a country which is joining a custom union and third countries outside the custom union. Applying Viner's argument about custom unions, the effect of TD among the EU members should be low since the EU is more than a custom union. It also includes a free trade zone, a common market, and an economic union. Moreover, the external tariff of the EU imposed to third countries will be low implying a small TD effect.

Therefore, Viner went further in the trade study and this is something which will be analyzed and shown in the following chapters.

In conclusion, there are some differences in their interpretations concerning, real cost vs opportunity cost<sup>9</sup> and custom unions.

Moreover, their deductions on the impact of a custom union are not entirely identical. For that reason, we will proceed analyzing a real example of custom union, the European Union, which will allow us to identify which of the prominent economists was closer to the

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<sup>9</sup> An afterthought regarding the debate real cost vs opportunity cost was published by Vanek (1959)



reality of a custom union. It is important to remark that this analysis will be based on an almost perfect custom union, the EU. The main investigation will be done studying the trajectory of the EU imports and exports to the rest of the world. The investigation is partial, so it is possible that some effects concerning the creation of the custom union may not be considered. As Viner mentioned, the probability of having trade creation is higher than trade diversion. The next chapters of this paper will allow the identification of the truth in this statement.

Hence, chapter two will determine the path of the EU imports from 2000 until 2014, splitting the analysis with the imports of the Eastern countries and without them. The pathway will allow the examination of the highest effect on trade.

## II. IMPORTS APPROACH

The aim of this chapter is to identify the presence of trade creation (TC) or trade diversion (TD) through an analysis of imports of the EU from the rest of the world.

We will analyze the imports through two different ways: First, we will study the evolution of imports of the EU countries coming from non-EU countries between 2000 and 2014. The decision to study this period, in particular, is due to the fact that most of the Eastern countries entered in the EU during the period considered. Hence, we will split this study considering the total imports of the EU-28 and the EU-22<sup>10</sup> with the rest of the world. If these EU-imports show us an increase during the period considered, then there is a high probability of having a dominant TC effect. If the EU-imports decrease across time, then it may be due to the presence of TD effect. This can happen since the EU can implement the strategy of increasing barriers to third countries in order to increase imports from the member states.

Second, we will make a review of some experts viewpoints regarding the trade analysis between the EU with the Eastern countries as well as without them.

Therefore, we begin the analysis of TC and TD in the order mentioned above.

### 1. Analysis of the EU imports resulting from third countries outside the EU

#### 1.1. *The EU with the East countries, the EU-28*

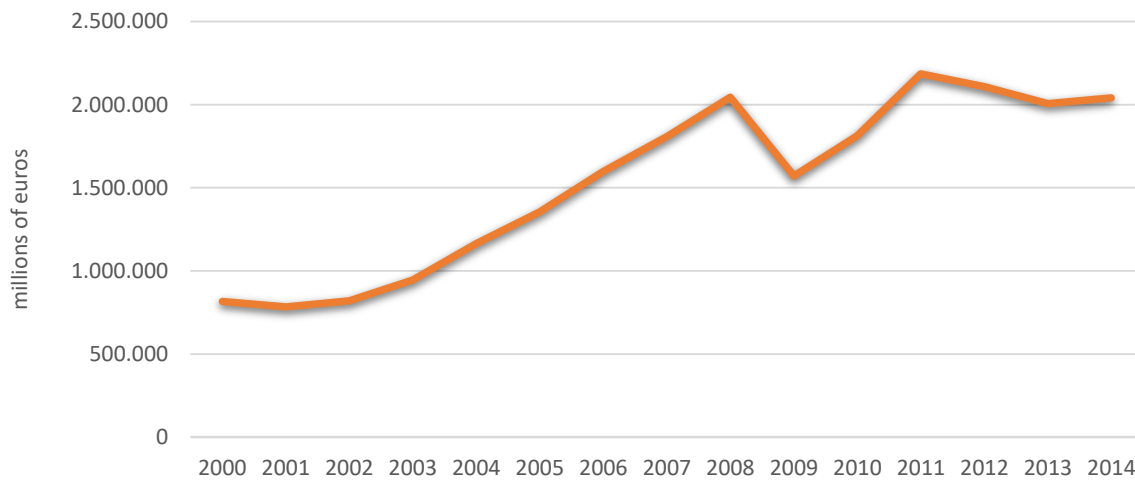
This analysis will be based on studying imports of the EU-28 and of the EU-22 coming from the rest of the world between 2000 and 2014. The dataset for the EU-28 used is from *Comtrade*. Imports were expressed in US dollars at first, but we converted it to euros to be able to make a comparison between the EU with Eastern countries and without them. The exchange rate EUR/USD used is 0,89460<sup>11</sup>.

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<sup>10</sup> EU-28: Includes all the EU members as soon as they were introduced. EU-22 the east countries are excluded: Slovakia, Hungary, Czech Republic, Poland (until 2004), Rumania and Bulgaria (until 2007).

<sup>11</sup> Data from the ECB from 09/07/2016.

**Figure 1: EU-28 Imports from the rest of the world**



Source: database Comtrade, own creation

Figure 1 shows an increasing path during the period studied, more resistant upsurge can be seen from 2001 until 2008. This evolutionary rise on the EU-imports can be interpreted as a TC effect since more trade is created between members and non-members. This result can also be possible due to the constant decrease of the Common Customs Tariff (CCT) during these years. The CCT is common to all members of the EU and is imposed on all industrial imports from non-EU countries. Moreover, the tariff rates implemented differ from one kind of import to another such that assessing and quantifying the effect of CCT becomes difficult. These tariff rates may also be set at a low rate to stimulate competition within some sectors of the EU, e.g. for pharmaceutical and IT-related goods.

On the contrary, a different result can be observed from 2008 until 2009 given that the EU-28 imports decreased over this period. This reduction in imports can be seen as a small TD but since the decrement is just during a short period of time we cannot truly consider it as a real TD effect. There are many different factors that could explain the reason for this trade fall. One of the main cause of this decrease is the economic crisis suffered on that period, known as Great Recession, which had important effects on trade: in the period 2008-09, imports declined to the 2005 level and several Eurozone member states (Greece, Portugal, Ireland, Spain and Cyprus) had seen their government debt increasing exponentially. Hence, when a country has a huge debt it will take urgent measures to

decrease it and this can be reflected in a decrement in the imports coming from the EU members and non-members.

In conclusion, in the time period analyzed we have evidence of TC at the beginning of the period but the evidence of TD is unclear. In chapter three we will identify the extension of this TC.

Some investigations on TC and TD, in different sectors and in different periods, gave the following results: Allen, Gasiorek & Smith (1996) investigated the existence of TC and/or TD due to the Single Market program (SMP) in the EU. One part of their research was based on a study through an econometric approach. The result of the econometric estimation was that the SMP has been trade creating, both for the EU and non-EU producers and there was little evidence of any substantial TD of non-EU trade.

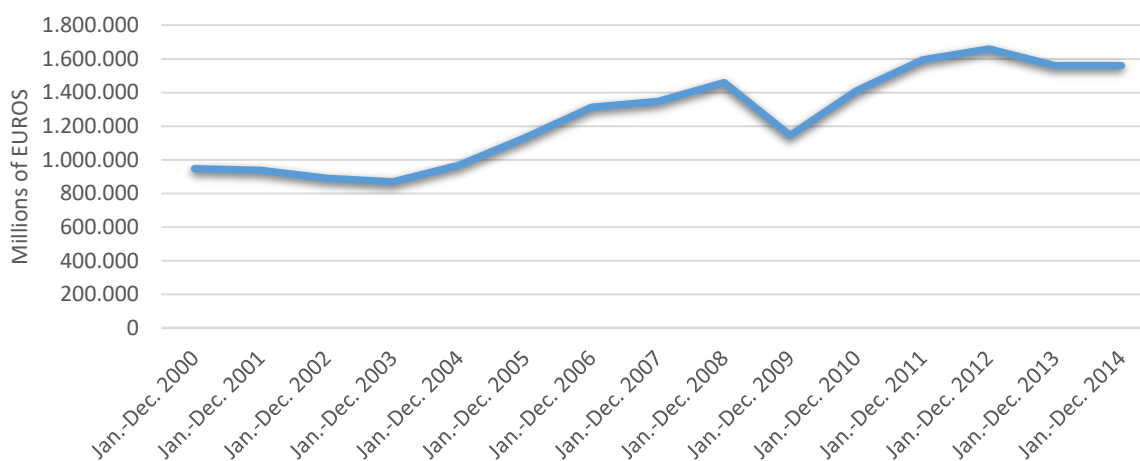
Ludlow (2001) explained how before joining to the EEC, the UK had a free trade agreement with the countries in the Commonwealth (i.e. New Zealand and Australia). Once the UK joined the EEC, it started to implement the ECC common external tariff on imports from third countries outside the union. The New Zealand agriculture sector was harmed because of the increase of barriers between the UK and New Zealand, so they suffered the TD effect. Therefore, Britain switched agricultural imports from New Zealand to European countries. In this scenario, the TC effect occurred between the UK and Europe due to the increase in trade and to the existence of TD which implied a reduction in the UK imports from New Zealand.

Drabik, Pokrivcak, and Ciaian (2007) analyzed the changes in agricultural trade patterns in Slovakia influenced by the gradual trade liberalization that occurred prior to the EU enlargement in 2004. They found existence of TD effect of agricultural trade liberalization between Slovakia and the EU. This happened because trade barriers in front of third countries increased.

## 1.2. The EU without the Eastern countries, the EU-22

In order to examine the period between 2000 and 2014 for the EU-22 we used data from Eurostat. After some manipulation on Excel regarding the total sum of imports in order to analyze the EU-22, we obtain the results represented in Figure 2.

**Figure 2: The EU-22 imports without East countries from the rest of the world**



Source: Database from Eurostat, own creation

The majority of Eastern countries entered into the Union in 2004, so the dataset until this year is just from the EU-22 members.

In Figure 2 we can observe a small decrease of imports until 2003 and an increase afterward because some non-East countries entered into the EU in 2004<sup>12</sup>. Those helped to increase the total EU imports from the rest of the world after 2004.

In general terms, imports are increasing for the period studied. This increase is probably because of the good economic situation experienced until 2008 and due to the necessity of foreign products after 2010. The decrease in imports during 2008 and 2009 can be attributed to the financial crisis since the customers' purchasing power was negatively affected.

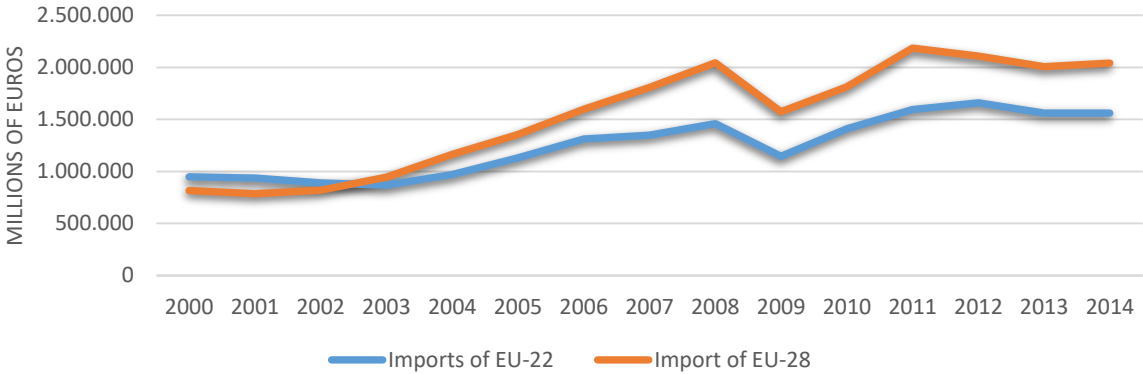
<sup>12</sup> The non-East countries which entered in 2004 in the EU are: Cyprus, Estonia, Lithuania, Latvia, Malta and Slovenia.

The TC effect is obvious due to the expansion in imports. Even if the TD is not clear, in a paper published by the OECD in 2000 a risk of TD was seen as possible due to the agreements between the European Union and the Eastern European and Mediterranean countries. This was the case because some of the countries had very high levels of protectionism and the introduction of rules of origin meant a potential intensification of diversion risks. The EU proposed a solution to this problem by declining tariffs of the new entering countries to the Union<sup>13</sup>.

1.3. Conclusions

The previous analysis of the imports of the EU-28 and the EU-22 let us compute a graph showed in figure 3 where both results are represented. The conversion from \$ to € was done correctly in order to be able to make a comparative graph of imports. The exchange rate EUR/USD used is 0,89460<sup>14</sup>.

**Figure 3: Comparison between the imports of the EU-28 and the EU-22 from the rest of the world**



Source: Database from Eurostat and Comtrade, own creation

In Figure 3, we can appreciate a similar and constant expenditure in imports from 2000 to 2003 due to the fact that most of the Eastern countries entered into the Union in 2004. The Eastern countries of 2004 were Czech Republic, Hungary, Poland, and Slovakia. Hence, due to the introduction of new members imports started to increase surpassing a trillion

<sup>13</sup> OECD (2000), ‘‘Summary - Economy Growth’’ pp. 13

<sup>14</sup> Data from the ECB from 09/07/2016.

and a half euros in 2006. In 2007, Romania and Bulgaria became members of the EU, these two new Eastern countries joining the other EU-members achieved the amount of spending of two trillion of euros at the beginning of 2008. The financial crisis at the end of 2008, damaged the imports, despite this fact the EU recovered the level of outlay of two trillion euros in 2011. In general terms, the Eastern countries increase their expenditure in imports from the rest of the world during the period analyzed. This can be seen through the difference between the import curves of the EU-22 and the EU-28 represented in Figure 3. This increase in imports is probably due to the necessity of cheap products coming from outside the EU. Summing up, the period specified shows us evidence of TC whereas TD is uncertain.

After studying the imports of the EU from the rest of the world we can see evidences of the existence of Viner's theory on custom unions. He mentioned that the probability to have trade creation is higher than to have trade diversion. In the previous analysis this statement is true since there is evidence of TC but not so clear of TD.

In this study we could also see what Haberler mentioned: even Western Europe stood much closer to many overseas countries than to the Eastern Europe, there was no reason why the reduction on tariffs stops there. In 2004, some Eastern countries entered to the EU confirming the previous Haberler's statement. In this sense, Haberler's prediction regarding the geographic and cultural barrier to commerce was overcome, as he uttered. It is easier to surpass the geographic and cultural barrier instead of the barrier of great stretches of land.

In the next chapter we will explain the trade effects analyzing the exports of the EU-28 through an econometric model.

### III. EXPORTS APPROACH

#### 1. Econometric model for exports of the EU-28

##### 1.1. Introduction of the gravity model

In this chapter we will proceed to develop an econometric regression in order to be able to give a more precise answer to the question of trade creation and/or trade diversion. The way to proceed will be through an adapted gravity equation.

This adapted gravity model comes from the general formulation known since the seminal work of Jan Tinbergen (1962). He used an analogy with Newton's universal law of gravitation to describe the patterns of bilateral aggregate trade flows based on the economic sizes and distances between countries. Moreover, there are qualitative variables which determine the effectiveness of trade agreements such as common borders, common languages, common colonial legacies, etc.

In this research we will modify some variables in order to obtain an answer for trade diversion and trade creation. Doing so, we are creating a new adaptive regression:

$$\begin{aligned} \ln Y_{it} = & \beta_0 + \beta_1(\text{Quantity} * \text{Price})_{1,it} + \dots + \beta_k(\text{Quantity} * \text{Price})_{k,it} + \delta_2 \text{Landlocked} * \\ & (\text{Quantity} * \text{Price})_2 + \dots + \delta_n \text{Landlocked} * (\text{Quantity} * \text{Price})_n + \gamma_2 \text{Eastern} * (\text{Quantity} * \\ & \text{Price})_2 + \dots + \gamma_n \text{Eastern} * (\text{Quantity} * \text{Price})_n + \lambda_2 \text{EasternEUMember} * (\text{Quantity} * \\ & \text{Price})_2 + \dots + \lambda_n \text{EasternEUMember} * (\text{Quantity} * \text{Price})_n + u_{it} \end{aligned} \quad (\text{A})$$

In the regression (A) we will explain the changes in the EU-28<sup>15</sup> exports through the exogenous variables: GDP per capita, CPI, and some qualitative variables.

Therefore the regression is represented by trade (exports of the 28-EU members), quantity (GDP per capita in constant 2010 US dollars), prices (CPI in 2010 equal to 100), geographical situation (two dummies: landlocked country or not, Eastern country or not) and Trade policy (a dummy variable with value equal to 1 if the country is from the East and is also an EU Member, 0 otherwise).

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<sup>15</sup>See Appendix A for details of the EU members and the year of inclusion



The aim of this adapted regression is to identify if the European Union Trade Agreement is trade creating or trade diverting for the Eastern EU members. Therefore, the sign and value of the coefficients related to the independent variables will identify the effectiveness of the European custom union. For instance, if the sign is negative then the effect which prevails will be trade diversion, otherwise there is sufficient empirical evidence trade creation.

### *1.2. Estimation method of Panel Data and Multiplicative Dummy variables*

The analytical procedure includes a gravity model to estimate export equations using combined time-series/cross-country data for the period 2000 to 2014. The sample of 28 EU countries was chosen for the empirical analysis and it incorporates the ante and post inclusion of some Eastern countries to the EU. The results are meaningful in terms of explaining the pattern of European trade. Moreover, the data set used for the quantitative variables is from World Bank in constant US dollars.

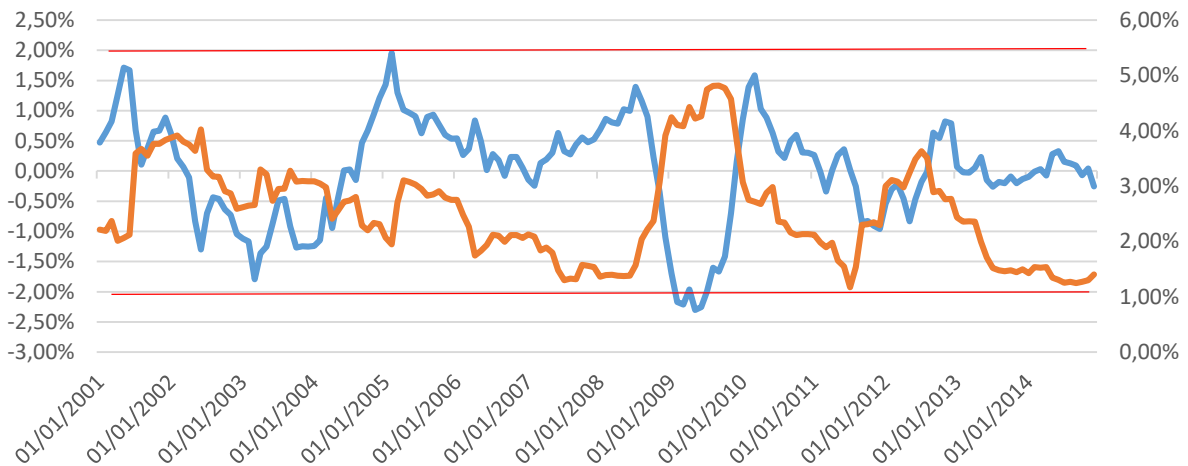
We used this data to estimate a model explaining the effect in exports when a country is from the Eastern Europe and when is from Eastern Europe but also an EU member. We will run the panel data regression using Stata. The panel data is a dataset in which the behavior of the variables is observed across time.

The national currency of some members of the EU is not the euro. Those are Poland, UK, Romania, Denmark, Hungary, Czech Republic, Sweden, Croatia, and Bulgaria. We analyze the fluctuations of the exchange rate<sup>16</sup> used through the exchange of euros for the national currency of the countries mentioned before. Considering the fluctuations under 2% without impact in our regression we identify that all of them are below this percentage allowing us to not include the exchange rate as a crucial variable in the regression. The following graph shows an example of how we analyzed the under 2% fluctuation in the exchange rate. This specific case selected randomly is Poland's exchange rate from 2000 until 2014.

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<sup>16</sup> The dataset used is from a reliable website: <http://es.investing.com/currencies/eur-pln-historical-data>

Figure 4: Poland's exchange rate fluctuations



Dataset "Investment", own creation

In Figure 4, the blue line represents the average between the monthly periods whereas the orange line denotes the standard deviation or the measure used to quantify the amount of variation and dispersion. The flat red line identifies the inclusion of the standard deviation between the 2% variation of the exchange rate.

Before running the regression it is important to add the option robust (Standard Deviations), to control for heteroscedasticity.

The methodology used in the econometric model is fixed effects (FE) which allows us to analyze the impact of variables that vary over time. Each entity has its own distinct features that may or may not influence the variables analyzed (for example, being an Eastern EU member country could influence the macroeconomic variables). The FE remove the effect of those time-invariant features so we can see the net effect of the predictors on the outcome variable. The FE also has the assumption of unique time-invariant characteristics of the individual which means that it shouldn't exist any kind of correlation with other individual's characteristics.<sup>17</sup>

Once we controlled for time-invariant features and heteroscedasticity we run the following regression with Stata:

<sup>17</sup> Torres-Reyna, Oscar (2007), "Panel Data Analysis Fixed and Random Effects using Stata", Princeton University

$$\begin{aligned} \ln Y_{it} = & \beta_0 + \beta_1 \ln GDP * CPI_{1,it} + \dots + \beta_k \ln GDP * CPI_{k,it} + \delta_2 \text{Landlocked} CPI GDP_2 + \dots + \\ & \delta_n \text{Landlocked} CPI GDP_n + \gamma_2 \text{Eastern} CPI GDP_2 + \dots + \gamma_n \text{Eastern} CPI GDP_n + \\ & \lambda_2 \text{Eastern} EUMember CPI GDP_2 + \dots + \lambda_n \text{Eastern} EUMember CPI GDP_n + u_{it} \quad (B) \end{aligned}$$

Where,

- $\ln Y_{it}$  is the log dependent variable, exports of goods, services and primary income, i=country name and t=time.

- $\ln GDP_{k,it}$  represents the first independent variable, in this case the log gross domestic product per capita (constant 2010 US dollars).

- $CPI_{k,it}$  represents the second independent variable, in this case the consumer price index (2010 = 100).

- $\beta_k$  are the coefficients for the independent variables.

- $u_{it}$  is the error term.

- $\text{Landlocked} CPI GDP_n$  is the entity landlocked country multiplied by CPI and GDP (landlocked country =1, non-landlocked country= 0). It is a binary dummy so we have n-1 entities included in the model.

- $\text{Eastern} CPI GDP_n$  is the entity Eastern country multiplied by CPI and GDP (Eastern country =1, non-Eastern country= 0). It is a binary dummy so we have n-1 entities included in the model.

- $\text{Eastern} EUMember CPI GDP_n$  is the entity Eastern country jointly with the entity EU Member multiplied by CPI and GDP (Eastern country and EU Member =1, Eastern country but not EU Member = 0). It is a binary dummy so we have n-1 entities included in the model.

- $\delta_n$ ,  $\gamma_n$  and  $\lambda_n$  are the coefficient for the binary variables (dummies).

The aim of this regression is to identify the effect on Exports of GDP per capita and CPI from 2000 until 2014. Moreover, we are complementing the regression with qualitative variables such as being landlocked, Eastern or EU member country in order to see the effect on trade in different scenarios. The results obtained are the following:

<pre> xtreg      LogX      logGDPPCCPI2010100      landlockedGDPCPI      EasternGDPCPI EasternEUMemberGDPCPI, fe vce(robust)  Fixed-effects (within) regression Group variable: COCODE R-sq:  within = 0.8353       between = 0.2019       overall = 0.2549  corr(u_i, Xb) = -0.1235  Number of obs      = 407 Number of groups   = 28 Obs per group:    min = 10                   avg  = 14.5                   max  = 15                   F(4,27) = 152.84                   Prob &gt; F = 0.0000                   (Std. Err. adjusted for 28 clusters in COCODE) </pre>							
			Robust			[95%	
LogX	Coef.	Std. Err.	T	P> t	Conf.	Interval]	
logGDPPCCPI2010100	.0037915	.0002386	15.89	0.000	.003302	.0042811	
LandlockedGDPCPI	.0004222	.0004352	0.97	0.341	-.0004707	.0013151	
EasternGDPCPI	-.0022664	.0003404	-6.66	0.000	-.0029649	.0015679	
EasternEUMemberGDPCPI	.0007505	.0001375	5.46	0.000	.0004683	.0010327	
_cons	8.150463	.1865666	43.69	0.000	7.76766	8.533266	
sigma_u	13.511.944						
sigma_e	.20939915						
Rho	.97654653	(fraction of variance due to u_i)					

The R-square depicts the goodness of fit, understood as how well the regressors are explaining the causality of the dependent variable. In this case it is 0,2549. Even though we are getting an apparently low value for this statistic, it is sufficiently high to assert that the independent variables chosen are valid for explaining the exports of the countries considered. In this model 407 number of cases (rows) and 28 total number of groups (countries) are treated. The coefficients of the regressors indicate by how much the dependent variable changes when the independent variables increase by one percentage point.

The statistical significance of a coefficient is tested as follows:

$$H_0 = \text{Not statistically significant}$$

$$H_1 = \text{Statistically significant}$$

To reject the null hypothesis, the t-ratio has to be higher than a T-student distribution (or a Normal distribution) at a 5% significance level: 1,96 (for a 95% confidence) for testing for individual significance. This critical value for the T-distribution given the fact that for a large number of observations this distribution converges to a normal distribution. The testing procedure holds when testing for joint significance of the model but the F-distribution has its particular critical value at 5% significance.

The two-tail p-values associated to the T-statistic indicate that almost each coefficient is individually significant statistically speaking. Hence, we reject the null hypothesis given the p-value is lower than 0,05 (95% confidence). However, we got that the variable *landlockedGDPCPI*<sup>18</sup> is non-significant at 5%. This means that all the variables have a significant influence on our dependent variable, *LogX* (log Exports) except *landlockedGDPCPI*. What is more, in the output the t-ratio of the independent variable *logGDPPCCPI2010100* is the one with higher relevance in the dependent variable.

Moreover, the F-test shows us the joint significance of the regression. In case the F-statistic is greater to the standard levels of significance (i.e. 1%, 5% and 10%) it means that we are rejecting the null hypothesis of no joint significance of the model. As we can appreciate, this is the case given the p-value associated to the F-statistic is lower than 0,05.

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<sup>18</sup> The reason why this variable is not significant is explained in detail in the Appendix B

### 1.3. *The economic interpretation of the variable*

a) The variable *logGDPPCCPI2010100* is statistically significant and the t-ratio is equal to 15,89 which represents a high influence of this variable on the dependent variable.

b) The coefficient of the variable *landlockedGDPCPI* has to be explained with respect its reference category: non-landlocked country. So, the interpretation is: for any landlocked country in the EU, an extra percentage point in GDP per capita and CPI leads to an increase in Exports by 0,0038 logarithm points. For the landlocked countries to the previous increment we need to sum an extra increase by 0,0004. In sum, for each percentage point increase in GDP per capita and CPI in the landlocked EU countries the exports increase 0,0042 logarithm points. Even though, the variable *landlockedGDPCPI* is not statistically significant it has an economic effect.

c) The multiplicative dummy variable *EasternGDPCPI* is statistically significant. The economic intuition behind the coefficient is as follows: for all non-Eastern countries an increase in 1% in GDP per capita and in the CPI, leads to an increase in exports of 0,0038 logarithmic points. But only for the Eastern countries this increase is offset by a decrease in exports by 0,0022 logarithmic points. As a result, for Eastern European countries an increase of 1% in the GDP and in the CPI means an increase of 0,00153 logarithmic points in total exports which is less increment compared with the non-Eastern countries.

d) The variable *EasternEUMemberGDPCPI* includes two features of the country: to be an Eastern country and also an EU member. This variable is statistically significant and different from 0. Its corresponding economic interpretation is: for non-Eastern countries and non-EU members, an increase of 1% in GDP per capita and in the CPI, means a 0,00379 logarithmic points increase in exports. If the country is from the East and it is an EU member the increase is even larger since we need to sum the value of 0,00075 to 0,00379. Therefore, for the Eastern EU members the increase of 1% in the GDP and in the CPI leads to an increase in exports of 0,00454 logarithm points.

On the one side, the economic intuition of the qualitative variable, *EasternEUMemberGDPCPI*, is important and it refers to the Eastern EU members and non-Eastern and non-EU members. The effect once the Eastern countries are in the Union is positive. This enables us to identify the effect of trade creation when we eliminate barriers to trade with the EU.

On the other side, in *EasternGDPCPI*, the dummy variable is capturing the effect on Exports of a percentage increase in GDP per capita and CPI when it is an Eastern country or it is not. Since being an Eastern country before 2000 and after 2014 is an obvious fact (it is a non-dimensional characteristic), we can argue this result in the following way: being an Eastern country means to have less increase in exports when GDP per capita and CPI increase by 1%, the trade improving is lower than the trade resulting for the rest of the European countries. This means that being an Eastern country makes trade improving less than the other European countries, such as, for instance, the North European countries or the Central European countries<sup>19</sup>.

In the next section we will investigate the exports of a specific Eastern country, Poland. We selected this country for its long extension, location and for being non-landlocked. These facts are favorable for the previous analysis of the econometric model.

#### *1.4. Analyzing graphically the exports of a particular example of an Eastern country, Poland.*

Poland is a country which became a member of the EU in 2004. Poland started the negotiations in 1998 but they already declared the goodwill of integration with the EU in 1994. The negotiations finished in 2002 and it ended being a member in 2004. Therefore,

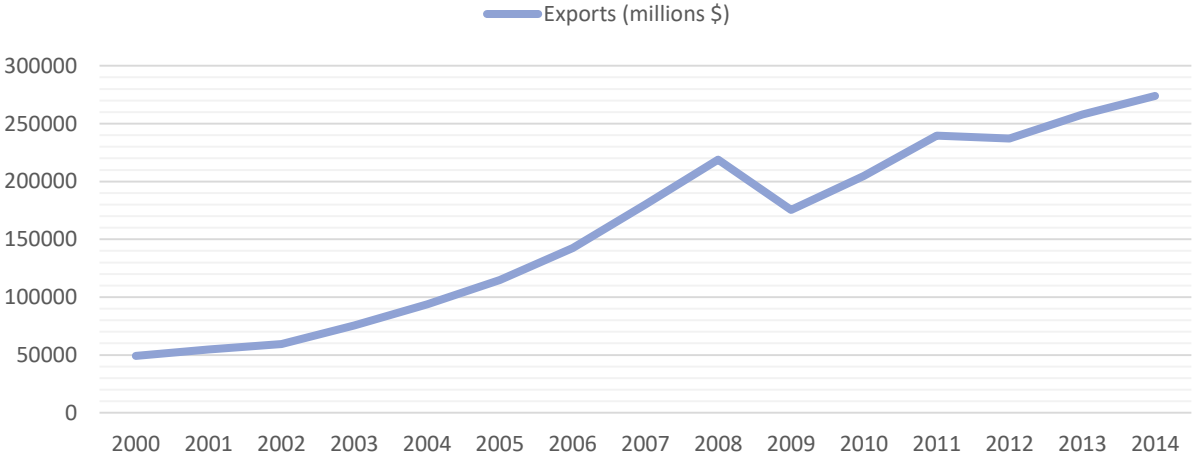
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<sup>19</sup>The North European countries are Ireland, United Kingdom, Netherlands, Northern Germany, Denmark, Sweden and Finland. The Central European countries are Austria, Germany, Italy, Luxembourg, France and Belgium.

given that the agreements started long time before 2004, the EU started to liberalize gradually Poland's market assuring the success of a complete integration by 2004.

In the graph below the exports of Poland are represented in millions of US dollars from 2000 until 2014. Hence, this variable represents the evolution of Poland's exports, before and after the inclusion to the EU.

Figure 5, Poland exports in millions of \$



Source: Dataset from World Bank, own creation

In figure 5, we observe that there is an intensive increment of the variable exports. It is more accentuated after the enclosure to the EU which allows us to identify the improvement of Poland's exports. The increase is accentuated from 2002 due to the gradual liberalization with the EU and it stopped with the arrival of the financial crisis on 2008. The general path of exports during the time range is positive since the amount increased around six times from 2000 until 2014. Hence, the effect in Poland's trade after the inclusion to the EU is positive since there is an increase in the openness to trade.

1.5. Conclusions

The panel data regression analyzed reveals some interesting observations concerning the EU trade. The regression results captured the effect of the dummy variables on exports. The conclusion subtracted is that exports increase if the country is from Eastern Europe and also an EU member. But, when the country is just from the East, independently if it is



a member of the EU or not, its trade increment is lower than the rest of the EU members increase.

These arguments allow for the identification of a trade creation effect if it is an Eastern country and EU member. When the country is not from the East and it is an EU member the increase in exports is more intensified than the increment in exports of an Eastern European country. Therefore, during the time range analyzed, there is a difference in the exports path depending on where the country is located and when it entered to the EU.

An Eastern country increase in exports is less significant than an increase in exports of non-Eastern European countries. Even so, there is evidence of increment in exports which means that the predominant effect within the EU is the creation of trade.

The specialist Kandogan (2005), measured the trade diversion and creation effects of major European agreements through a modified triple-indexed gravity model with bilateral fixed effects. The conclusion of the study was that the mainstream of the agreements appeared to be welfare improving for Europe and its partner countries in all sectors. Some exceptions were founded in the trade made with less similar partners, such as the EU agreements with Central and Eastern European countries. The latter agreement was unsuccessful, especially in sectors of labor and resources because of its failure to create trade. Therefore, the arguments provided by Kandogan in his analysis allow to proof Viner's theory concerning the impact of a trade agreement since there is evidence of trade creation and trade diversion in the European custom union.

Moreover, Haberler's theory regarding specialization can also be an answer to the positive effect on trade. He stated: "the specialization of the countries in those sectors where they have a relatively greater efficiency will end up always better off"<sup>20</sup>. Hence, the European countries experienced a specialization in some sectors which allowed a larger improvement in trade and the main macroeconomic variables.

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<sup>20</sup> Haberler, G. (1930), pp. 3-19

## IV. Conclusions

For Viner a custom union can have two effects, creation and/or destruction of trade. Hence, in the case of the EU the destruction of trade should be low since is an almost perfect custom union. Meanwhile, for Haberler the custom union was always seen as something positive which creates trade.

The objective of this research was to check if Jacob Viner's or Gottfried von Haberler's theory of custom union was more accurate and reflected more realistically the current custom union system presented in the European Union.

The European Union is more than a custom union, it also includes a free trade zone, a common market, and an economic union. All these features complicated the analysis since the custom union is nearly perfect. Hence, through the analysis of the most decisive trade variables, we have tried to identify which of the two renowned economists was closer to the type of the European custom union.

Chapter two allowed us to see evidence of Viner's theory in the EU because imports increased during the time range analyzed since trade creation effect surpass trade diversion effect. Moreover, the division of the examination between the Eastern countries and the rest of the EU members allowed identifying Haberler's argument regarding the non-brake of tariffs at the Western Countries borders.

The objective of chapter three was to identify the trade effect through an econometric analysis using a dataset which includes members and non-members of the EU between 2000 and 2014. The panel data regression allowed the recognition of the increase in export which may be due to trade creation or to trade diversion. The positive effect on trade was seen through the increase in exports of Eastern countries once they became an EU member. Moreover, when the country is from the Eastern Europe, independently if it is a member of the EU or not, the results revealed a positive path of trade but less trade improving than the other non-Eastern EU members.

Following a recent paper by Dhingra, Ottaviano, Sampson and Van Reenen (2016) where they provided a model which studied the effects of Brexit on the UK's trade with the EU and the rest of the world, they concluded that trade will be harmed since UK's degree of integration with the EU will be definitely reduced. From Viner's point of view, this incident can be an effect of trade diversion since it will stop buying from the EU, or a trade creation effect if the UK starts buying from its own country (protectionism) or from third countries. Therefore, the consequences of Brexit explained in the paper are in line with Viner's theory. However, this event can be seen as a contradiction with Haberler's theory since a custom union does not look to be always wholeheartedly welcomed, at least not for Britain. In addition, other arguments introduced in this paper are in favor of the existence of trade diversion, at least in some sectors.

Even though Gottfried von Haberler was right in some statements, Viner went one step ahead introducing the concepts of trade creation and trade diversion. Therefore, the existence of trade agreements can create and/or destroy trade at least in some specific sectors. This allows us to say that Jacob Viner's view seems to describe better the characteristics of the European custom union. Finally, it turns out that for the EU the integration level is much higher than the concept of custom union introduced by Viner. In particular, trade creation surpasses trade diversion ending up into a positive effect on trade. Hence, despite the cultural and political differences between the EU members the predominant effect on trade is trade creation.

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**Database:**

Comtrade, Eurostat, World Bank and Investing

## Appendix A

The twenty-eight countries of the EU and the year of the inclusion:

Country	Year
Belgium	1958
France	1958
Germany	1958
Italy	1958
Luxembourg	1958
Netherlands	1958
Denmark	1973
Ireland	1973
United Kingdom	1973
Greece	1981
Portugal	1986
Spain	1986
Austria	1995
Finland	1995
Sweden	1995
Cyprus	2004
Czech Republic	2004
Estonia	2004
Hungary	2004
Latvia	2004
Lithuania	2004
Malta	2004
Poland	2004
Slovakia	2004
Slovenia	2004
Bulgaria	2007
Romania	2007
Croatia	2013

## Appendix B

The model was run in Stata manipulating the database with the following codification:

- 1) xtset COCODE Year, yearly
- 2) generate landlockedGDP2010100 = Landlocked\*logGDPPC2010100  
generate landlockedCPI = Landlocked\*CPI2010100  
generate EasternCPI = Easterncountry\*CPI2010100  
generate EasternGDP2010100 = Easterncountry\*logGDPPC2010100  
generate EUMemberCPI = EUMember\*CPI2010100  
generate EUMemberGDP = EUMember\*logGDPPC2010100  
generate EasternEUMemberGDP = EUMember\*logGDPPC2010100\*Easterncountry  
generate EasternEUMemberCPI = EUMember\*CPI2010100\*Easterncountry  
generate landlockedGDPCPI = Landlocked\*logGDPPC2010100\*CPI2010100  
generate EasternGDPCPI = Easterncountry\*CPI2010100\*logGDPPC2010100  
generate EUMemberGDPCPI = EUMember\*CPI2010100\*logGDPPC2010100  
generate EasternEUMemberGDPCPI  
= EUMember\*Easterncountry\*logGDPPC2010100\*CPI2010100

We run the regression with the influence of GDP per capita and dummy variables in the variable exports.

→ xtreg LogX logGDPPC2010100 landlockedGDP2010100 EasternGDP EasternEUMemberGDP, fe vce(robust)

```
. xtreg LogX logGDPPC2010100 landlockedGDP2010100 EasternGDP2010100 EasternEUMemberGDP,
> vce(robust)
```

Fixed-effects (within) regression

Group variable: COCODE

R-sq: within = 0.7023  
between = 0.1533  
overall = 0.1444

corr(u\_i, Xb) = -0.9773

Number of obs = 407  
Number of groups = 28  
Obs per group: min = 10  
avg = 14.5  
max = 15

F(4,27) = 308.19  
Prob > F = 0.0000

(Std. Err. adjusted for 28 clusters in COCODE)

LogX	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
logGDPPC2010100	3.584872	.3258077	11.00	0.000	2.91637	4.253374
landlockedGDP2010100	1.222522	.518698	2.36	0.026	.1582415	2.286802
EasternGDP2010100	-1.342695	.4223003	-3.18	0.004	-2.209184	-.4762067
EasternEUMemberGDP	.0386116	.0120583	3.20	0.003	.01387	.0633532
_cons	-24.17827	2.903987	-8.33	0.000	-30.13676	-18.21978
sigma_u	6.9169972					
sigma_e	.28149382					
rho	.99834658	(fraction of variance due to u_i)				

Graph 1 - Source: Own creation based on the dataset from World Bank

We run the regression with the influence of CPI and dummy variables in the variable exports.

→ xtreg LogX CPI2010100 landlockedCPI EasternCPI EasternEUMemberCPI, fe vce(robust)

. xtreg LogX CPI2010100 landlockedCPI EasternCPI EasternEUMemberCPI, fe vce(robust)						
Fixed-effects (within) regression			Number of obs	=	408	
Group variable: COCODE			Number of groups	=	28	
R-sq: within	=	0.8146	Obs per group: min	=	10	
between	=	0.1025	avg	=	14.6	
overall	=	0.1552	max	=	15	
corr(u_i, Xb) = -0.2124			F(4,27)	=	137.09	
			Prob > F	=	0.0000	
(Std. Err. adjusted for 28 clusters in COCODE)						
LogX	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
CPI2010100	.0392971	.0025933	15.15	0.000	.033976	.0446182
landlockedCPI	.0066849	.0053514	1.25	0.222	-.0042952	.017665
EasternCPI	-.0265089	.0037032	-7.16	0.000	-.0341073	-.0189106
EasternEUMemberCPI	.0074295	.0014231	5.22	0.000	.0045094	.0103496
_cons	8.127589	.203331	39.97	0.000	7.710388	8.544789
sigma_u	1.458413					
sigma_e	.22256706					
rho	.97724053 (fraction of variance due to u_i)					

Graph 2 - Source: Own creation based on the dataset from World Bank

We can analyze the graph 1 and 2 as following:

The test (F) shows us the jointly significance of the regression (Prob > F is lower than 0,05 which means that all the coefficients in the model are different than zero. T-values test the hypothesis that each coefficient is different from 0. In our outputs all the values are higher than 1,96 (except for variable *landlockedCPI* in graph 2) which means that the variables have a significant influence on the dependent variable, *logX* (log Exports). The higher the t-value the higher the relevance of the variable. In the graph 1 and 2 the t-value of the independent variable *logGDPPC2010100* and *CPI2010100* show higher relevance in the dependent variable. The variable *landlockedCPI* from the Graph 2 is not significant at 5% since the p-value is higher than 0,05 explaining the non-significant result obtained in the regression of Chapter three of this research. The coefficients of the regressors indicate how much the dependent variable changes when the independent variables increase by one percentage point.



