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# The Effects of Economic Integration on Croatian Merchandise Trade: A Gravity Model Study

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Nina Ranilović

Zagreb, June 2017





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## Abstract

The paper shows that Croatia trades more with higher income and closer countries, which is in line with the standard gravity model assumption, and that a strong bias exists towards trade with countries of the former Yugoslavia. In addition, Croatian accession to the European Union proved to affect trade positively. On the other hand, free trade agreements signed with non-EU countries do not have a statistically significant and positive effect on Croatian trade. Although the positive impact of Croatia's membership in Central European Free Trade Agreement (CEFTA) did not prove to be robust, this could be explained by its strong overlap with the group of countries from former Yugoslavia. Additionally, it was found that the crisis affected the determinants of Croatian exports and imports in different ways and that some disparities exist between trade in goods and trade in goods and services.

**Keywords:**

merchandise trade, Croatia, gravity model, EU accession, free trade agreements, CEFTA membership

**JEL:**

C23, F13, F14, F15

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# 1 Introduction

International trade is one of the key factors of a country's economic development. Croatia's merchandise trade accounts for around 55% of GDP. However, its exports of services exceeds merchandise exports due to the strong tourism sector, so when taking into account both trade in goods and services the indicator of trade openness rises to approximately 85% of GDP. Still, Croatia is among the least open Central and Eastern European (CEE)<sup>1</sup> countries and the improvement in this indicator is important for stronger economic development.

Although merchandise exports had never been sufficient to cover imports in any single year after 1995, since the outbreak of the global economic and financial crisis the trade deficit has declined sharply, mainly through weak demand and import adjustment. In addition, the structure of Croatian trade changed after accession to the European Union (EU) in July 2013.

This paper uses the gravity model of international trade to analyse the impact of EU accession, CEFTA membership and different preceding free trade agreements (FTAs) on Croatian merchandise trade. This model, based on Newton's law of gravity, explains bilateral trade flows as proportional to the economic size of trading partners and inversely proportional to their distance, i.e., larger and closer economies trade more with each other. Trade flows are defined not only by size and geographical distance but also by trade agreements and other historical and cultural connections that make trading easier.

Croatia was laggard in entering different FTAs compared to CEE countries and hence the motivation behind this paper is to explore whether membership in CEFTA and later in the EU brought benefits to Croatian trade. While testing the robustness of the results, we also analyse whether the recent financial crisis affected exports and imports in the same way and whether the main findings apply in the case of trade in goods and services.

This paper contributes to the existing literature on Croatian trade by being among the first to analyse the impact of EU membership. Previous analyses of Croatian trade were mainly conducted using cross-section gravity models, while this paper uses a variety of different panel estimation techniques to capture both spatial and temporal data variations and also to better account for unobserved, country-pair specific, time-invariant determinants of trade. The model is estimated using ordinary least squares, fixed and random effects, Poisson pseudo-maximum likelihood and the Arellano-Bover/Blundell-Bond estimators.

The paper is organised as follows: the second section describes the characteristics of Croatian merchandise trade and its geographical structure. The third section reviews the main empirical findings of previous studies that used a gravity model with Croatia included in their sample. The fourth section explains basic concepts of the gravity model and the methods applied in the paper and describes the data used. The results of econometric analysis and various robustness checks are described in the fifth section. The last section concludes.

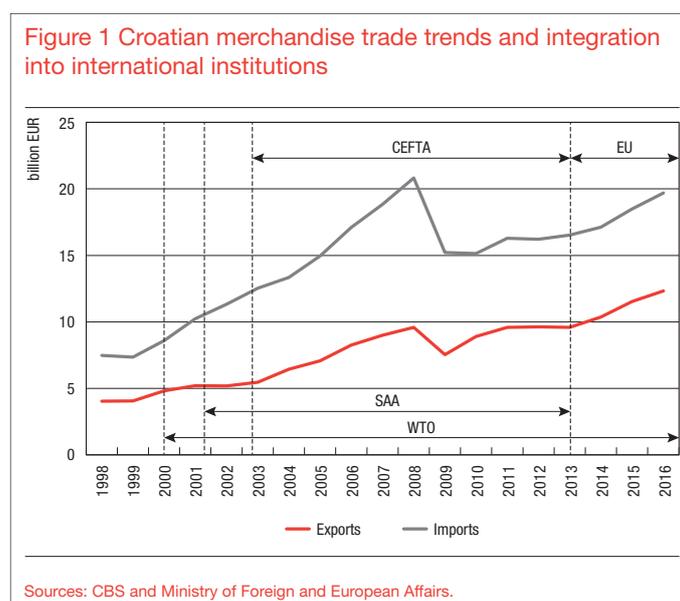
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<sup>1</sup> Refers to the Central and Eastern European (CEE) countries, as defined by the OECD excluding Albania. The CEE group of countries comprises Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, Slovenia, and the three Baltic States: Estonia, Latvia and Lithuania.

## 2 Merchandise trade in Croatia

In the period from 1998 to 2016 Croatia recorded a constant merchandise trade deficit with the export – import coverage ratio around 53% on average<sup>2</sup>. Slower export than import growth in Croatia can partially be explained by the late integration into international economic institutions (Figure 1). First, unlike other CEE countries, which entered the World Trade Organization in 1995, Croatia became a member in 2000. Second, the lack of an Association Agreement with the EU deprived Croatia of preferential access to the EU market, as explained in Stojčić (2012). Additionally, during that period other CEE countries that signed European Agreements with the EU were discouraged from sourcing their inputs in Croatia because these agreements required that their exports to the EU market contained minimum levels of input originating from the EU or Association Agreement countries. In October 2001 Croatia signed the Stabilization and Association Agreement but its exports to CEE countries were further impeded until December 2002, when it became a member of CEFTA. In July 2013 Croatia became a member of the EU and the second state (after Slovenia) of the former Yugoslavia to join the Union.

Weak growth of Croatian exports can also be explained by a number of factors, including a low share of high value-added products, lack of a clear national export strategy, low inflow of foreign direct investment in the tradable sector, high business costs compared to peer countries and relatively low investment in R&D. According to European Commission (2015) Croatian exports were concentrated in non-growing products and geographical markets, insufficiently integrated into global value chains and inefficient in product and factor markets.



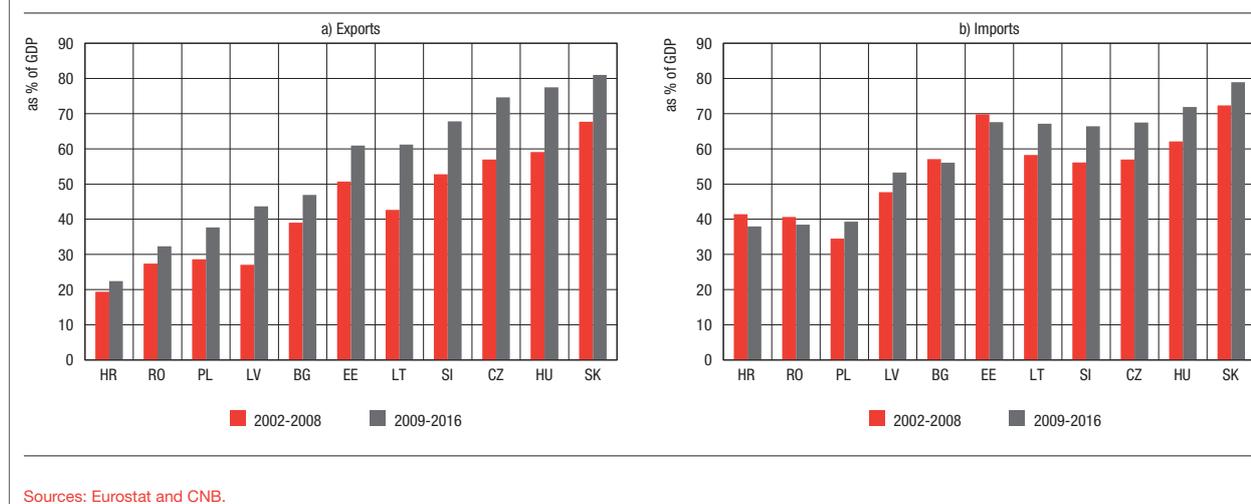
The global financial crisis had a strong impact on Croatian economy, resulting in a sharp decrease in domestic demand and imports. In 2009 merchandise exports and imports dropped heavily, after which exports recovered faster than imports. Although exports in the post-crisis period grew faster than imports, their value is still quite small compared to peer countries.

The average ratio of merchandise exports in GDP from 2002 to 2016 was only 18.2%, which puts Croatia in the last place among CEE countries. Imports amounted to 36.4% of GDP, which is also the lowest among CEE countries<sup>3</sup>. After the onset of the crisis, the share of merchandise exports in GDP increased, while

<sup>2</sup> In the period 1998-2016, the lowest export – import coverage ratio was recorded in 2005 and amounted to 44%, while the highest ratio was recorded in 2016 and amounted to 63%.

<sup>3</sup> During 2002-2016 period, the share of Croatian exports of goods and services on average amounted to 41.0% of GDP and imports to 44.1%, which is still quite low compared to other CEE countries.

Figure 2 Exports and imports in CEE, the average value in the pre- and post-crisis period



the share of imports declined (Figure 2). In addition, given that Croatian exports are highly import dependent<sup>4</sup>, a low level of imports partly stems from exports that are also relatively weak.

The majority of Croatian merchandise trade is conducted with EU member states (Table 1). The share of exports to the EU in total Croatian exports exceeds 60% for the whole period. Among the EU-15<sup>5</sup>, the most important trading partners are Italy, Germany and Austria and within the EU-12 the highest exports were to

Table 1 Geographical structure of Croatian merchandise trade  
as % of total

	Export		Import	
	Pre-crisis 1998-2008	Post-crisis 2009-2016	Pre-crisis 1998-2008	Post-crisis 2009-2016
<b>EU-27</b>	<b>65.2</b>	<b>62.1</b>	<b>70.0</b>	<b>70.3</b>
<b>EU-15</b>	<b>49.9</b>	<b>42.8</b>	<b>53.9</b>	<b>48.6</b>
Austria	6.7	6.0	6.3	7.4
Italy	21.5	15.4	17.0	14.3
Germany	12.6	10.9	16.0	14.1
<b>EU-12</b>	<b>15.3</b>	<b>19.3</b>	<b>16.1</b>	<b>21.7</b>
Slovenia	8.8	9.8	7.2	8.9
Hungary	1.5	2.8	2.8	5.3
<b>CEFTA</b>	<b>18.3</b>	<b>19.2</b>	<b>3.4</b>	<b>5.7</b>
Bosnia and Herzegovina	13.6	11.5	2.0	3.1
Serbia	3.0	4.4	0.6	1.9
<b>EFTA</b>	<b>1.4</b>	<b>1.8</b>	<b>2.0</b>	<b>1.8</b>
<b>Other</b>	<b>15.2</b>	<b>16.9</b>	<b>24.7</b>	<b>22.3</b>
Russia	1.6	2.3	7.9	5.8
China	0.1	0.5	3.3	4.4
USA	2.5	2.6	2.6	1.4

Note: Serbia before 2006 includes Montenegro.

Source: CBS.

4 According to estimates of the CNB (2013), in 2004 the import dependency of exports was 33%, which was particularly pronounced in the production of crude oil and natural gas, paper and pulp products, metal and office machinery and computers.

5 The EU-15 consists of: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom. The EU-12 comprises Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovakia and Slovenia. Moreover, CEFTA consists of Albania, Bosnia and Herzegovina, Montenegro, Kosovo, Macedonia, Moldova and Serbia, and the EFTA comprises Iceland, Liechtenstein, Norway and Switzerland.

Slovenia and Hungary.

Since the crisis, a visible decline in exports to EU-15 countries can be seen, especially to Italy, France and Germany, accompanied by an increase of exports to the EU-12, particularly Hungary, Slovenia and Poland. Among countries that are not members of the EU, the share of CEFTA countries in total exports increased in the post-crisis period, mainly due to an increase of exports to Serbia, while the share of exports to Bosnia and Herzegovina declined. At the same time, exports to the European Free Trade Association (EFTA) and third countries also increased.

Immediately following the EU accession (fourteen quarters up to the end-2016) a sharp increase in the share of exports to the EU-12 was recorded, and, to a much lesser extent, to the EU-15.

EU countries also dominate on the imports side with the share of around 70% on average. Croatia mostly imports from Italy, Germany and Austria within the EU-15, and among the EU-12 from Slovenia and Hungary. Since the crisis, a visible decline in the share of imports from EU-15 countries was recorded, especially from Italy, France and Germany, accompanied by an increase of imports from the EU-12, particularly Hungary, Slovenia and Poland. At the same time, the share of imports from CEFTA increased, primarily due to imports from Bosnia and Herzegovina and Serbia. Imports from EFTA did not change noticeably between two periods, while the share of third countries declined in the post-crisis period.

The share of imports from the EU-12 and EU-15 increased immediately after the EU accession (fourteen quarters up to the end-2016), while at the same time the biggest decline was recorded in the share of imports from third countries.<sup>6</sup>

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### 3 Previous studies of Croatian trade using the gravity model

Several authors have used the gravity model to analyse Croatian merchandise trade. Their research has shown that Croatian merchandise trade complies with the basic assumptions of the gravity model. There are three main issues and conclusions present in the papers. First, Croatia's weak export performance could be explained by reliance on low value-added exports in labour- and resource-intensive sectors; second, no hard evidence of the benefits of the FTAs on Croatian exports was found; and third, Croatia has a positive bias towards trade with former Yugoslav republics, while diverse results were reported for the trade with the EU.

The first group of studies concludes that Croatia's weak export performance can be explained by the dominance of low value-added exports in labour- and resource-intensive sectors. Buturac and Gržinić (2009) analysed Croatian merchandise trade with EU countries by product groups for 2006 and found that the balance of the majority of products was negative, which was especially pronounced in machinery, vehicles, precision instruments and chemicals. All these products are high value-added and capital- and research-intensive. On the other hand, a positive balance was recorded in low value-added products such as trade in wood and leather. In addition, they showed that Croatia trades more with geographically closer countries, such as Slovenia, and with developed, high-income countries like Italy, Germany and Austria. Similarly, the results from a gravity model in the European Commission's *Country report for Croatia* (2015) suggest that Croatia "features a significantly higher share of low-value-added exports in labour-intensive or raw-material intensive sectors, such as wood and cork, construction materials, leather products and footwear and animal products" (p. 29). Furthermore, while almost all Member States from the CEE have income elasticity of exports around unity, the value for Croatia is around 1/2. The main conclusion of the report is that the lower income elasticity of exports

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<sup>6</sup> The data for imports by trading partners after EU accession are not fully comparable with earlier data due to changes in methodology. In Intrastat (statistics on the trade between countries of the EU) data on the imports of goods are reported by the country of departure, while in Extrastat (statistics on the trade between countries outside the EU) by country of origin. This can lead to the conclusion that some of the imports from third countries has since July 2013 been redirected to EU member states.

means that Croatia does not take full advantage of its proximity to the rich markets.

A second stream of studies applied the gravity model to measure the trade effects from free trade agreements Croatia has signed, but found no evidence of their benefits. Malešević (2003) focused on the impact of upcoming Croatian CEFTA<sup>7</sup> membership on exports and imports. The results indicated that there was no evidence to distinguish imports from CEFTA from those from other countries in transition. In addition, Croatian exports to CEFTA countries was significantly lower than the exports to other countries in the sample. Furthermore, Begović (2011) measured the effect of free trade agreements on trade between the CEFTA member countries<sup>8</sup> and their major trading partners in the period 1999-2007. The author concluded that trade liberalization did not improve trade in the region during the observed period, since the FTA variable turned significant and negative. Additionally, the variable that captures only trade between CEFTA member countries was not statistically significant. The author argued that this could be a result of recent conflicts between the observed countries and that the conventional assumption that trade liberalization leads to improved trade performances between member countries did not apply in the case of CEFTA.

A third group of papers reported a positive bias of Croatian trade towards former Yugoslav republics, while diverse results were reported for trade with the EU. Družić, Anić and Sekur (2011) measured the effect of Croatia's regional integration using a gravity model of trade and found that Croatia did not trade more with EU countries than with other countries with the same distances and market sizes. However, there was a strong positive impact of the Western Balkan region (which raised Croatian exports there by more than eight times). The authors concluded that further strengthening of regional economic ties was of great importance because the region represented an enormous opportunity for the exploitation of Croatian export potential. Moreover, Croatian imports were affected by the size of a trading partner, while this variable was statistically insignificant in the export equation indicating that Croatian exporters were more competitive in the markets of less developed neighbouring countries. In addition, the distance variable had a stronger impact on Croatian exports than on imports. Šošić and Vujčić (2002) analysed trade flows of Croatia and some South and East European (SEE)<sup>9</sup> countries and showed that trade between these countries was significantly above potential, while trade flows with the countries that at that time constituted the EU and the CEFTA were only slightly above potential. Šošić and Vujčić (2005) used a gravity model to determine if Croatia was fit to join the EU from the trade perspective. The authors suggested that, although the gravity model showed no significant deviation of actual Croatian trade with the EU countries in relation to its potential, there was still quite a delay in Croatian trade integration with the EU compared to the other CEE countries. In addition, they found a significant positive bias towards trade with former Yugoslav republics<sup>10</sup>, especially Bosnia and Herzegovina, and Macedonia. Their results also showed a stable positive bias in trade with Slovenia and a growing bias in trade with Serbia and Montenegro. On the other hand, Pllaha (2012) found that trade between nine SEE countries was below potential. Moreover, Christie (2001) analysed trade on a sample of South-eastern European countries (SEE) and concluded that there was a very large trade potential between Croatia and the EU3 (Germany, Italy and Austria). In addition, Bussiere, Fidrmuc and Schnatz (2005) evaluated the trade integration of the CEE with the euro area and showed a negative gap between actual and potential trade for Albania, Bosnia and Herzegovina, Macedonia and, to a lesser extent, Croatia.

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7 CEFTA at that time consisted of Poland, Hungary, Czech R., Slovakia, Slovenia, Bulgaria and Romania, which are now a part of the EU-12.

8 Referring to Albania, B&H, Moldova, Macedonia, Montenegro, Serbia and Croatia.

9 Bosnia and Herzegovina, Yugoslavia, Macedonia and Albania.

10 Former republics of Socialist Federal Republic of Yugoslavia are: Bosnia and Herzegovina, Croatia, Kosovo, Macedonia, Montenegro, Serbia and Slovenia.

## 4 Method and data description

In this section we explain the basic concepts of the gravity model and methods applied in the paper. In addition, we describe the data used in the estimation and their sources.

### 4.1 Theoretical and methodological basis of the gravity model

The basic premise of the gravity trade model is that bilateral trade flows between two countries can be explained by their income and distance (proximity). Specifically, the model is based on Newton's law of universal gravity, according to which the holding strength between two bodies is directly proportional to their masses but inversely proportional to the square of the distance between them.

This concept was applied to the international economy by Tinbergen (1962) and further developed, among others, by Anderson (1979), Bergstrand (1985), Anderson and van Wincoop (2003) and Helpman et al. (2008). The gravity model of international trade replaces a force between two bodies with exports, imports or total trade, body mass with total demand and supply in partner countries (usually their GDPs), distance indicates the ease of access to foreign market (transportation costs) and the gravity constant is a variable that depends on neither of the partner countries (for example, the level of world trade liberalization) (Shepherd, 2013). Furthermore, according to this equation larger countries will mutually trade more and distant countries less because they have higher transportation costs. The basic gravity equation of trade between two countries takes the following form:

$$X_{ij} = G \frac{GDP_i^{\beta_1} GDP_j^{\beta_2}}{D_{ij}^{\beta_3}}, \quad (1)$$

where,  $X_{ij}$  is bilateral trade between countries  $i$  and  $j$ ,  $GDP$  is their gross domestic product,  $D$  is the distance between countries  $i$  and  $j$  and  $G$  is a constant.

Betas represent elasticity of bilateral trade between the two countries in relation to domestic GDP ( $\beta_1$ ), the trading partner's GDP ( $\beta_2$ ) and distance ( $\beta_3$ ). For example, if the domestic GDP increases by 1%, with all other variables held constant, the total bilateral trade will rise by  $\beta_1\%$ .

In recent literature economists have expanded the gravity model by including regional trade agreements, membership in economic unions, exchange rate variability and other dummy variables like common borders, language and so on. In addition, many authors emphasise the importance of including a lagged trade variable into equation to capture the "history effect". Campbell (2010) stresses that there is a habit-persistence on the consumer side and that a successful sale in one period yields a successful sale in the future. As for the producers' side, technology parameters are not merely exogenously given, but rather, they reflect learning-by-doing and sunk costs. These include building factories, designing products, and acquiring patents and copyrights, as well as creating distribution chains, sales networks, and brand names through marketing, all of which require detailed knowledge about local markets, tastes, customs, languages and regulations. Once acquired, these are assets that will continue to make the firm more productive in the future.

This paper analyses Croatian exports and imports with selected partner countries and includes additional variables to measure the impact of FTAs and the effect of Croatian membership in CEFTA and the EU (above other FTAs) on bilateral trade. In addition, the dummy variable  $ex\_Yu$  was used to capture the effect of historical links between Croatia and other countries of former Yugoslavia on trade. A static model is estimated with equation (2) and a dynamic model that incorporates a lagged trade variable to capture the "history effect" is estimated with equation (3):

$$\ln X_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln D_i + \beta_3 FTA_{it} + \beta_4 SAA_{it} + \beta_5 EU_{it} + \beta_6 CEFTA_{it} + \beta_7 ex\_Yu_i + \theta_i + \varepsilon_i \quad (2)$$

$$\ln X_{it} = \alpha_i + \beta_1 \ln X_{it-1} + \beta_2 \ln Y_{it} + \beta_3 \ln D_i + \beta_4 FTA_{it} + \beta_5 SAA_{it} + \beta_6 EU_{it} + \beta_7 CEFTA_{it} + \beta_8 ex\_Yu_i + \theta_t + \varepsilon_i \quad (3)$$

where  $X_{it}$  is Croatian exports/imports to/from country  $i$  in year  $t$ ,  $Y_{it}$  is a product of the nominal GDP of Croatia and of country  $i$ <sup>11</sup>,  $D_i$  is the geographical distance between Zagreb and country  $i$  capital,  $SAA_{it}$  captures all trade-related provisions with the EU which refer to the Interim Agreements under Stabilisation and Association Agreement (SAA) but also trade facilitation under single EU market from July 2013,  $FTA_{it}$  represents all other free trade agreements between Croatia and country  $i$  that are not included in  $SAA_{it}$ ,  $EU_{it}$  is a dummy variable that captures the effect of Croatian membership in the EU,  $CEFTA_{it}$  is a dummy variable that captures the effect of Croatian membership in CEFTA,  $ex\_Yu_i$  is a dummy variable for countries that were a part of the former Socialist Federal Republic of Yugoslavia,  $\alpha_i$  are the country-pair individual effects and  $\theta_t$  are time-specific effects.

A priori expectations are as follows: lagged trade and product of GDPs are expected to have a positive sign. Distance, as a proxy for transportation costs, is expected to have a negative coefficient. Free trade agreements, membership in economic unions and belonging to the same country in the past should have a positive impact on trade, therefore, a positive coefficient is expected.

Parameters in equations (2) and (3) were estimated using panel data analysis, which takes country pair-specific effects into account and reduces both the heterogeneity bias and the endogeneity bias. Time-effect dummies are also included in all models to capture the business cycle effect.

The results from both static and dynamic estimation methods are presented. Pooled ordinary least squares (OLS) is a good basis for comparison with other, more sophisticated models; however, it does not take into account unobserved country heterogeneity, which could distort estimates. The fixed effects model (FE) assumes that the unobserved heterogeneous component in the regression is constant over time. However, using fixed effects has a major restriction because the variables that do not change over time (such as distance) are omitted from the model to avoid perfect collinearity with fixed effects. Arguing in favour of a model with fixed effects, Egger (2000) emphasises that some of the main variables that are usually associated with the gravity model, such as the size of a country, access to international transport infrastructure and geographical and historical determinants (for example, trade links between countries that belong to certain economic unions) are not random variables, but are determined by specific historical, political and geographical factors. Also, the selected sample of countries used in the analysis is not accidental, but predetermined to observe specific trade flows. Nevertheless, to make a decision between the random (RE) and fixed effects model we use the Hausman specification test. Additionally, to deal with the problem of zero trade flows and taking into account that there is a problem of interpreting the parameters of log-linearised models in the presence of heteroskedasticity in the data (as suggested in Santos-Silva and Tenreyro (2006)), we also provide results from the Poisson pseudo-maximum likelihood estimator (PPML). For the estimation of the dynamic model (DY), we use the generalised method of moments, which was introduced by Arellano and Bond (1991) and Blundell and Bond (1998). As was suggested in Roodman (2009), this model accounts for potential endogeneity of independent variables, time-invariant country characteristics (fixed effects), the rise in autocorrelation by the inclusion of the lagged trade variable and the fact that the panel is “small T, large N”. We also use the Arellano-Bond test for autocorrelation to check for the absence of serial second-order correlation in the residuals of first-differenced equation, Hansen J statistic to test for joint validity of the instruments and the “difference-in-Hansen” to see if differenced instruments for level equations are valid. Following Baier and Bergstrand (2002), we treat variables that capture trade blocs and economic unions (which are also special forms of free trade agreements) as endogenous because free trade agreements not only intensify trade but also tend to be formed where countries already trade considerably. Moreover, the authors show that free trade agreements tend to exist among countries that are close in distance, remote from other countries and have large GDPs, which are exactly the same factors that tend to explain large trade flows.

<sup>11</sup> Data on trade and GDP are expressed in nominal terms following Baldwin (2006), who suggested that deflating nominal GDP and trade by a price index is a “bronze medal mistake” because gravity equation is obtained from the expenditure, and not demand, functions and therefore it requires nominal data.

## 4.2 Data and sources

The empirical analysis in this paper is based on the annual data for Croatian merchandise exports and imports from 1998 to 2016. The sample consists of 85 Croatian major trading partners so that countries observed, on average, account for more than 95% of total Croatian merchandise exports and imports. The sources for the trade data are the Central Bureau of Statistics (CBS)<sup>12</sup> and “Traditional international trade database” of Eurostat (ComExt). Furthermore, the total demand of the partner country is represented in the model by its nominal GDP, obtained from the “World Economic Outlook” database of the International Monetary Fund (IMF). Croatian nominal GDP is taken from the Central Bureau of Statistics. Moreover, from the “GEODIST” database of the French Institute for Research in the field of international economics (CEPII) we selected the distance variable, which is measured using the geographical coordinates of Zagreb and capital of the trading partner.

Data on the accurate timing of bilateral free trade agreements signed by Croatia are obtained from the Ministry of Foreign and European Affairs. In more detail, variable *SAA* takes value 1 if trading partner was a member of the EU after Croatia signed the Stabilisation and Association Agreement and continues to be equal to 1 after Croatia joined the EU. Binary variable *FTA* is equal to unity if Croatia has a signed free trade agreement with its trading partner in a given year, excluding those accounted for by the *SAA* variable<sup>13</sup>. The *EU* variable captures the effect of Croatian membership in the EU and takes value 1 if both Croatia and the partner country are members of the EU in a given year. The variable *CEFTA* is defined in the same way in order to capture the effect of Croatian membership in CEFTA. It is important to note that the *CEFTA* variable includes a larger set of countries than the seven current members. The selection of these four dummy variables enables us to capture all free trade agreements that Croatia signed with its trading partners, including membership in CEFTA and trade facilitation under the single EU market. The first two, *SAA* and *FTA*, capture the overall effect of FTAs on Croatian trade, while *EU* and *CEFTA* measure the specific effect of Croatian membership in these unions on trade. In addition, the variable *ex\_Yu* is 1 if a partner country was a part of the Socialist Federal Republic of Yugoslavia. For a more detailed explanation of dummy variables see Appendix A, Table A1.

## 5 Results

Below are the results of the original model of merchandise exports and imports. The main conclusions are mostly in line with the previous gravity model studies of Croatian trade, especially regarding the strong partiality for trade with former Yugoslavia countries and lack of the positive impact of CEFTA membership on Croatian trade.

### 5.1 Estimates for merchandise trade

Table 2 reports estimates of the export and import equation using various estimation techniques. Results are mostly in line with expectations. The most unexpected result is the impact of signed FTAs on Croatian trade, for which the estimated parameters are not statistically significant in the export equation and vary in sign in the import equation.

12 The statistics on the trade in goods of the Republic of Croatia compiled by the CBS defines goods imports and exports as each transfer of goods across the state borders, which means that it also includes transactions involving goods transfer across the Croatian borders involving trade between non-residents (quasi-transit trade or “Rotterdam effect”). These transactions intensified after Croatia joined the EU increasing the value of intra-EU flows from Croatia to other EU Member States.

13 Models were also tested with different versions of variables that capture the effect of free trade agreements to trade. First, we included all bilateral FTAs and membership in the EU and CEFTA into one common dummy variable. Second, we tried creating two dummy variables, one for all trade-related provisions with the EU and second that included all other FTAs. In addition, a dummy variable for a common border was included in import and export equations. However, obtained results in those versions fitted standard gravity assumptions to a lesser extent than the chosen version.

Table 2 Estimation results for export and import equation

Exports of goods					
Model:	OLS	RE	FE	PPML	DY
ln (Y)	0.47***	0.47***	0.61**	0.66***	0.33***
ln (D)	-1.24***	-1.26***	(omitted)	-1.19***	-0.71***
EU	0.10	0.10	0.14	-0.02	0.33**
CEFTA	0.19	0.09	0.06	0.53**	-0.07
SAA	0.08	-0.04	-0.06	-0.20	-0.15
FTA	-0.35	-0.28	-0.26	0.01	-0.16
ex_Yu	1.89***	1.75***	(omitted)	1.33***	1.28***
ln (EXPORTS (t-1))					0.41***
cons	1.08	1.17	-11.52**	-2.20	-0.30
Imports of goods					
Model:	OLS	RE	FE	PPML	DY
ln (Y)	1.00***	1.04***	1.19***	0.86***	0.41***
ln (D)	-0.85***	-0.95***	(omitted)	-1.31***	-0.34***
EU	0.74***	0.72***	0.76***	0.77***	0.34***
CEFTA	0.33	0.16	0.12	0.33	0.18
SAA	0.88**	0.55***	0.51**	-0.83**	0.23
FTA	0.59*	0.65***	0.67***	-0.70*	0.11
ex_Yu	2.29***	1.87***	(omitted)	0.91***	1.03***
ln (IMPORTS (t-1))					0.59***
cons	-11.93***	-12.43***	-22.78**	-5.24***	-5.85***

Note: \*, \*\* and \*\*\* refer to 10%, 5% and 1% statistical significance levels, respectively. Heteroskedasticity and autocorrelation of residuals in the panel data are accounted for using the cluster/robust options in Stata.  
Source: Author's calculations.

According to the results, the product of countries' GDPs is, as expected, statistically significant and positively correlated with goods' exports and imports. If GDPs of Croatia and its trading partner increase by 1%, holding other factors constant, Croatian exports to that partner country increase in a range from 0.3% to 0.7%. The income coefficients in the import equation show a stronger relationship than in the exports case. If the GDPs of Croatia and its trading partner increase by 1%, holding other factors constant, Croatian imports from that partner country increase in a range from 0.4% to 1.2%. Distance, as an indicator of transportation costs, is statistically significant and has the expected negative sign. Interestingly, in most of the estimates (except PPML), transportation costs affect Croatian exports more than imports.

The *EU* variable is statistically significant only in the dynamic model for the export equation. Referring to that result, after accession to the EU Croatian exports to the EU member countries rose by approximately 40%<sup>14</sup> compared to other countries in the sample. In the import equation the *EU* variable is statistically significant in all models. When Croatia became a member of the EU, imports from other member countries increased by more than 100% (only the dynamic model shows a smaller effect of around 40%).

Membership in CEFTA is statistically significant for Croatian exports only in the PPML model and has the expected positive sign. According to this result, joining CEFTA boosted Croatian exports to other CEFTA member countries by around 70%. However, in the import equation *CEFTA* variable is not statistically significant. The result for CEFTA membership could be affected by the fact that *CEFTA* and *ex\_Yu* variables overlap because all former SFRY countries were once a part of CEFTA.

Former membership in the Yugoslavia is highly positively correlated with Croatian trade and statistically significant in both equations. Moreover, Croatian exports to countries of the former Yugoslavia are at least 2.5 times and imports from them at least 1.5 times higher than from other countries in the sample.

14 Changes in the predicted trade flow for a dummy variable *i* are calculated as  $e^{\beta_i} - 1$ .

Both exports and imports from the previous period positively affect current export and import value at a statistically significant level of 1%.

The results are largely in line with the findings of similar studies. However, it is important to emphasise that calculated parameters are not fully comparable with all of the papers mentioned in the Section 3 because some of them observe bilateral trade flows between groups of countries, while in this paper we use a gravity model for a single country.

When comparing studies that examined Croatian trade flows, in this paper we can also observe a strong partiality towards trade with former Yugoslavia members, as in Družić, Anić and Sekur (2011), Šošić and Vujčić (2002) and Šošić and Vujčić (2005).

The expected positive effect of Croatian membership in CEFTA for Croatian trade is not robustly confirmed in this paper, which is in line with the results of Begović (2011). Furthermore, Malešević (2003) did not find evidence that Croatian trade with CEFTA countries is stronger than trade with countries outside this group. However, that analysis was conducted for the period before Croatian accession to CEFTA (which was then composed of different countries than it is today), so the results are not fully comparable with our study.

In addition, Družić, Anić and Sekur (2011) found that the effect of distance was more pronounced on Croatian exports than on imports. Finally, the parameters of distance and income obtained in the static OLS model are in line with comparable results of Buturac and Gržinić (2009).

## 5.2 Robustness checks

Robustness of the original model is tested dividing the sample into the period before and after the global and financial crisis and replacing the dependent variables with exports and imports of goods and services.

### 5.2.1 Effects of the crisis on Croatian merchandise trade

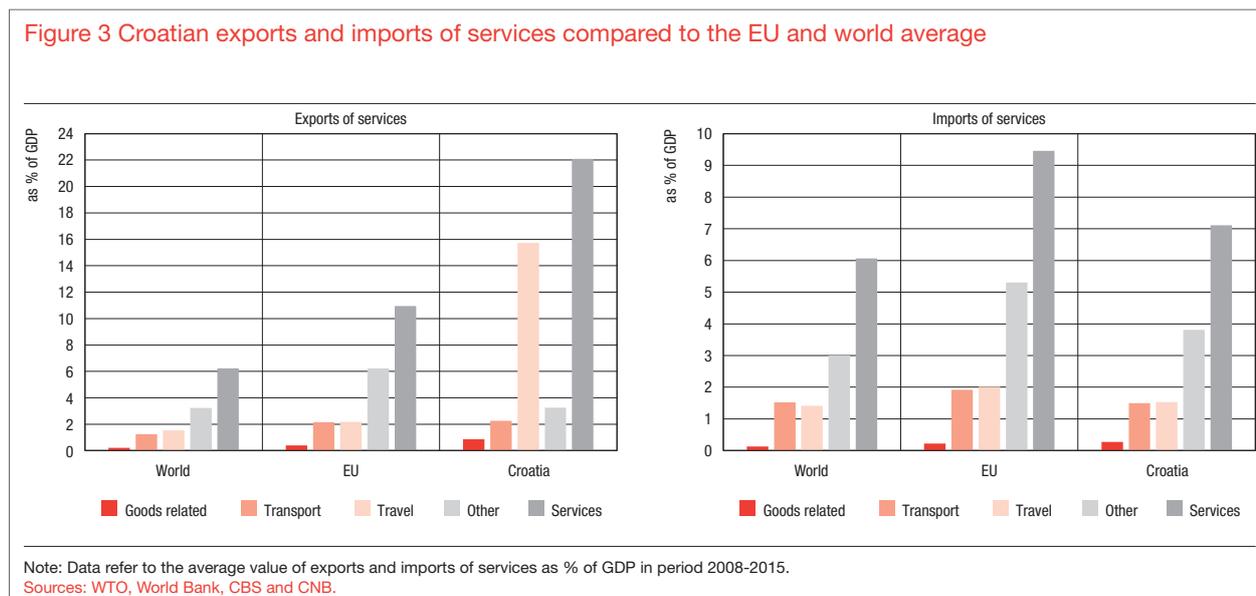
In order to check the robustness of the results and analyse the effects of the global economic and financial crisis on export and import determinants, the main sample was divided into two sub periods: the period before and after the outbreak of the global financial crisis. The main results obtained in the evaluation for the whole period were largely retained, referring to confirmed statistical significance and sign of the estimated parameters (see Appendix A, Table A2).

In the export equation, income and distance coefficients are in most estimates higher before the crisis than in the years after the outbreak of the crisis. Croatia was not a member of the EU in the pre-crisis period and therefore we can measure its effect only in the post-crisis period. Statistical significance and positive correlation of this variable with Croatian exports is confirmed only in the dynamic model. Croatian membership in CEFTA is positive before the crisis but not statistically significant. In the coming period variable *CEFTA* is statistically significant and positive in the PPML model, but surprisingly negative in the dynamic model. The negative impact on exports could partially reflect the measures that some Croatian manufacturers undertook before entering the EU, within which they moved their production to other CEFTA countries (or increased their existing production in other CEFTA countries) in order to take advantage of duty-free placement of goods under the free trade area once Croatia enters the EU. Signed free trade agreements did not prove to be significant in the case of exports in both periods. Finally, Croatian exports to former Yugoslav member countries were stronger before the crisis.

For the import equation, no conclusions can be made comparing income coefficients in the pre- and post-crisis period. The effect of distance on Croatian imports is stronger in the years after the outbreak of the crisis. In the same period, the *EU* variable is positive and statistically significant in all estimates. Membership in CEFTA is in most estimates statistically significant and positively correlated with Croatian imports before the crisis but not statistically significant in the coming period. The impact of signed free trade agreements on Croatian imports is inconclusive, since the estimated coefficients vary in sign and/or are not statistically significant. As opposed to exports, imports from former Yugoslavia member countries are in most estimates higher in the years after the crisis outbreak.

### 5.2.2 Estimates for trade in goods and services

Another robustness check is to estimate the model with dependent variables being exports and imports of goods and services, while keeping all explanatory variables the same as in equations (2) and (3), and compare the obtained coefficients with the results for merchandise exports and imports for the same period (2011-2016)<sup>15</sup>. The Croatian economy is very dependent on the services sector (especially tourism), which is reflected in noticeably larger share of exports of services in gross domestic product than the European and world average, while services imports are below the EU average and only slightly above the world average (Figure 3). In the last fifteen years tourism revenues accounted for around 70% of total services revenues, with Germany, Italy, Slovenia and Austria being the main outbound markets.



In the dataset we consider the same 85 partner countries as in the original estimation, which on average account for around 90% of Croatian services exports and 70% of services imports. The source for the services data is CNB.

The main results obtained for the merchandise trade were again mostly retained when taking into account trade in goods and services, referring to confirmed statistical significance and sign of the estimated parameters (see Appendix A, Table A3).

The coefficients with the joint income variable in the equation for exports of goods and services are in some estimates (OLS, RE, PPML) somewhat larger<sup>16</sup>, but still very similar to those obtained for merchandise exports in the same period.

Distance coefficients are negative and in general lower than in the original estimation suggesting that proximity could be less important for Croatian trade in services.

The *EU* variable is statistically significant only in the dynamic model for exports of goods and services and is of a smaller magnitude than in the merchandise export equation. This could be due to the fact that stronger exports of services in the recent period were mostly boosted by factors other than the EU accession, like security issues in the competitor markets and some domestic factors, namely the investments in tourism facilities as well as the persistent marketing efforts undertaken by tourist operators. Similarly, on the imports side, membership in the EU is statistically significant only in the PPML model and the corresponding coefficient is also smaller than in the same model for merchandise imports. This suggests that joining the EU had a

<sup>15</sup> Data for Croatian trade in services by country are available for the 2011-2016 period.

<sup>16</sup> This result suggests a higher income demand elasticity of Croatian export of services, than of goods, which could raise a question whether Croatia's strong tourism sector and provision of foreign exchange contributed to appreciation of the real exchange rate and thus to a diminished competitiveness in the goods exporting sector. However, no conclusion can be drawn solely on the basis of this result and this question remains open for future research. More on the "Dutch-disease" in Croatia can be found in Holzner (2005) and Vizek and Tkalec (2014).

milder positive impact on Croatian trade in services with other EU member countries than on trade in goods.

Membership in CEFTA is statistically significant and positive for Croatian exports of goods and services (again only in the PPML model), while in the import equation this variable is not statistically significant.

As opposed to the original estimation, the fact that the trading partner was a member of the EU after Croatia signed Stabilisation and Association Agreement is statistically significant and positively correlated in some models with Croatian exports of goods and services. At the same time, other signed FTAs remain statistically insignificant.

In addition, the fact that the partner country is a former Yugoslav Republic again has a positive impact on Croatian trade when services are included.

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## 6 Conclusions

The main purpose of this paper was to examine Croatian merchandise trade with its most important trading partners and assess whether, and to what extent, its determinants changed after the signing of various free trade agreements and CEFTA and EU membership. In this context, we used the gravity model of international trade and tested whether Croatian trade flows fit the basic assumptions of the model. In addition to standard variables used in the gravity equations (economic size and distance), we added a lagged trade variable, indicator variables for free trade agreements, variables that capture the effect of Croatian membership in CEFTA and in the EU and a dummy variable for former Yugoslavia.

According to the results, exports and, even more, imports intensify with the higher level of income of Croatia and its trading partner. At the same time, greater distance from the trading partner weakens exports more than imports suggesting that Croatian product is less accessible to a faraway country than a product of the same country in the Croatian market. The “history effect” is present in both flows, meaning that past trade value is positively correlated with the present one. The positive effect of EU accession is confirmed in the export equation only in the dynamic model, while in the import equation this result proved to be robust. On the other hand, impact of CEFTA and FTAs on Croatian trade in most cases turned to be either insignificant and/or even had an unexpectedly negative sign. Despite the violent break-up of Yugoslavia, all model estimates suggest a strong bias towards trade with former Yugoslav republics, revealing the strong inertia of existing commercial relations, which have retained their role since the Yugoslav period. It should be taken into account that this result can be a consequence of a definition of *FTA* and *CEFTA* variables, which consist mostly of former SFRY countries, so in some way they overlap.

Furthermore, when separating the sample in the period before and after the crisis, some estimates suggest a negative impact of CEFTA membership in the crisis period on Croatian exports. The latter could be due to a fact that Croatian manufacturers shifted their production to other CEFTA countries to take advantage of duty-free placement of goods under the free trade area once Croatia enters the EU. Additionally, since the crisis outbreak Croatian exports to countries of former Yugoslavia are slightly less pronounced, while the opposite is true for imports. Signed free trade agreements remain statistically insignificant in both periods for exports, while their impact on imports is ambiguous. Another analysis conducted on trade in goods and services suggests that signing the SAA could have positively affected Croatian exports of services, which is not the case for exports of goods. In addition, EU accession had a milder positive impact on Croatian trade in services with other EU member countries than on trade in goods.

Lastly, this paper can be further upgraded if issues that are usually connected with gravity models are addressed. One of the main criticisms of the gravity model is in the definition of the distance variable, which cannot adequately replace the average transportation costs from one country to another. Therefore, the improvement of this variable is crucial for further research.

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## Appendix A

Table A1 Defining dummy variables

<b>Variable CEFTA takes value 1 with:</b>	
Czech R., Hungary, Poland, Slovak R. and Slovenia in 2003	
Bulgaria and Romania 2003-2007	
Albania, Bosnia and Herzegovina, Kosovo, Moldova, Montenegro and Serbia 2007-2013	
Macedonia 2006-2013	
<b>Variable SAA takes value 1 with:</b>	
Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy,	
Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom 2002-2016	
Cyprus, Czech R., Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak R. and Slovenia 2004-2016	
Romania and Bulgaria 2007-2016	
<b>Variable EU takes value 1 with:</b>	
Austria, Belgium, Bulgaria, Cyprus, Czech R., Denmark, Estonia, Finland, France, Germany, Greece	
Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal	
Romania, Slovenia, Slovak R., Spain, Sweden and the United Kingdom 2013-2016	
<b>Variable FTA takes value 1 with:</b>	
Albania 2003-2016	Montenegro 2004-2016
Bulgaria 2003-2006	Norway 2002-2016
Bosnia and Herzegovina 2005-2013	Poland 2003
Czech R. 2003	Romania 2003-2006
Hungary 2003	Serbia 2004-2016
Iceland 2005-2016	Slovak R. 2003
Kosovo 2006-2016	Slovenia 2003
Moldova 2004-2016	Switzerland 2002-2013
Macedonia 1998-2016	Turkey 2003-2016
<b>Variable ex_Yu takes value 1 with:</b>	
Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro, Slovenia, Serbia 1998-2016	

Table A2 Estimation results for exports and imports before and after the outbreak of the crisis

Exports of goods 1998-2008							Exports of goods 2009-2016						
Model:	OLS	RE	FE	PPML	DY	Model:	OLS	RE	FE	PPML	DY		
In (Y)	0.49***	0.47***	0.60*	0.64***	0.41***	In (Y)	0.43***	0.43***	0.35	0.68***	0.30***		
In (D)	-1.25***	-1.25***	(omitted)	-1.13***	-0.92***	In (D)	-1.22***	-1.19***	(omitted)	-1.28***	-0.61***		
EU	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	EU	0.12	0.13	0.12	-0.10	0.42*		
CEFTA	0.26	0.29	0.29	0.44	0.08	CEFTA	0.12	0.03	0.03	0.76**	-0.24*		
SAA	0.08	-0.01	-0.03	-0.23	-0.24	SAA	0.09	0.14	(omitted)	-0.20	-0.17		
FTA	-0.31	-0.24	-0.23	-0.21	-0.18	FTA	-0.38	-0.23	-0.10	0.14	-0.06		
ex_Yu	2.07***	1.85***	(omitted)	1.42***	1.51***	ex_Yu	1.71***	1.66***	(omitted)	1.17***	1.10***		
In (EXPORTS (t-1))					0.30***	In (EXPORTS (t-1))					0.49***		
cons	0.71	1.03	-11.21	-2.26	-0.18	cons	2.33	2.27	-5.24	-2.33	-0.63		
Imports of goods 1998-2008							Imports of goods 2009-2016						
Model:	OLS	RE	FE	PPML	DY	Model:	OLS	RE	FE	PPML	DY		
In (Y)	1.00***	0.88***	0.18	0.88***	0.32***	In (Y)	0.98***	0.95***	0.38	0.84***	0.50***		
In (D)	-0.77***	-0.85***	(omitted)	-1.26***	-0.28***	In (D)	-1.02***	-1.05***	(omitted)	-1.41***	-0.59***		
EU	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	EU	0.57**	0.67***	0.61**	0.80***	0.30*		
CEFTA	0.82***	0.53***	0.58**	0.66***	0.33	CEFTA	-0.13	-0.31	-0.30	0.05	-0.10		
SAA	0.88**	0.43**	0.43**	-0.81**	0.03	SAA	0.76	0.67	(omitted)	-0.98**	0.19		
FTA	0.61	0.43*	0.51*	-0.94**	-0.02	FTA	0.38	0.24	0.09	-0.59*	0.04		
ex_Yu	2.47***	1.69**	(omitted)	0.82***	0.82***	ex_Yu	2.13***	2.12***	(omitted)	0.91**	1.06***		
In (IMPORTS (t-1))					0.66***	In (IMPORTS (t-1))					0.50***		
cons	-12.69***	-9.79***	-1.39	-6.03***	0.00	cons	-11.36***	-10.34***	-5.47	-3.63*	-5.57**		

Notes: \*, \*\*, and \*\*\* refer to 10%, 5% and 1% statistical significance levels, respectively.

Heteroskedasticity and autocorrelation of residuals in the panel data are accounted for using the cluster/robust options in Stata.

Source: Author's calculations.

Table A3 Estimation results for trade in goods and services

Exports of goods						Exports of goods and services					
2011-2016						2011-2016					
Model:	OLS	RE	FE	PPML	DY	Model:	OLS	RE	FE	PPML	DY
In (Y)	0.45***	0.46***	0.83	0.70***	0.25***	In (Y)	0.50***	0.48***	0.14	0.80***	0.24***
In (D)	-1.24***	-1.24***	(omitted)	-1.31***	-0.52***	In (D)	-1.05***	-1.04***	(omitted)	-1.38***	-0.45***
EU	0.15	0.16	0.17	-0.08	0.44**	EU	0.03	0.03	0.02	-0.16	0.35**
CEFTA	0.04	0.01	0.01	0.66**	-0.16	CEFTA	0.04	0.07	0.08	0.76**	-0.17
SAA	0.03	0.04	(omitted)	-0.21	-0.28	SAA	0.62**	0.64*	(omitted)	0.06	0.03
FTA	-0.26	-0.21	-0.17	0.22	-0.07	FTA	0.00	0.02	0.04	0.35	0.02
ex_Yu	1.65***	1.66***	(omitted)	1.25***	0.80***	ex_Yu	1.73***	1.68***	(omitted)	1.10***	0.78***
In (EXPORTS (t-1))					0.61***	In (EXPORTS (t-1))					0.56***
cons	2.22	1.95	-15.85	-2.38	-0.60	cons	0.04	0.41	0.18	-3.91**	-0.47
Imports of goods						Imports of goods and services					
2011-2016						2011-2016					
Model:	OLS	RE	FE	PPML	DY	Model:	OLS	RE	FE	PPML	DY
In (Y)	0.96***	0.94***	0.7	0.82***	0.49**	In (Y)	0.70***	0.69***	0.51	0.80***	0.47**
In (D)	-1.12***	-1.12***	(omitted)	-1.44***	-0.62**	In (D)	-0.80***	-0.78***	(omitted)	-1.37***	-0.60***
EU	0.32	0.43**	0.44**	0.57***	-0.30	EU	0.13	0.10	0.09	0.47***	-0.14
CEFTA	-0.03	-0.13	-0.14	0.10	0.51	CEFTA	0.03	0.22	0.24	0.22	0.14
SAA	0.83*	0.79**	(omitted)	-0.75*	0.68*	SAA	1.16***	1.22***	(omitted)	-0.60	0.57*
FTA	0.16	0.19	0.19	-0.43	-0.10	FTA	0.02	0.10	0.20	-0.31	-0.07
ex_Yu	2.02***	2.00***	(omitted)	0.88**	1.07*	ex_Yu	2.14***	2.07***	(omitted)	0.95***	1.14**
In (IMPORTS (t-1))					0.51**	In (IMPORTS (t-1))					0.47***
cons	-9.93***	-9.53***	-12.56	-3.16	-4.95*	cons	-6.47	-6.55**	-8.09	-3.24*	-4.24*

Notes: \*, \*\*, and \*\*\* refer to 10%, 5% and 1% statistical significance levels, respectively.

Heteroskedasticity and autocorrelation of residuals in the panel data are accounted for using the cluster/robust options in Stata.

Source: Author's calculations.

## The following Working Papers have been published:

No.	Date	Title	Author(s)
W-1	December 1999	Croatia in the Second Stage of Transition, 1994–1999	Velimir Šonje and Boris Vujčić
W-2	January 2000	Is Unofficial Economy a Source of Corruption?	Michael Faulend and Vedran Šošić
W-3	September 2000	Measuring the Similarities of Economic Developments in Central Europe: A Correlation between the Business Cycles of Germany, Hungary, the Czech Republic and Croatia	Velimir Šonje and Igeta Vrbanc
W-4	September 2000	Exchange Rate and Output in the Aftermath of the Great Depression and During the Transition Period in Central Europe	Velimir Šonje
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After the submission, the manuscripts shall be subject to peer review and classification by the Manuscript Review and Classification Committee. The authors shall be informed of the acceptance or rejection of their manuscript for publication within two months following the manuscript submission.

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Manuscripts should be submitted via e-mail or optical storage media (CD, DVD), accompanied by one printed paper copy. The acceptable text format is Word.

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Additional information, such as acknowledgments, should be incorporated in the text at the end of the introductory section.

The second page should contain the abstract and the key words. The abstract is required to be explicit, descriptive, written in third person, consisting of not more than 250 words (maximum 1500 characters). The abstract should be followed by maximum 5 key words.

A single line spacing and A4 paper size should be used. The text must not be formatted, apart from applying bold and italic script to certain parts of the text. Titles must be numerated and separated from the text by double-line spacing, without formatting.

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The preferred formats for illustrations are EPS or TIFF with explanations in 8 point Helvetica (Ariel, Swiss). The scanned illustration must have 300 dpi resolution for grey scale and full colour illustration, and 600 dpi for lineart (line drawings, diagrams, charts).

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