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Nina Ranilović

The Effects of Crisis and EU Accession on Croatian Merchandise Trade: A Gravity Model Study

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CROATIAN NATIONAL BANK

Nina Ranilović¹

THE EFFECTS OF CRISIS AND EU ACCESSION ON CROATIAN MERCHANDISE TRADE: A GRAVITY MODEL STUDY

This paper analyzes Croatian merchandise trade in the period from 1998 to 2015, using gravity model of international trade. With this model we can assess bilateral trade flows based on the economic size and the distance between the two countries. The results show that Croatian merchandise trade fits standard gravitational assumptions and that since the outbreak of the global crisis and the Croatian accession to the European Union (EU) the determinants of Croatian exports and imports changed. In addition, signed free trade agreements with trading partners don't have a statistically significant and positive affect on Croatian exports, contrary to expectations. Lastly, analysis of the Croatian trade potential points that, in the recent years, the level of actual exports has mostly improved in relation to its potential with the EU-15 and, on the import side, with the EU-12.

Key words: merchandise trade, Croatia, gravity model, trade potential, crisis, EU accession

¹ Croatian National Bank; nina.ranilovic@hnb.hr.

All errors, opinions stated and conclusions contained in paper are solely those of the author.

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1. Introduction

Engagement in the international trade flows can be considered as one of the key factors for the economic development of a country. Croatia is a small and open economy, where in the last fifteen years total merchandise trade with foreign countries accounted for slightly more than 50% of GDP. This indicator is relatively low in relation to countries with comparable economic characteristics and its improvement is important for stronger economic development. Although exports in the post-war period has never been sufficient to cover imports, since the outbreak of the global economic and financial crisis, we saw a declining trend in the trade deficit but mainly through imports adjustment. In addition, after Croatia in July 2013 became a full member of the European Union, certain changes in its trade structure occurred.

The analysis in this paper is based on a gravity model of international trade, which arises from Newton's law of universal gravitation. According to this model, bilateral trade flows are proportional to the economic size of trading partners and inversely proportional to their distance, i.e., larger, richer and closer countries trade more. In addition to the size of the economy and remoteness, trade flows are also defined by bilateral free trade agreements (FTAs) and other historical and cultural connections. In addition to these standard applications, gravity model can be used as a tool to measure the trade potential of the country, which assesses the extent to which actual trade flows differ from their potential (which are estimated in the model).

In addition to assessing the extent to which Croatian merchandise trade fits the standard assumptions of the gravity model, the main purpose of this paper is to answer a few additional questions. For example, can we explicitly say that the FTAs intensify trade or this depends on the economic situation of trading partners? Has the membership in Central European Free Trade Agreement (CEFTA) and then in the EU brought benefits to Croatian exports? Did economic and financial crisis affect export and import determinants in the same way or were there differences between the two flows? Also, we will try to determine in which markets exports still hasn't reached its potential.

The contribution of this paper in relation to the existing literature is that the analysis is based on the most recent data, including the period after Croatia joined the EU. Therefore, we can observe differences in the trade structure before and after the accession. Furthermore, there are a number of papers that analyzed Croatian trade flows using a cross-section gravity model. This study uses panel data to capture both spatial and temporal data variation, in accordance with the recent literature, and also to better account for unobserved, country-pair specific, time-invariant determinants of trade. In addition to estimating the model using pooled OLS (OLS), fixed (FE) and random effects (RE), we also add a lagged trade variable and use the dynamic gravity model to capture the "history effect", as suggested by Eichengreen and Irwin (1998).

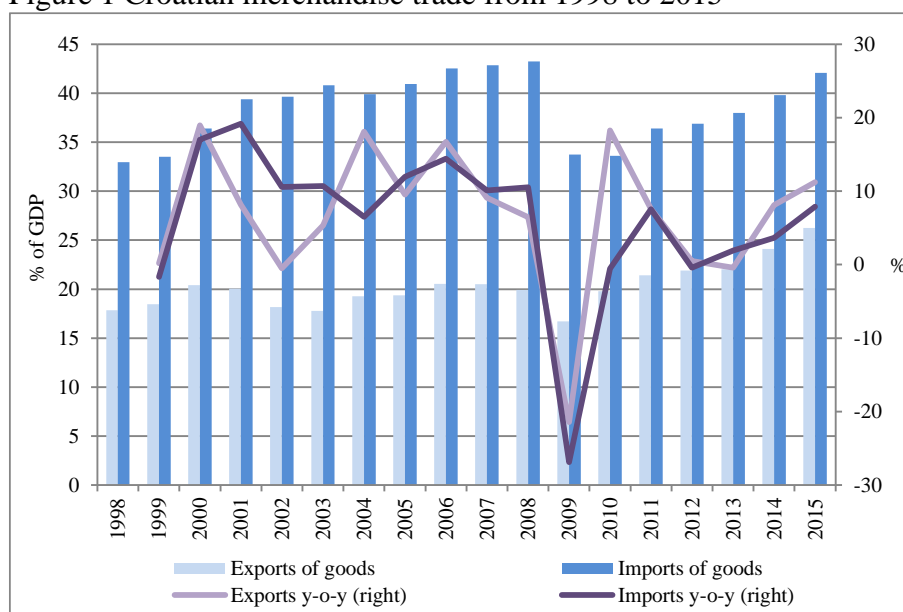
The rest of the paper is organized as follows: the second section reviews the characteristics of the Croatian merchandise trade and describes in more detail its geographical structure. Section 3 summarizes the main empirical findings of studies that used a gravity model with Croatia in their sample. The fourth section explains basic concepts of the gravity model and methodology applied in the paper. In addition, it describes the data used in the model and their sources. The results of econometric analysis are described in the fifth section, as well as Croatian export and import potential. Section 6 concludes.

2. Merchandise trade in Croatia

In the period from 1998 to 2015 Croatia continuously recorded a merchandise trade deficit, and the export – import coverage ratio was on average around 53%. The period before 2009 was marked by the predominant increase in trade deficit, while imports grew stronger than exports. Weaker export growth can partially be explained by a number of factors, such as a lower share of high value-added products², lack of a clear national export strategy, low inflow of foreign direct investment in the tradable sector, higher business costs than in regional peers and relatively low investment in R&D. In addition, Croatian exports is "concentrated in non-growing products and geographical markets, insufficiently integrated into global value chains and inefficient in product and factor markets"³.

In 2009, the global crisis has left strong consequences on the Croatian merchandise trade, resulting in strong decrease in domestic demand and imports, rather than in exports. In 2009 exports and imports recorded negative annual growth rates, after which export on average grew faster than imports. As a result, exports in 2015 amounted to EUR 10.5 bn., with an average growth rate in the period 2010-2014 of 7.5%, while imports in the same period recorded an average growth rate of 3.3% and in 2015 reached EUR 18.5 bn. (Figure 1).

Figure 1 Croatian merchandise trade from 1998 to 2015



Source: CBS.

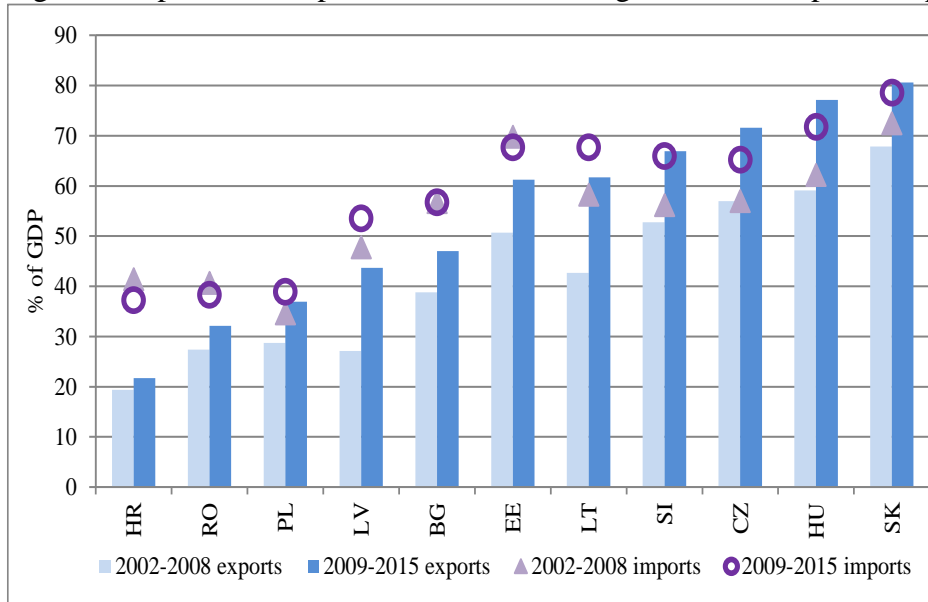
It should be noted that, although exports in the post-crisis period grew faster than imports, its value is still relatively small in relation to countries with comparable economic characteristics. Thus, from 2002 to 2015 the average ratio of exports of goods in GDP was only 20.6%, which places Croatia at the last place compared to countries from Central and Eastern Europe. This proportion was in the pre-crisis period on average even lower, but

² Buturac and Gržinić (2009) analysed Croatian merchandise trade with the EU countries by product groups in 2006 and found that the balance of majority of products is negative, which is especially pronounced in machinery, vehicles, precision instruments and chemicals. All these products are high value-added, capital intensive and focused on research and development. On the other hand, the positive balance was recorded in the trade of wood and leather, which are low value-added products.

³ Conclusions of European Commission in "Country Report Croatia 2015, Including an In-Depth Review on the prevention and correction of macroeconomic imbalances"

increased in the coming period. In the observed period, imports accounted for 39.3% of GDP and even lower ratio was recorded in Poland, which is a larger country thus reflecting lower need for trade openness. Unlike exports, the share of imports of goods in GDP on average decreased since the outbreak of the crisis (Figure 2). In addition, given that the Croatian exports is highly import dependent⁴ low level of imports partly stems from the relatively weak exports.

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



Note: Data for Czech Republic is available until 2014.
Sources: Eurostat, CBS.

Geographical structure (Table 1) of Croatian merchandise trade shows visible dominance of the EU member states. Their share in the total Croatian exports for the whole period exceeds 60%, on average slightly higher in the pre-crisis period (65.2%), after which it was reduced (61.4%). Among the EU-15⁵, the most important trading partners are Italy (average value of the share in total exports throughout the period amounted to 19.2%), Germany (11.9%) and Austria (6.4%). At the same time, within the EU-12, the highest exports was recorded to Slovenia (9.0%) and Hungary (2.0%). Although in the pre-crisis period the importance of the EU-15 was larger, its share gradually reduced after 2009 in favor of the EU-12. Accordingly, the biggest decreases were recorded in exports of other transport equipment to Italy, wearing apparel to Germany and electrical machinery, apparatus and appliances to Austria. At the same time, the most pronounced growth was recorded in exports of sugar to Hungary, furniture and parts to Slovakia and medical and pharmaceutical products to Poland. It's important to note, that in the post-crisis period the largest part of the increase in the share of EU-12 was after Croatia joined the EU.

⁴ According to estimates of the HNB (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, Greece, Ireland, Italy, Luxembourg, Netherlands Portugal, Spain, Sweden and the United Kingdom. The EU-12 are 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 consists of Iceland, Liechtenstein, Norway and Switzerland.

Among countries that are not members of the EU, share of CEFTA countries in total exports increased in the post-crisis period, mainly due to growth of exports to Serbia (related to stronger exports of certain food products and fertilizers) but as well Montenegro and Kosovo. Conversely, the share of exports to Bosnia and Herzegovina declined (especially non-metallic minerals and tobacco and tobacco products). Furthermore, we can see that in the post-crisis period exports to the European Free Trade Association (EFTA) grew, mainly related to exports of other transport equipment to Norway. Exports to third countries also intensified in the aftermath of the crisis thanks to higher exports to Russia, Turkey, Egypt, Tunisia and China.

Looking at the most recent period of ten quarters after EU accession⁶ and comparing it with the same period before that, we see that exports to the EU-12 increased the most, mostly boosted by stronger exports of mineral fuels to Slovenia and Hungary. Exports to the EU-15 also grew, but to a lesser extent, owing it to stronger exports of furniture and parts, road vehicles and manufactures of metals to Germany, wearing apparel to Spain, leather to Austria and cork and wood to Italy. Meanwhile, exports to CEFTA countries increased only slightly, primarily due to growth in exports of mineral fuels and food and live animals to Serbia, while exports to EFTA countries remained unchanged. On the other hand, exports to other countries decreased, with the largest decline recorded in exports to Tunisia (primarily petroleum and petroleum products), Liberia (other transport equipment), USA (medical and pharmaceutical products) and Turkey (metalliferous ores and metal scrap).

Table 1 Geographical structure of Croatian merchandise trade (% of total)

	EXPORT		IMPORT	
	pre-crisis	post-crisis	pre-crisis	post-crisis
	1998-2008	2009-2015	1998-2008	2009-2015
EU 27	65.2	61.4	70.0	69.3
EU-15	49.9	42.7	53.9	48.3
EU-12	15.3	18.8	16.1	21.0
EFTA	1.4	1.8	2.0	1.9
CEFTA	18.1	19.7	3.4	5.6
Other	14.7	17.1	24.6	23.2

Source: CBS.

On the imports side, EU countries also dominated in the entire observed period. The average share of imports coming from EU countries is slightly less than 70%, although it decreased over time. Croatia mostly imports from Italy (16.0%), Germany (15.1%) and Austria (6.7%) within the EU-15, and among the EU-12, from Slovenia (7.7%) and Hungary (3.7%). In addition, since the crisis a visible decline in the imports from EU-15 countries can be seen, especially from Italy, France and Germany, accompanied by an increase of imports from EU-12, particularly Hungary, Slovenia and Poland. The decline in imports was largely a result of decreasing imports of other transport equipment from Italy and France and lower imports of road vehicles from Germany. On the other hand, imports from Hungary and Slovenia increased due to intensive mineral fuels imports, as well as imports of tobacco and tobacco products from Poland. Similar to exports, in the post-crisis period the most pronounced increase in the share of EU-12 happened after Croatia joined the EU. At the same time, imports from CEFTA increased, among other, due to the stronger growth of imports of

⁶ Croatia became the 28th EU member country on 1 July 2013.

petroleum and petroleum products from Bosnia and Herzegovina and paper and pulp products from Serbia. Imports from EFTA didn't noticeably change between two periods, while the share of third countries declined in the post-crisis period (mostly imports from Russia, Syria, Japan and the US).

In the period after EU accession, the imports from EU-12 increased. This was mainly due to the stronger imports of road vehicles from Slovenia, medical and pharmaceutical products from Hungary and electric current from both countries⁷. At the same time, imports from EU-15 also intensified, mostly boosted by higher imports of leather and natural and manufactured gas from Austria, road vehicles and wearing apparel from Germany and telecommunications and sound-recording and reproducing apparatus and equipment from Netherlands. In the same period, imports of electric current from Switzerland declined, which affected a decrease of imports from EFTA, while imports from CEFTA remained unchanged. Imports from third countries declined, which is especially related to lower imports of capital products and wearing apparel from China, petroleum and petroleum products from Russia and coal, coke and briquettes and medical and pharmaceutical products from the US. However, it should be noted that the data for imports by trading partners after EU accession are not fully comparable with earlier data due to changes in methodology. In more detail, in Intrastat (statistics on the trade between countries of the EU) data on the imports of goods is reported by the country of departure, while in Extrastat (statistics on the trade between countries outside the EU) by country of origin. Moreover, this can lead to the conclusion that a part of the imports from third countries is since July 2013 redirected to the EU member states.

3. Literature review

The gravity model is often used in the economic literature as a tool for empirical analysis of bilateral trade flows. Several authors have used it in their papers to observe determinants of Croatian international flows. Their research has shown that the Croatian merchandise trade complies with the basic assumptions of the gravity model (see Appendix A, Table A1).

For example, Buturac and Gržinić (2009) analyzed the difference between the intensity of Croatian exports to certain EU countries using economic size of the trading partner (GDP) and distance. In addition, they evaluated the competitiveness of Croatian exports in the EU market. The results of their analysis showed that Croatia traded more with geographically closer countries, such as Slovenia, and with developed, high-income countries like Italy, Germany and Austria. On the other hand, the weakest export was recorded to Estonia and Luxembourg, because of their remoteness. Furthermore, European Commission (2015) used the same variables to describe Croatian exports in their Country report in 2015. Results from a gravity model showed that, while almost all Member States from Central and Eastern Europe have income elasticity of exports around unity, value for Croatia is almost halved. The main conclusion of the analysis was that the lower income elasticity of exports means that Croatia doesn't take full advantage of proximity to the rich markets compared to its competitor countries.

Furthermore, Šošić and Vujčić (2002) analyzed trade flows of Croatia and some SEE countries (Bosnia and Herzegovina, Yugoslavia, Macedonia and Albania) using gravity model. Their results showed that trade between these countries was significantly above

⁷ From July 2013 Croatian exports and imports of electric current intensified stimulated by the liberalization of the electricity market.

potential, while trade flows with the countries that at that time constituted EU and CEFTA were only slightly above potential. Somewhat later, the same authors (2005) used a gravity model to determine if Croatia is fit to join the EU. 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 the Croatian trade integration with the EU compared to CEE countries. In addition, the authors determined that there was a significant bias/partiality towards trade with former Yugoslav republics (SFR Yugoslavia or SFRY), especially with Bosnia and Herzegovina and Macedonia. The results also showed a stable bias in trade with Slovenia and a growing bias in trade with Serbia and Montenegro. Similarly, Pllaha (2012) also observed trade flows between nine SEE countries (including Croatia) using dynamic gravity model. His research confirmed that trade flows in a given year have a positive impact on the intensification of trade in the coming years. However, the author pointed out that trade between all countries in the sample was considered below potential, which is contrary to the findings of Šošić and Vujčić (2005). In addition, he confirmed positive correlation between GDP and free trade agreements with trade flows.

In addition, Bussiere, Fidrmuc and Schnatz (2005) evaluated the integration of trade in Central and Eastern Europe with the countries of the euro area using a gravity model. Their results showed that only Hungary has made trade above potential with the euro area, while the Czech Republic and Slovakia were close to its full potential. For the Baltic countries, Poland and Slovenia there was still room to increase market share in the euro area. Furthermore, Romania and Bulgaria rapidly increased their share in the euro area market in the period 1997-2003, while for Albania, Bosnia and Herzegovina, Macedonia and, to a lesser extent, Croatia there was still quite a gap from the potential trade with the euro area. Also, Christie (2001) analyzed trade on a sample of Southeastern European countries (SEE) and concluded that there was a very large trade potential between Croatia and the EU3 (Germany, Italy and Austria).

Furthermore, Malešević (2003) focused on the impact of upcoming Croatian membership in CEFTA on its exports and imports. However, CEFTA then consisted of Poland, Hungary, Czech R., Slovakia, Slovenia, Bulgaria and Romania, which are now a part of the EU-12. The results interestingly indicated that there wasn't a direct effect on Croatian imports and the author concluded that there was no evidence that would distinguish imports from CEFTA from other countries in transition. In addition, Croatian exports to CEFTA countries was significantly lower than the exports to other countries in the sample. Moreover, Begović (2011) measured the effect of free trade agreements on trade between CEFTA member countries (Albania, B&H, Moldova, Macedonia, Montenegro, Serbia and Croatia) and their major trading partners in the period 1999-2007 using a dynamic gravity model. The author argued that trade liberalization didn't improve trade in the region for the observed period, since the FTA variable turned significant and negative. Moreover, the variable that captures only trade between CEFTA member countries was not statistically significant. The author stated that this could be a result of recent conflicts between the observed countries and that a conventional assumption that trade liberalization leads to improved trade performances between member countries didn't apply in the case of CEFTA.

4. Methodology and data description

4.1. Theoretical and methodological basis of the gravity model

The basic premise of the gravity model is that bilateral trade flows between two countries can be explained by their income and remoteness. Specifically, the model is based on Newton's law of universal gravitation, according to which the holding strength (F_{ij}) between two bodies i and j is directly proportional to their masses (M_i and M_j) and a gravitational constant (G), but inversely proportional to the square of the distance between them (D_{ij}):

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2}, \quad (1)$$

Newton's equation applied in the international economy 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 gravitational 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 gravitational equation of trade between two countries takes the following form:

$$X_{ij} = G \frac{GDP_i^{\beta_1} GDP_j^{\beta_2}}{D_{ij}^{\beta_3}}, \quad (2)$$

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.

Beta's represent elasticity of bilateral trade between the two countries in relation to domestic GDP (β_1), the trading partner's GDP (β_2) and geographical distance (β_3). For example, if the domestic GDP increases by 1%, with all other variables held constant, the total bilateral trade will rise by $\beta_1\%$.

The gravity equation has a multiplicative form so the standard procedure of its assessment is with the application of the natural logarithm on the whole equation.

$$\log X_{ij} = \beta_0 + \beta_1 \log BDP_i + \beta_2 \log BDP_j + \beta_3 \log D_{ij} + \varepsilon_{ij} \quad (3)$$

In the recent literature economists expand the gravity model including regional trade agreements and membership in economic unions which are considered to promote trade, but also exchange rate variability and other cultural dummy variables. In addition, many authors emphasize the importance of including a lagged trade variable into equation to capture the "history effect". Campbell (2010) stresses out that there is a habit-persistence on the consumer side and that a successful sale in one period will naturally yield to 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, acquiring patents and copyrights but as well 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 consider the impact of FTAs and the effect of Croatian membership in CEFTA and the EU (above other FTAs) on bilateral trade. In addition, we add a dummy variable ex_Yu to capture the effect of historical links between Croatia and other countries of former Yugoslavia on trade. A static model is estimated with equation (4) and dynamic model which incorporates lagged trade variable to capture the "history effect" is estimated with equation (5):

$$\ln X_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln D_i + \beta_3 FTA_{it} + \beta_4 SAA_{it} + \beta_5 EU_{it} + \beta_6 CEFTA_{it} + \beta_7 ex_Yu_i + \theta_t + \varepsilon_i \quad (4)$$

$$\ln X_{it} = \alpha_i + \beta_1 \ln X_{it-1} + \beta_2 \ln Y_{it} + \beta_3 \ln D_i + \beta_4 FTA_{it} + \beta_5 SAA_{it} + \beta_6 EU_{it} + \beta_7 CEFTA_{it} + \beta_8 ex_Yu_i + \theta_t + \varepsilon_i \quad (5)$$

where X_{it} is Croatian exports/imports to/from country i in year t , Y_{it} is a product of Croatian and country's i nominal GDP, D_i is the distance between Zagreb and country's 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 aren't included in SAA_{it} , EU_{it} is a dummy variable which captures the effect of Croatian membership in the EU, $CEFTA_{it}$ is a dummy variable which captures the effect of Croatian membership in CEFTA, ex_Yu_i is a dummy variable for countries which were a part of former Socialist Federal Republic of Yugoslavia, α_i are the country-pair individual effects and θ_t are time-specific effects.

All things considered, 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 drive trade, therefore a positive coefficient is expected.

Parameters in equations (4) and (5) 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.

In this paper, the results from both static and dynamic model are presented. Although the pooled OLS is a most commonly used econometric tool in gravity models, it does not take into account unobserved country heterogeneity, which could distort estimates. Nevertheless, pooled OLS is a good basis for comparison with other, more sophisticated models. Fixed effects model assumes that the unobserved heterogeneous component in the regression is constant over time. However, using fixed effects also 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. Egger (2000) in favor of a model with fixed effects,

states 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 is not accidental, but predetermined to observe specific trade flows. Nevertheless, to make a decision between the random and fixed effects model we use Hausman specification test.

For the estimation of the dynamic model, we use system Generalized method of moments (GMM), as suggested in Roodman (2009), to account for potential endogeneity of independent variables, time-invariant country characteristics (fixed effects), the rise in autocorrelation by inclusion of the lagged trade variable and the fact that the panel is „small T, large N“. We use Arellano-Bond test for autocorrelation to check for the absence of serial second-order correlation in the residuals of first-differenced equation. Also, we use the Hansen J statistic to test for joint validity of the instruments and the “difference-in-Hansen” to test 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 not only that they intensify trade but also „free trade agreements tend to be formed where countries already trade considerably.“ Moreover, 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.

The estimated parameters from the system GMM model are used to measure Croatian export and import potential. The index of trade potential indicates whether the actual exports and imports are larger/smaller than their potential value. The formula for calculating the index is used as in De Benedictis and Vicarelli (2004), in which they defined trade potential index ($Pottrade_i$) as:

$$Pottrade_i = \frac{Efftrade_i}{Fittrade_i} \quad (6)$$

where $Efftrade_i$ is the actual value of Croatian exports/imports to/from country i , $Fittrade_i$ is potential value of exports/imports to/from country i estimated by gravity equation. To facilitate the interpretation of the results, a standardized index (SPT_i) was calculated that takes value in the range [-1, 1]:

$$SPT_i = \frac{Pottrade_i - 1}{Pottrade_i + 1} \quad (7)$$

Positive values of the given index indicate a higher actual trade than potential, while negative values indicate the opposite.

4.2. Data and sources

The empirical analysis in this paper is based on data for Croatian merchandise exports and imports. The dataset spans from 1998 to 2015 and annual data is used. 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 trade data are based on the

data of the Central Bureau of Statistics (CBS) 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 "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 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 Stabilisation and Association Agreement and continues to apply 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 with the SAA variable⁸. EU/CEFTA variable captures the effect of Croatian membership in the EU/CEFTA and takes value 1 if both Croatia and partner country are members of the EU/CEFTA in a given year. 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, variable ex_Yu is 1 if a partner country was a part of Socialist Federal Republic of Yugoslavia. For a more detailed explanation of dummy variables see Appendix A, Table A2.

5. Results overview

The following section analyzes the results of econometric analysis carried out in this paper using static and dynamic model for the entire sample period and two sub periods (the period from 1998 until 2008 and from 2009 until 2015). Two periods are used to assess the effects of the global economic and financial crisis on the parameters observed in gravitational equations. In addition, by applying the system GMM estimated coefficients, we calculate the potential bilateral trade between Croatia and its main trading partners. At the end of this section, the results are compared with those from the similar empirical papers.

5.1. Export

Table 2 reports the export equation results estimated using static (4) and dynamic (5) models. Estimation results for export equation are mostly in line with expectations, except for variables that represent preferential trade agreements with EU countries after signing the

⁸ Models were also tested with different versions of variables that capture the effect of free trade agreements to trade. Firstly, we included all bilateral FTAs and membership in the EU and CEFTA into one common dummy variable. Secondly, 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 common boarder was included in import and export equations. However, obtained results in those versions fitted standard gravity assumptions to a lesser extent compared with the chosen version.

Interim Agreement and other free trade agreements, for which in this empirical analysis statistical significance wasn't confirmed.

Table 2 Estimation results for export equation

Model:	static OLS	static RE	static FE	dynamic system GMM
ln(Y)	0.47***	0.49***	0.71***	0.34***
ln(D)	-1.26***	-1.26***	(omitted)	-0.75***
EU	0.10	0.12	0.19	0.42**
CEFTA	0.16	0.03	-0.00	-0.04
SAA	0.07	-0.02	-0.02	-0.18
FTA	-0.35*	-0.19	-0.16	-0.19
ex_Yu	1.92***	1.82***	(omitted)	1.46***
ln(EXPORTS (t-1))				0.38***
_cons	1.12*	0.72	-13.65***	-0.16

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

Source: author's calculations.

According to the results of the first three static models (pooled OLS, model with random and fixed effects) product of countries' GDPs is statistically significant and positively correlated with exports, as previously expected. If GDPs of Croatia and its trading partner increase by 1%, holding other factors constant, Croatian exports to that partner country increases in range from 0.5% to 0.7%. Distance, as an indicator of transportation costs, is omitted from the FE model because it is a variable that doesn't change over time (similar to ex_Yu variable), but in other models is statistically significant and has the expected strong, negative sign. The fact that the partner country is a former member of Socialist Federal Republic of Yugoslavia (as was Croatia) raises Croatian exports to that country by more than five times compared to exports to other countries in the sample⁹. Although variable EU has the expected positive sign, it is not statistically significant in static models. Variables CEFTA and SAA are also not statistically significant and vary in sign. It is important to note that the importance of CEFTA variable is partially offset due to the variable ex_Yu because all former SFRY countries were once a part of CEFTA. On the other hand, FTA variable is statistically significant only in the OLS model but has an unexpected, negative sign. The possible explanation for this could be that Croatian export was through the whole sample period more oriented towards the EU market.

As for the preferred dynamic model, the assumption that exports from the previous period affects current export value is confirmed, at statistically significant level of 1%. Moreover, current exports value is 38% of its previous level. Main gravity variables also remain statistically significant in the estimated model. The results show that the higher the income between partner countries, the more intensified Croatian export is. As for distance, the strong negative sign is again confirmed. Variable ex_Yu is statistically significant and positively correlated with exports. According to the estimation results, Croatian export is approximately three times higher to countries of the former Yugoslavia. It is important to note that the EU variable, which captures the effect of Croatian accession to the EU, becomes significant in dynamic model. After joining the EU, Croatian exports to member countries rose by more than 50% compared to other countries in the sample. Statistical significance for other variables (SAA, FTA and CEFTA) wasn't confirmed.

⁹ Changes in the predicted trade flow for a dummy variable i are calculated: $e^{\beta i} - 1$.

Post-estimation tests (see Appendix A, Table A3) suggest that there is a problem of heteroscedasticity and autocorrelation in the panel data, which are appropriately accounted for. According to the Hausman specification test, fixed effects model should be preferred panel data model for used dataset. Regarding the dynamic model, the p-value of Hansen test is above Roodman's (2009) "rule of thumb threshold" of $p=0.25$, so we can't reject the hypothesis that the overidentifying restrictions are valid. In addition, the hypothesis of no second-order autocorrelation also can't be rejected. The "difference-in-Hansen" test suggests that differenced instruments for level equations are valid.

In order to check the robustness of the dynamic model and analyze the effects of the global economic and financial crisis on exports 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 (Table 3).

Table 3 Estimation results for export equation before and after the outbreak of the crisis

	1998-2008		2009-2015
Model:	system GMM	Model:	system GMM
ln(Y)	0.40***	ln(Y)	0.36***
ln(D)	-0.88***	ln(D)	-0.90***
EU	(omitted)	EU	0.58*
CEFTA	0,05	CEFTA	-0.34*
SAA	-0,24	SAA	-0.25
FTA	-0,18	FTA	-0.29
ex_Yu	1.53***	ex_Yu	1.57***
ln(EXPORTS (t-1))	0.33***	ln(EXPORTS (t-1))	0.25*
_cons	0,00	_cons	1,30

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

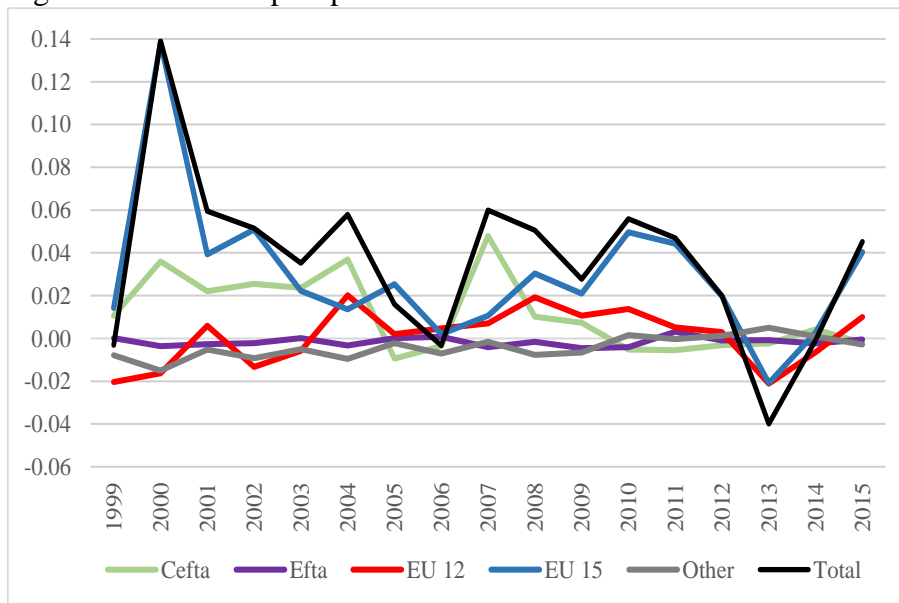
Source: author's calculations.

Although there aren't significant differences between estimated parameters in two observed periods, it can be seen that the joint income of partner countries affected Croatian exports slightly more in the pre-crisis period. Effect of distance on trade is somewhat larger in the post-crisis period. Croatia wasn't a member of the EU in the pre-crisis period and therefore we can measure its effect only in the post-crisis period, when statistical significance and positive correlation of this variable with Croatian exports is again confirmed. Croatian membership in CEFTA is statistically significant but negative in the aftermath of the crisis. This 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 better take advantage of duty-free placement of goods under the free trade area. In addition, being a former Yugoslav republic has slightly greater impact on Croatian exports in the post-crisis period, while at the same time the lagged exports variable has a lesser effect on current exports.

Analysis of Croatian export potential indicates that total exports was above its potential level in the most of the observed years, reflecting primarily changes in the trade with EU and CEFTA member countries (Figure 3). The most prominent changes in the total index can be observed in 2000 and can be explained by Croatian accession to the World Trade Organization. Additionally, a negative trend in the aftermath of crisis that culminated in 2013

is visible. In the last two observed years, we can see a positive trend of the index that can be attributed to the favorable effects of joining the EU.

Figure 3 Croatian export potential



Note: Liechtenstein is excluded from EFTA due to the unavailability of the data. Total is the sum of individual indices for country groups, which were weighted by their share in total exports for a given year.

Source: author's calculations.

Looking at the pre-crisis period, a rise in the actual exports compared to its potential in 2000 reflects Croatian accession to the WTO, which liberalized its trade to a great extent and facilitated trade procedures, especially with EU-15 countries. After that, exports started to decline compared to its potential until 2004, when improvement in the index was mostly boosted by EU-12 countries. In the next two years, index started to decline again reaching the lowest level in 2006, which primarily reflects the decrease of exports to the EU-15. Looking at the actual data, in 2006 decline in exports of capital products to Austria stands out, but as well, of furniture and road vehicles to Germany. However, the index again started to rise in 2007, reflecting dynamics in the index with CEFTA countries, as a result of the accession of seven new member countries (most of them were also former Yugoslav republics). Furthermore, in 2007 exports of electric current and non-metallic mineral manufactures to Bosnia and Herzegovina and miscellaneous manufactured articles to Serbia considerably increased compared to 2006.

Post-crisis period was marked mostly with a downward trend of the index reaching the lowest level in 2013, which is primarily a consequence of worsening of the index with EU-15. However, the index switched its direction in the last two years with positive contribution stemming from the EU accession, which facilitated exports to the single EU market. Looking at the actual trade data, in the last two observed years there was a pronounced increase in exports of wearing apparel to Spain, furniture to Germany, leather to Austria, road vehicles to Belgium and medical and pharmaceutical products and ships to Netherlands. Index also improved with EU-12, but to a lesser extent, and the actual data indicates higher exports of electric current to Slovenia and Hungary.

Looking at the whole period, among the EU-15 the export potential index was positive in the whole period with Italy, Germany and Austria. As for most other countries, we can observe a shift in the index value from negative to positive after Croatia joined the union, especially with Spain, France, Luxembourg, Portugal and Netherlands. Regarding EU-12, there is still room for improvement of exports to Slovenia, since its actual value is in the whole period below its potential. This result is surprising given that our model estimates point to a considerable bias towards trade with former Yugoslav republics, including Slovenia. On the other hand, exports to Hungary was in line with its potential and even above it in the last two years. Furthermore, the only CEFTA member country, where Croatian exports exceeded its potential in the whole period is Bosnia and Herzegovina.

5.2. Import

Table 4 reports the import equation results estimated using static (4) and dynamic (5) models. Estimation results for imports equation are also in line with standard expectations for gravity model.

Table 4 Estimation results for import equation

Model:	static OLS	static RE	static FE	dynamic system GMM
ln(Y)	1.00***	1.09***	1.35***	0.37***
ln(D)	-0.83***	-0.94***	(omitted)	-0.31***
EU	0.82***	0.85***	0.92***	0.46***
CEFTA	0,24	0,05	0,01	-0.08
SAA	0.80***	0.43**	0.40**	0,11
FTA	0.60***	0.66***	0.67***	0,25
ex_Yu	2.34***	1.99***	(omitted)	0.92***
ln(IMPORTS (t-1))				0.64***
_cons	-12.26***	-13.52***	-26.21**	-5.49***

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

Source: author's calculations.

Compared to exports, even variables that capture the effect of FTAs on trade are statistically significant in the static imports equations. Moreover, in static models, the coefficients of income are statistically significant and positively correlated with imports and show even stronger relationship than one in export case. If GDPs of Croatia and its trading partner increase by 1%, holding other factors constant, Croatian imports from that partner country increases in range from 1.0% to 1.4%. Distance is statistically significant and has a strong, negative sign. Interestingly, it seems that transportation costs effect more Croatian exports than imports. When it comes to imports from the EU countries, we can see that it has intensified after signing the Interim Agreement and in that period imports from the EU countries was approximately more than 50% higher than imports from other countries in the sample. When Croatia became the member of the EU, imports from other member countries increased by approximately 150%. Other FTAs are also significant for explaining imports and, according to the estimates, the existence of FTAs increases imports by more than 80%. If a partner country is a former member of SFRY, Croatian imports raises by more than six times compared to imports from other countries in the sample. On the other hand, membership in CEFTA isn't statistically significant for explaining Croatian imports.

In the preferred dynamic model, imports from the previous period affects current import value to a great extent. In more detail, current import is 64% of its previous level and the lagged imports variable is statistically significant at 1%. Standard gravitational assumptions are confirmed again in the dynamic model, meaning that the income variable and distance are statistically significant and have the expected sign. Moreover, model shows that if partner country is a former SFRY member it has statistically significant and positive impact on imports. Additionally, Croatian imports is approximately one and a half times higher from countries of the former Yugoslavia. EU variable, which captures the effect of Croatian membership in the EU, is also significant in the dynamic model. After joining the EU, Croatian imports from other member countries rose by almost 60% compared to other countries in the sample. Variables SAA, FTA and CEFTA do not have significant effect on imports.

Post-estimation tests (see Appendix A, Table A4) suggest that there is a problem of heteroscedasticity and autocorrelation in the panel data, which are appropriately accounted for. According to the Hausman specification test, fixed effects model should be preferred panel data model for used dataset. Regarding the dynamic model, the p-value of Hansen test is above Roodman's (2009) "rule of thumb threshold" of $p=0.25$, so we can't reject the hypothesis that the overidentifying restrictions are valid. In addition, the hypothesis of no second-order autocorrelation can't be rejected. The "difference-in-Hansen" test suggests that differenced instruments for level equations are valid.

To check the robustness of the results, the dynamic model for imports equation was estimated for two sub periods (Table 5). Since all variables kept the same sign and statistical significance, as in the estimation for the whole period, we can infer to robustness of the results. The results show that joint income and distance affect Croatian imports to a slightly bigger extent in the post-crisis period and these differences are somewhat larger than in the exports equation. In addition, statistical significance and positive correlation of the EU variable with Croatian imports is confirmed in the same period. Croatian membership in CEFTA and enforcement of FTAs are not statistically significant in observed periods. Finally, imports from a former Yugoslav republic is slightly higher in the aftermath of crisis.

Table 5 Estimation results for import equation before and after the outbreak of the crisis

	1998-2008		2009-2015
Model:	system GMM	Model:	system GMM
ln(Y)	0.33***	ln(Y)	0.43***
ln(D)	-0.28***	ln(D)	-0.54***
EU	(omitted)	EU	0,3*
CEFTA	0,28	CEFTA	-0.23
SAA	0,03	SAA	0,04
FTA	0,01	FTA	-0.02
ex_Yu	0.89***	ex_Yu	0.91**
ln(IMPORTS (t-1))	0.66***	ln(IMPORTS (t-1))	0.57***
_cons	0,00	_cons	-4.10**

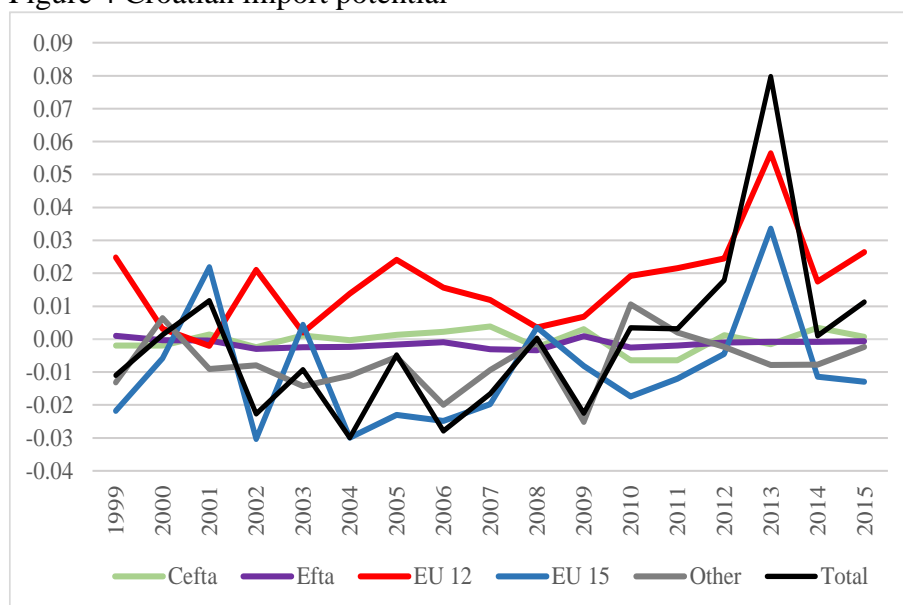
Note:*, ** and *** refer to 10%, 5% and 1% statistical significance levels, respectively.

Source: author's calculations.

Analysis of Croatian import potential (Figure 4) indicates that total imports was above its potential level in 2001, which could be the effect of joining the WTO, then again in 2008 just before the crisis outbreak, and from 2010 afterwards. The dynamics of the import potential index largely follow dynamics of EU and third countries import potential indices, which is in

contrast with exports equation where, in addition to the EU countries, CEFTA countries had greater importance. We can also see an obvious positive level shift in 2013, after Croatia joined the EU. An improvement in the total index in the last two years can be completely attributed to higher imports from EU-12 than its potential, which can again be partially explained by methodology changes and the fact that a part of imports from third countries is now attributed to EU countries. At the same time, the index with EU-15 returned to the level of 2012 and then again took the negative value.

Figure 4 Croatian import potential



Note: Liechtenstein is excluded from EFTA due to the unavailability of the data. Total is the sum of individual indices for country groups, which were weighted by their share in total imports for a given year.

Source: author's calculations.

In the pre-crisis period, total imports was predominantly lower than its potential. Except for 2001, imports was above its potential only in 2008, which was mainly due to the higher imports from EU-15. The analysis of the actual data shows an increase in imports of petroleum, ships and machinery specialized for particular industries from Italy compared to 2007.

In the aftermath of crisis, there was a positive trend of the index, largely due to the improvement of the index with the EU countries, reaching the highest level in 2013. Looking at the actual data, in 2013 imports of mineral fuels from Slovenia and Hungary sharply increased. The positive contribution also came from EU-15 countries, thanks to stronger imports of natural and manufactured gas and capital products from Austria, wearing apparel, footwear and textile yarn from Germany, but also capital and medical and pharmaceutical products from Netherlands. After reaching its pre-accession level in 2014, index again started to increase, largely as a result of dynamics of the index with the EU-12. The latter could be attributed to higher actual imports of electric current from Hungary, road vehicles and capital products from Slovenia but as well tobacco and tobacco products and meat and meat preparations from Poland.

5.3. Comparison of the results with similar studies

The results are largely in line with the findings of similar studies. However, it is important to emphasize that calculated parameters are not fully comparable with all of the papers listed in the Literature review (and also in Appendix A, Table A1) 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. However, their results are a good indicator of the standard gravitational parameters, which are also obtained in this paper.

As for the comparison with studies based on the Croatian trade flows, in this paper we can also observe a strong partiality towards trade with former Yugoslav republics, like in Šošić and Vujčić (2005). In addition, the authors emphasized that Croatian trade with CEE countries in 2003 was 112% above its potential (in more detail exports was 57% below and imports 548% above potential). We obtained similar results; the actual exports to CEE5 (Czech Republic, Hungary, Poland, Slovenia, Slovakia) is in the whole observed period below potential, while imports was only slightly above potential. Still, with both flows we can see a sharp improvement in the indices after Croatian accession to the EU. Unlike the membership in the EU, the effect of Croatian membership in CEFTA isn't statistically significant for Croatian trade in this paper, which is in line with the results of Begović (2011). Furthermore, Malešević (2003) also didn't find evidence that Croatian trade with CEFTA countries is stronger than trade with countries outside this group. However, the author carried out her entire analysis in the period before Croatian accession to CEFTA (which then constituted from different countries than today), so the results are not fully comparable with our study. Also, the author estimated RE model and obtained distance coefficients which are similar to the ones in this paper. In addition, the parameters of distance and income obtained in the static OLS model are in line with results of Buturac and Gržinić (2009).

6. Conclusions

The main purpose of this paper was to examine Croatian bilateral merchandise trade with its most important trading partners and assess whether, and to what extent, its determinants changed after the outbreak of the global financial crisis and EU accession. In this context, we used gravity model of international trade and tested whether Croatian trade flows fit basic assumptions of the model. In addition to standard variables used in the gravitational 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. Furthermore, using obtained coefficient estimates, we calculated Croatian export and import potential.

According to the results of the preferred dynamic model, 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 the exports more than imports. The "history effect" is present in both flows, meaning that past trade value is positively correlated with the present one. The positive effect of the EU accession is confirmed in both equations. On the other hand, FTAs are insignificant for exports and imports, while the former Yugoslav republics have significant and positive impact on Croatian trade. This result can partly be

explained by the definition of FTA and CEFTA variables, which consist mostly of former SFRY countries, so in some way they overlap. In addition, this also suggests that Croatia still has a considerable bias towards trade with countries in the region. Furthermore, the descriptive analysis of Croatian merchandise trade showed that the global crisis affected Croatian imports more than exports. The latter is in line with econometric results, which point to somewhat larger changes between estimated coefficients in the pre- and post-crisis period in the import equation.

The analysis of Croatian export potential indicated that actual exports to EU-12 countries started to improve in relation to its potential in the last two years, but there's still unfulfilled export potential to Slovenia. Among the EU-15, the export potential index was positive in the whole period with Italy, Germany and Austria. In addition, we can see a shift in the index value from negative to positive with Spain, France, Luxembourg, Portugal and Netherlands after Croatia joined the EU. Regarding CEFTA market, Bosnia and Herzegovina is the only member country where Croatian exports was in the whole period above its potential.

Lastly, this paper can be further upgraded by tackling issues that are usually connected with gravity models. One of the main criticisms of the gravity model is in the definition of the distance variable, which can't adequately replace the average transportation costs from one country to another. Also, there is a problem of missing data or zero trade values with a particular trading partner in a given period. Despite certain shortcomings, the gravity model is a frequently used tool in the analysis of bilateral trade flows between countries in many relevant economic institutions. Potential continuation of this research could be on an out-of sample projection of future trade flows using the obtained coefficient estimates. In addition, it would be interesting to see how the estimates would change if the analysis had been carried out on disaggregated data of export and import according to product groups.

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Appendix A

Table A1 Results obtained in similar gravity studies

Authors	Period	Countries in sample	Variables	Model	Main results
Buturac G., Gržinić J., 2009	2005	Croatia and EU countries	Dependent: exports, independent: partner's GDP, distance	OLS	GDP coeff. 0.5, distance -0.6
Šošić V., Vujčić B., 2002	1999	Croatia, 42 European countries, 151 countries outside Europe	Dependent: total trade, independent: partner country's GDP & GDP p.c., distance, dummy variables	OLS	GDP coeff. from 0.9 to 1.1, road distance between -1.3 and -2.1, air distance between -0.9 and -1.3, GDP p.c. around 0.2. Croatia has a trade bias toward former Yugoslavia countries. Trade between Croatia and SEE countries considerably below potential. Trade with EU and CEFTA slightly above potential.
Šošić V., Vujčić B., 2005	1999, 2002-2003	Croatia, EU-15, CEE, former Yugoslavia	Dependent: exports, imports, total trade, independent: GDP of a partner country, distance, dummy variables,	OLS	Croatian trade with the EU in line with potential. Trade with CEE countries in 2003 112% above potential. Trade with former Yugoslavia countries far above potential (especially with B&H).
Pllaha A., 2012	2000-2010	SEE 9 (Albania, B&H, Bulgaria, Croatia, Macedonia, Romania, Serbia & Montenegro, Slovenia, Turkey)	Dependent: total trade, independent: product of GDPs p.c., distance, dummy variables	GMM	GDP coefficient 0.2, lagged trade 0.6, distance -0.2, FTA 0.4. Actual trade between all SEE9 countries is below potential.
Bussiere M., Fidrmuc J., Schnatz B., 2005	1980-2003	CEE, OECD, Eurozone	Dependent: total trade, independent: sum of GDPs, distance, dummy variables	dynamic OLS	GDP coefficient 0.6, distance -0.7, EU dummy insign., CEFTA sign., positive. Croatian trade with the euro area below potential.
Christie, E., 2001	1996-1999	SEE7 (Albania, B&H, Bulgaria, Croatia, Macedonia, Romania, Yugoslavia) & SEE 11 (SEE7+Slovenia, Hungary, Greece, Turkey)	Dependent: imports, independent: exporter's GDP, importer's GDP, distance, dummy variables	OLS	Importer's GDP coefficient 0.9, exporter's GDP 1.0, distance -1.2. Croatian trade with Austria and Italy is below potential.
Malešević, L., 2003	1996-2000	Croatia and its 41 trade partners from Europe, America, Asia and Australia	Dependent: exports and imports, independent: Croatian GDP, partner country's GDP, distance, dummy variables	RE	Exports eq.: coeff. with Croatian GDP 1.3, partner's GDP 0.5, distance -1.0, CEFTA is sign. and negative. Imports eq.: Croatian GDP 2.5, partner's GDP 0.6, distance -0.5, CEFTA is negative and insign.
Begović, S., 2011	1999-2007	CEFTA countries and their 13 major trading partners	Dependent: exports, independent: product of GDPs, Linder effect, exchange rate, dummy variables	GMM	Lagged exports coeff. 0.6, product of GDPs 0.3, distance -0.4, CEFTA insign. FTA sign. and negative

Table A2 Defining dummy variables:

<p>CEFTA takes value 1 with: Czech R., Hungary, Poland, Slovakia, Slovenia in 2003 Bulgaria, Romania 2003-2007 Albania, B&H, Kosovo, Moldova, Montenegro, Serbia 2007-2013 Macedonia 2006-2013</p> <p>SAA takes value 1 with: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom 2002-2015 Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, Slovenia 2004-2015 Romania and Bulgaria 2007-2015</p> <p>EU takes value 1 in 2013, 2014, 2015 with: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom.</p>	<p>FTA takes value 1 with: Albania 2003-2015, Bulgaria 2003-2006, B&H 2005-2013, Czech R. 2003, Hungary 2003, Iceland 2005-2015, Kosovo 2006-2015, Moldova 2004-2015, Macedonia 1998-2015, Montenegro 2004-2015, Norway 2002-2015, Poland 2003, Romania 2003-2006, Serbia 2004-2015, Slovakia 2003, Slovenia 2003, Switzerland 2002-2013, Turkey 2003-2015</p> <p>ex_Yu takes value 1 with: B&H, Kosovo, Macedonia, Montenegro, Slovenia, Serbia 1998-2015</p>
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Table A3 Estimation results for export equation and post-estimation tests

Model:	static OLS	static RE	static FE	dynamic system GMM
ln(Y)	0.47***	0.49***	0.71***	0.34***
ln(D)	-1.26***	-1.26***	(omitted)	-0.75***
EU	0.10	0.12	0.19	0.42**
CEFTA	0.16	0.03	-0.00	-0.04
SAA	0.07	-0.02	-0.02	-0.18
FTA	-0.35*	-0.19	-0.16	-0.19
ex_Yu	1.92***	1.82***	(omitted)	1.46***
_Iyear_1999	0.23	0.25*	0.25*	-0.21
_Iyear_2000	0.03	0.01	-0.05	-0.32
_Iyear_2001	0.42*	0.31*	0.21	-0.22
_Iyear_2002	0.21	0.16	0.05	-0.25
_Iyear_2003	0.35	0.26	0.13	-0.13
_Iyear_2004	0.38	0.30	0.14	-0.09
_Iyear_2005	0.64**	0.56***	0.35	0.11
_Iyear_2006	0.78***	0.70**	0.44	0.16
_Iyear_2007	0.71***	0.63**	0.34	-0.04
_Iyear_2008	0.63**	0.55*	0.22	-0.01
_Iyear_2009	0.52**	0.44	0.13	-0.14
_Iyear_2010	0.80***	0.73**	0.39	0.08
_Iyear_2011	0.80***	0.73**	0.37	0.05
_Iyear_2012	0.93***	0.85***	0.49	0.12
_Iyear_2013	0.97***	0.87***	0.48	(omitted)
_Iyear_2014	1.00***	0.91***	0.52	0.04
_Iyear_2015	0.97***	0.88***	0.47	0.02
ln(EXPORTS (t-1))				0.38***
_cons	1.12*	0.72	-13.65***	-0.16
legend:			p<0,01 ***, p<0,05 **, p<0,1 *	
White's test for H0: homoskedasticity			chi2(24) = 591.99	Prob > chi2 = 0.0000
Mean VIF = 1,60				
Wooldridge test for H0: no first-order autocorrelation			F(1, 84) = 30.072	Prob > F = 0.0000
Hausman test for H0: difference in coefficients not systematic			chi2(5) = 28.32	Prob>chi2 = 0.0000
Dynamic model:				
Number of instruments = 71 , Number of groups = 85				
Arellano-Bond test for AR(1) in first difference			z = -4.4	Pr > z = 0.0000
Arellano-Bond test for AR(2) in first difference			z = 0.7	Pr > z = 0.486
Hansen test of overid. restrictions:			chi2(46) = 50.90	Prob > chi2 = 0.287
Difference-in-Hansen tests of exogeneity of instrument subsets:				
GMM instruments for levels				
Hansen test excluding group:			chi2(23) = 30.99	Prob > chi2 = 0.123
Difference (null H = exogenous):			chi2(23) = 19.92	Prob > chi2 = 0.647

Table A4 Estimation results for import equation and post-estimation tests

Model:	static OLS	static RE	static FE	dynamic system GMM
ln(Y)	1.00***	1.09***	1.35***	0.37***
ln(D)	-0.83***	-0.94***	(omitted)	-0.31***
EU	0.82***	0.85***	0.92***	0.46***
CEFTA	0,24	0,05	0,01	-0.08
SAA	0.80***	0.43**	0.40**	0,11
FTA	0.60***	0.66***	0.67***	0,25
ex_Yu	2.34***	1.99***	(omitted)	0.92***
_Iyear_1999	-0.04	-0.03	-0.04	0.89***
_Iyear_2000	-0.05	-0.03	-0.09	0.99***
_Iyear_2001	-0.19	-0.14	-0.24	0.97***
_Iyear_2002	-0.40	-0.26	-0.37	0.98***
_Iyear_2003	-0.60**	-0.47*	-0.59	0.90***
_Iyear_2004	-0.64**	-.048**	-0.64	0.89***
_Iyear_2005	-0.75***	-0.62**	-0.84	0.83***
_Iyear_2006	-0.81***	-0.66**	-0.93	0.88***
_Iyear_2007	-0.81***	-0.69***	-1.01	0.79***
_Iyear_2008	-0.87***	-0.75***	-1.12	0.79***
_Iyear_2009	-1.03***	-0.91***	-1.24*	0.47***
_Iyear_2010	-1.05***	-0.91***	-1.28*	0.66***
_Iyear_2011	-0.95***	-0.82***	-1.21*	0.69***
_Iyear_2012	-0.99***	-0.87***	-1.27*	0.62***
_Iyear_2013	-1.60***	-1.56***	-1.99***	(omitted)
_Iyear_2014	-1.70***	-1.65***	-2.08***	0.22*
_Iyear_2015	-1.87***	-1.82***	-2.27***	0,22
ln(IMPORTS (t-1))				0.64***
_cons	-12.26***	-13.52***	-26.21**	-5.49***
legend:			p<0,01 ***, p<0,05 **, p<0,1 *	
White's test for H0: homoskedasticity			chi2(24) = 224.30	Prob > chi2 = 0.0000
Mean VIF = 1,60				
Wooldridge test for H0: no first-order autocorrelation			F(1, 84) = 19.576	Prob > F = 0.0000
Hausman test for H0: difference in coefficients not systematic			chi2(5) = 30.67	Prob>chi2 = 0.0000
Dynamic model:				
Number of instruments = 71 , Number of groups = 85				
Arellano-Bond test for AR(1) in first difference			z = -2.73	Pr > z = 0.006
Arellano-Bond test for AR(2) in first difference			z = 1.40	Pr > z = 0.160
Hansen test of overid. restrictions:			chi2(46) = 48.86	Prob > chi2 = 0.359
Difference-in-Hansen tests of exogeneity of instrument subsets:				
GMM instruments for levels				
Hansen test excluding group:			chi2(23) = 31.61	Prob > chi2 = 0.109
Difference (null H = exogenous):			chi2(23) = 17.25	Prob > chi2 = 0.797