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Article

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Research Article

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Examining the Effects of Trade Liberalisation Using a Gravity Model Approach

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Abstract: The main objective of this article is to study the impact of trade liberalisation in Croatia as one of the first structural reforms being implemented, covering the period from 2000 to 2021. The panel data model was specified using a two-step system generalised method of moment estimator. The obtained results show that trade liberalisation measured through the specific indices encompassing a broader set of both tariff and non-tariff barriers, size of the trade sector, freedom of foreign exchange market, and capital controls positively impacted export performance. The results also showed a negative and statistically significant effect of remoteness on trade, confirming that geographical distance is an essential indicator of transportation costs. The coefficient for Schengen accession was positive and statistically significant, indicating that the Schengen agreement has boosted exports and that we can expect the same for Croatia, especially in the context of simultaneous accession to the Eurozone and the Schengen area on 1 January 2023.

Keywords: international trade, European Union, Schengen, Croatia, GMM

JEL Classification: F43, F53, F62

1 Introduction

With globalisation being in the midst of a transformation, fuelled by the current political and economic tensions, we are increasingly witnessing processes of growing protectionism

and a consequent disruption or bypass of multilateral institutions (European Commission (EC), 2021). All these processes, strengthened by rapid technological change and reconfiguration of global value chains (GVCs), will further impact the international trade outlook (United Nations (UN), 2021).

Over the last decade, the European Union (EU) has adjusted its trade policies to balance between protectionism and globalisation. It has also engaged in numerous preferential trade talks. It has over 70 bilateral trade accords, and many other discussions are still open (Ülgen, et al., 2022).

Although the costs of open trade are more easily detected than gains, a wealth of evidence demonstrates how trade liberalisation has supported the rise in prosperity for the growing global population due to a consistent increase in productivity (Cernat, 2019). Gnanon (2018) identified six potential channels through which trade liberalisation could induce higher economic growth, including improving welfare, promoting foreign direct investment, reducing trade costs, moderating fluctuations in trade and providing traders with stable income, greater cooperation, and generating higher public revenue. Freeman et al. (2022) found that most EU members benefit significantly from trade despite some differences between individual countries. Central and Eastern European countries (CEECs) tend to see significant benefits, while countries such as Italy and Greece may see more limited benefits. It is worth noting that these benefits tend to increase over time as economic integration reduces trade costs and the EU internal market grows. This is particularly true for CEECs, which have experienced globalisation and economic transition while integrating into the EU and undergoing numerous structural reforms.

In this study, we contribute to this debate by examining the impact of trade liberalisation between the EU and Croatia, the last country to join the EU, affecting its degree of integration into GVCs. The World Bank (2018) has reported that Croatia has undergone economic and living standard improvements since gaining independence. Over a few decades, Croatia has successfully established a liberal democracy, embraced a market economy, and achieved upper-middle-income country status. A commitment to various international

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trade agreements, regional partnerships, and domestic reforms marked Croatia's journey towards greater economic openness. More precisely, Croatia successfully implemented trade liberalisation in phases, with its membership in international organisations and associations significantly shaping its international trade patterns. After becoming a World Trade Organization (WTO) member in 2000 and a Central European Free Trade Agreement (CEFTA) member in 2002, Croatian exports and imports significantly increased in goods and services (see Figures A1 and A2 in Annex). Goods exports have been one of the past period's most significant growth and economic recovery sources. Croatia has managed to increase its share of global exports in gross domestic product (GDP), thus confirming the importance of joining the EU for better integration into European and GVCs. However, due to its prevailing reliance on the tourism sector, which accounts for up to 70% of services exports and the contribution of which to the Croatian economy is around 17%, post-transition Croatia remains a small open economy with limited productivity gains (World Bank, 2018). Despite the favourable developments, the Croatian export sector remains small compared to other CEECs (e.g. 20% of GDP relative to around 80% in Slovakia), so its ability to influence overall productivity and growth is still limited. In addition, the technological sophistication of exports remained relatively low (Official Gazette, 13/2021). When it comes to the most important trade partners, the top five countries (more than 50% of total trade) to which Croatia exported in 2020 are Germany, Italy, Slovenia, Bosnia and Herzegovina, and Hungary, while the top five countries from which Croatia imports goods are Germany, Italy, Slovenia, Austria, and Hungary. Finally, according to the Industrial Development Report 2022 (United Nations Industrial Development Organization (UNIDO), 2021), Croatia still belongs to the group of developing and emerging industrialised countries when analysing the level of industrialisation. In this context, this study embarks on a comprehensive analysis of the effects of trade liberalisation on trade performance in Croatia, with the primary goal of investigating how trade liberalisation has affected export performance as one of the country's competitiveness indicators. In the spirit of Spornberger (2022), this study contributes to the "cost of non-Europe" by retrospectively evaluating the liberalisation and integration of EU trade. Another contribution of our article is in using panel data (over time bilateral trade data) and the system generalised method of moments (GMM) model estimation. To clarify the effect of trade liberalisation in Croatia, we examine the dynamics of merchandise exports and imports from 2000 to 2021 using data from EU members and the United Kingdom (UK). The gravity model is applied over a longer time series as

compared to previous studies to account for the time after the EU accession and captures only the trade between EU member countries and Croatia. Furthermore, we want to shed light on the limitations of trade liberalisation effects on economic growth given the specific features of this small open economy. Moreover, most studies do not make a clear distinction between indicators that show the outcomes of openness (e.g. volume of trade, country's size, population, and technological advancement) and those that reflect trade policy openness (e.g. trade policy as a result of intentional policy actions that make a country more open to trade) (McCulloch *et al.*, 2001).¹ In this article, we try to bridge the gap between trade policy openness and outcome openness by using the freedom to trade internationally, a sub-component of the Fraser Institute's Economic Freedom Index. The results show that trade liberalisation positively impacted both exports and imports. The imports of goods are predominantly driven by the exports of services, mainly from the tourism sector, on which the economy relies heavily. Considering that the increase in imports does not stem primarily from manufacturing, the expected boost in trade from the accession to the Schengen area indicates the need to tackle the problem of high import dependence and low technological sophistication of exports.

The remainder of this article is structured as follows. Section 2 gives an overview of existing literature on gravity model application in trade analysis and the literature on the effects of trade liberalisation in EU countries. Section 3 describes the data used, the method applied, and the reasons behind choosing a system GMM estimator. Section 4 contains the results of the econometric analysis and their interpretation, followed by a discussion in Section 5. Finally, Section 6 concludes and presents some limitations and potential avenues for future research.

2 Literature Review

The gravity model of trade is a highly intuitive, structural model with sound theoretical foundations, a realistic general equilibrium setting that simultaneously accounts for multiple countries, and a very flexible structure that can be integrated into a broad class of more general equilibrium

¹ The main difference between these two types is that even if a country does not have an open trade policy, it may still be a large trading nation due to its natural advantages (McCulloch *et al.*, 2001; Singh, 2018).

models to study the linkages between trade and labour markets, investment, the environment, etc. (Yotov et al., 2016). It explains trade flows between pairs of countries (bilateral trade flows) by variables drawn from importing and exporting countries. In its most basic form, the model assumes that trade between country i and country j is proportional to the product of GDP_i and GDP_j and inversely related to the distance between them (Braha et al., 2015).

Newton's law of gravity, applied to international trade, states that just as particles attract each other in proportion to their size and proximity, countries trade in proportion to their respective market size (e.g. GDP) and proximity (Yotov et al., 2016). The first applications of Newton's law of gravity to economics include Linneman (1966), Poyhonen (1963), Ravenstein (1885), and Tinbergen (1962). Seminal work of Anderson (1979) is the first to provide a theoretical economic basis for the gravity equation based on constant elasticity of substitution (CES) preferences and goods that are differentiated by region of origin. Another early contribution to gravity theory comes from Bergstrand (1989, 1990) and Deardorff (1998) who have preserved the CES preference structure and added monopolistic competition or a Heckscher–Ohlin structure to explain specialisation (Anderson & van Wincoop, 2003).

This was followed by the influential work of Anderson and van Wincoop (2003) and Eaton and Kortum (2002), which provided the microeconomic foundations of the gravity model and greatly impacted the further development and application of the gravity model. More precisely, with the publication of Anderson and van Wincoop (2003) and Eaton and Kortum (2002), the conventional wisdom that gravity equations lacked micro-foundations was finally dismissed (Head & Mayer, 2014). Since neither model relied on imperfect competition or increasing returns, there was no longer a reason to believe that gravity equations should only apply to a subset of countries or industries (Head & Mayer, 2014).

The next important year was 2008, because three papers were published – Chaney (2008), Helpman et al. (2008), and Melitz and Ottaviano (2008) – who brought together recent work on heterogeneous firms with the determination of bilateral trade flows (Head & Mayer, 2014). Since then, the gravity model has been used in research with many augmentations.

Traditionally, gravity models have been based mainly on intuitive ideas about which variables will likely influence trade. The existing literature contains numerous studies that examine the impact of trade liberalisation on various economic outcomes, with results varying depending on the variables and countries included in the analyses. The remaining part of the literature review is divided into three

parts according to our research interest – articles analysing trade liberalisation in EU countries, then in New Member States (NMS), and those related to Croatia. First, Gnanon (2018) analysed 150 countries, including EU countries, by using an unbalanced panel dataset comprising over the period 1995–2015 to assess the impact of multilateral trade liberalisation on economic growth. His results suggest a strong positive effect, with upper-middle-income and high-income countries benefiting most from multilateral trade liberalisation due to their superior trading capabilities compared to low-income and lower-middle-income countries. Jena and Barua (2020) analysed the convergence dynamics in the EU. They showed that lower-income countries are catching up with the richer countries by opening up to international trade, excluding intra-EU trade, and by implementing growth-enhancing government expenditure policies. Their results showed that relatively lower-income countries such as Romania, Croatia, Latvia, Malta, and Cyprus experienced a somewhat higher impact of trade and government expenditure than higher-income countries. Spornberger's (2022) analysis covers 43 countries (the EU28, BRIC countries [Brazil, Russia, India, Indonesia, and China]) and 10 OECD member countries (Australia, Canada, Japan, Mexico, Norway, South Korea, Switzerland, Taiwan, Turkey, and the USA) from 1995 to 2014. This article focuses on trade in manufactured goods, using a structural gravity framework and a flexible two-step estimation approach, accounting for over two-thirds of international goods trade. The results reveal a deep integration process that increased trade shares within the EU, i.e. trade shares between the EU-15 and the CEECs increased by around 40% due to EU integration effects.

When it comes to analysing trade liberalisation for the NMS² of the EU, the literature is not very extensive. Namely, Bussière et al. (2005) analysed the rapid trade integration of the CEECs with the euro area from 1980 to 2003. Based on the augmented gravity model, the results suggest that trade integration between most of the largest CEECs and the euro area is already relatively well advanced, while some Baltic and South Eastern European countries still have significant scope for trade integration. In addition, Papazoglou et al. (2006) used a gravity model to forecast the potential impact of the 2004 EU enlargement on trade balances and trade flows. The results suggest that gross trade creation for the accession countries is about 25% of their 2003 trade. Similarly, Hagemeyer and Mućk (2019) evaluated the effects of exports and GVC

² It refers to member states that joined the EU after 2004.

participation on economic growth in CEECs from 1995 to 2014. The authors showed that exports had played a vital role in converging the CEECs with their advanced counterparts. Also, they showed that the significant growth drivers are GVC participation, imports of technology, and capital deepening.

Several authors have used the gravity model to analyse Croatian trade liberalisation. For example, Klimczak (2016) examined the Western Balkan region (Albania, Bosnia and Herzegovina, Croatia, Montenegro, Serbia, and FYR of Macedonia) by using panel data for the 2001–2014 period. Based on the estimation results, it appears that trade liberalisation has only had a minimal impact on the value of exports. Demand, various supply-related variables, and foreign direct investments are key factors influencing exports. Interestingly, a large internal market, measured by population rather than GDP, appears to limit exports. Ranilović (2017) analysed the effects of Croatian accession to the EU on merchandise trade using the gravity model. The results confirmed the positive effect of the EU accession on trade. On the other hand, free trade agreements with non-EU countries have no statistically significant and positive effect on Croatian trade. Stojčić et al. (2018) analysed the trade liberalisation effects with the EU on changes in the structure and quality of exports from NMS from 1990 to 2015. Their results showed that the timing of trade liberalisation with the EU affected the export performance evolution and the structure and quality of exports from NMS with a recorded increase in the share of high technology-intensive industries. The authors showed that the most advanced NMS obtained full benefits of preferential access to EU markets, with smaller effects recorded in Slovenia and Croatia. Jošić and Bašić (2021) analysed Croatia's CEFTA and EU membership effects on trade creation and trade diversion using the gravity model of international trade. Their analysis encompassed 180 trading partner countries from 2000 to 2016. The results showed positive effects of Croatia–CEFTA integration evident in a dominant trade creation effect. Conversely, the Croatia–EU integration exhibited a trade diversion effect in cases of imports and exports and is inconclusive in total trade flows. Ristanović et al. (2020), using a dynamic econometric model, evaluated the factors that showed the impact on the total trade of Serbia and EU member states in a period from 2001 to 2018. Their results showed that the size of the economy and population played an important role in the trade of Serbia. At the same time, the geographical distance negatively affects the bilateral trade between Serbia and foreign trading partners from the EU, proving the basic assumption of a gravity model. Additionally, a common border and a common language also show positive effects on bilateral trade.

3 Research Methods

In this article, we use panel data (over time bilateral trade data), which is considered to have an advantage of mitigating the bias generated by heterogeneity across countries. Precisely, the models are estimated using a two-step system GMM estimator (Arellano & Bover, 1995; Blundell & Bond, 1998) suitable for cases of “large n and small t ” (Roodman, 2009) where lagged levels are used as instruments for current differences, and vice versa (WTO, 2012). Namely, the GMM is a statistical estimation technique used in econometrics (Hansen, 1982) and other fields to estimate model parameters when the assumptions of ordinary least squares (OLS), fixed-effects, or random-effects models may not apply or are inappropriate. GMM can be a powerful and flexible method for estimating model parameters under certain conditions, making it a better choice to these other methods in some cases. In particular, OLS, fixed-effects models, and random-effects models make specific assumptions about the data, such as linearity and homoscedasticity. GMM does not rely on these assumptions and can provide consistent estimates, but it is not without its challenges. In addition, the lagged dependent variable on the right-hand side of the equation (as in our model) can lead to a correlation between that variable and the error term. In such cases, the conventional estimators listed previously may yield biased and inconsistent estimates (Heo et al., 2021).

Next, the system GMM can effectively address endogeneity issues (Arellano & Bover, 1995), where the explanatory variables are correlated with the error term. This is a common problem in regression analysis, and GMM can help mitigate bias caused by endogeneity. Furthermore, using both levels and differences of the data can lead to greater precision in parameter estimates. Therefore, GMM is a very flexible method that can be adapted to different types of data and model specifications, focusing on the change of variables over time, which is particularly important in our model. Hence, it is a natural choice when dealing with data that have both cross-sectional and time-series dimensions.

Our model employs data for all EU countries (the UK is also included³). The analysis covers the 2000–2021 period. Symbolically, the general panel baseline model is specified as follows:

$$\ln X_{it} = \alpha_i + \beta_1 \ln X_{it-1} + \beta_2 \ln GDP_{it} + \beta_3 \ln Rem_i + \theta_t + \varepsilon_i, \quad i = 1, \dots, N, \quad t = 1, \dots, T_i, \quad (1)$$

³ This study does not take Brexit into account.

where N is the number of units of observation, T is the number of periods, X_{it} stands for the value of the dependent variable (in this case, the Croatian export and import) i in the period t , the parameter α is the constant, β is the scalar, X_{it-1} is the one-period lagged (1 year) dependent variable, θ_t is the fixed element or random error for the unit of observation, and ε_i is the error term in the model. The dependent variable measures bilateral trade (export and import) between Croatia and other EU members plus the UK. The variables of international trade, imports, and exports are deflated by the Harmonised Index of Consumer Prices. There are also independent variables influencing the structure of exports. First, $\ln GDP$ is nominal GDP, and the reason for using nominal, not real GDP is explained in Shepherd et al. (2019). Namely, the GDP data are effectively deflated by the multilateral resistance terms (MRT), which are unobserved price indices. Deflating by some other factors, such as a readily observable price index, is likely to be misleading (Shepherd et al., 2019). Furthermore, a proxy “remoteness” ($\ln Rem$) is also included in the analysis. More specifically, a formula that measures a country’s average weighted distance from its trading partners, where weights are the partner countries’ shares of EU GDP (denoted by GDP_{EU}), is used to control for the multilateral resistance terms for exporting and importing countries (WTO, 2012):

$$Rem_i = \sum_j \frac{dist_j}{\frac{GDP_j}{GDP_{EU}}}.$$

In our analysis, MRT is controlled in GMM estimations using the variable remoteness. Remoteness measures a country’s average weighted distance from its trading partner countries. Namely, the multilateral resistances bear the intuitive interpretation that, all else equal, two countries will trade more with each other the more remote they are from the rest of the world (Yotov et al., 2016). Proper account for the multilateral resistances is the critical difference between the naive vs. theory-founded applications of the trade gravity model (Anderson & van Wincoop, 2003). Some researchers criticise a reduced-form version of the custom treatment from Anderson and van Wincoop (2003), where the multilateral resistance terms are approximated by the so-called “remoteness indexes” constructed as functions of bilateral distance and GDP (Head & Mayer, 2014).

However, trade costs go beyond tariffs and transportation expenses. They can include factors such as customs procedures, border delays, cultural differences, and regulatory barriers. Remoteness serves as a proxy for some of these non-tariff trade barriers because more distant

countries are likely to face greater logistical and regulatory challenges when trading with each other. Analysts can better account for these hidden trade costs by including remoteness in the gravity model.

In addition to remoteness, several other variables can be used as multilateral resistance terms in the gravity model of international trade to capture various aspects of trade costs and barriers. That is why we added the Schengen variable and an index of economic freedom,⁴ in order to capture different dimensions of trade costs and barriers in a more comprehensive manner.

The selection of variables in the model is made on the basis of previous research (e.g. Braha et al., 2015; Heo & Doanh, 2020; Ristanović et al., 2020; WTO, 2012) and the specific needs of this research.⁵ The dependent one-period-lagged variable will be used as an instrumental variable.

In the next step, two extended model versions were introduced and are the subject of the analysis. Model (2), in addition to the base variables, includes the variable Schengen entry ($Schengen$), population ($\ln pop$), and freedom to trade internationally ($\ln fti$) as a proxy for trade liberalisation:

$$\ln X_{it} = \alpha_i + \beta_1 \ln X_{it-1} + \beta_2 \ln GDP_{it} + \beta_3 \ln Rem_i + \beta_4 Schengen_{it} + \beta_5 \ln pop_{it} + \beta_6 \ln fti_{it} + \theta_t + \varepsilon_i. \quad (2)$$

The dummy variable representing Schengen entry is a binary variable that takes the value of 1 if the country is in Schengen and 0 otherwise.⁶ In addition, the dummy variable assumes a value of 1 from the year the country enters the Schengen area. The Schengen Agreement represents a significant achievement in the ongoing process of deepening

⁴ In an extended model that will be explained later.

⁵ In recent years, these models have been estimated using data on international trade flows only, but a number of recent studies stress the importance of including intra-national (i.e. domestic) trade flows as well (Campos et al., 2021). For instance, Yotov (2012) argued that the solution to the *distance puzzle* is the application of the appropriate measure of globalisation – that is the increase in international economic integration relative to the integration of internal markets. Consequently, the author emphasised the need to evaluate the effects of bilateral distance and international trade costs relative to the effects of internal distance and internal trade costs in order to capture the effects of globalisation. However, the estimates of the standard gravity variables based on the sample with international and intra-national trade are statistically not different from the corresponding estimated parameters based on the sample with international trade only (Yotov et al., 2016). Another shortcoming is that internal trade includes trade in services, whereas external trade is largely limited to merchandise trade (Brei & von Peter, 2017).

⁶ Today, the Schengen area includes most EU countries, with the exception of Bulgaria, Cyprus, Ireland, and Romania, as well as the United Kingdom.

European integration, and its primary aim is to simplify the movement of goods, services, and people within Europe's internal borders. Therefore, it is reasonable to expect that it will affect trade barriers. Moreover, according to Aussillon and Le Hir (2016a), the Schengen Agreement must have reduced the “economic distance” between its member countries through various channels. Articles that analyse the importance of the Schengen Agreement based on the gravity model (Aussilloux & Le Hir, 2016a; Chen & Novy, 2011; Davis & Gift, 2014; Felbermayr et al., 2016) conclude that it yields positive effects on trade. More precisely, Davis and Gift (2014) argued that labour mobility resulting from Schengen positively affects trade by increasing demand for foreign goods, improving awareness of low-cost producers abroad, and lowering the risks associated with buying and selling outside the country. Chen and Novy (2011) found that cross-country trade integration is lower for those countries that joined the EU most recently and have not yet implemented the Schengen Agreement that abolishes physical border controls. Aussilloux and Le Hir (2016b) showed that re-establishing permanent border controls within the Schengen Area would decrease trade between Schengen countries by 10–20%. The Schengen area's GDP would be reduced by 0.8 points, equivalent to more than 100 billion euros. Next, according to Felbermayr et al. (2016), Schengen has boosted trade by 3% on average (equivalent to a drop in tariffs by 0.7 percentage points). Goods trade is more robustly affected than services, and peripheral countries benefit more than central ones. More interestingly, Spornberger (2022) concluded that trade integration has not deepened for the EU-15, while trade shares among the newly joined central and eastern EU members doubled.

Furthermore, numerous analyses show that the effects of the population on trade are ambiguous (Kumar & Ahmed, 2015; Ristanović et al., 2020). Additionally, according to Fitzsimons et al. (1999), trade rises with population, which indicates that large and wealthy countries tend to trade more with each other based on a given GDP per capita.

Freedom to trade internationally is a measure of a wide variety of restraints that affect international exchange: tariffs, quotas, hidden administrative restrictions, and controls on exchange rates and the movement of capital, and it is often used as a proxy for institutional quality. It can be defined as freedom to exchange – in its broadest sense, buying, selling, making contracts, and so on – is essential to economic freedom, which is reduced when freedom to exchange does not include businesses and individuals in other nations (The Fraser Institute, 2022). It is interesting for our analysis since it captures both tariff and non-tariff barriers, the size of the trade sector, freedom of the foreign exchange market, and capital

controls. According to Sonora (2014), the economic freedom of a trading partner has a statistically significant and positive effect on the volume of trade between the US and its trading partners. The next variation (3) includes the index of economic freedom (*lneconf*) instead of freedom to trade internationally:

$$\ln X_{it} = \alpha_i + \beta_1 \ln X_{it-1} + \beta_2 \ln GDP_{it} + \beta_3 \ln Rem_i + \beta_4 Schengen_{it} + \beta_5 \ln pop_{it} + \beta_6 lneconf_{it} + \theta_t + \varepsilon_i. \quad (3)$$

The index of economic freedom of Heritage Foundation⁷ is used as a general measure of the economic freedom of a country measured through the lenses of four categories of freedom, including market openness (trade freedom, investment freedom, and financial freedom). We employ it as a robustness check and as a substitute for the former Fraser Institute Index because both indices gauge economic freedom by using a weighted average of various components. However, while the former primarily relies on quantitative variables, the latter incorporates qualitative assessments (research that considers this index in a context of measuring trade liberalisation includes Gnanon (2018), Santos-Paulino (2005), and Wall (1999)).

All variables not expressed in shares are logarithmically transformed (nominal GDP, freedom to trade internationally, index of economic freedom, and remoteness). Table 1 describes the variables, their sources, and expected signs that align with economic theory and previous research.

4 Results

This section provides estimates obtained within the system GMM model. Table 2 shows the results of the estimated impact of the trade liberalisation in Croatia and the diagnostic tests of dynamic panel data analysis. We estimated four models: specification (2) – analyses the influence of the basic gravity variables (nominal GDP and remoteness) and additional variables, which include Schengen entry (Schengen), population (lnpop), and freedom to trade internationally (lnftti) as a proxy for trade liberalisation – for export (a) and imports (b); and specification (3) – which includes the index of economic freedom (*lneconf*) instead of freedom to trade internationally – for export (a) and import (b). The results of the trade liberalisation in Model (2) suggest that the coefficients are in line with the expectations of the study and consistent with the predictions of

⁷ <https://www.heritage.org/index/about>

Table 1: Data description and sources

Code	Variable	Source	Expected sign
<i>lnexport</i>	Goods, value of exports, free on board (FOB), US dollars	IMF – Direction of Trade Statistics	Positive
<i>lnimport</i>	Goods, value of imports, cost, insurance, freight (CIF), US dollars	IMF – Direction of Trade Statistics	Positive
<i>lngdp</i>	Nominal GDP (current prices; million euro)	Eurostat	Positive
<i>lnrem</i>	GDP (constant 2015 US\$)	The World Bank	Negative
	Distance	https://www.distancecalculator.net/	
<i>lnftti</i>	Freedom to trade internationally	Fraser Institute	Positive
<i>lnecon_free</i>	Index of economic freedom	The Heritage Foundation	Positive
<i>lnpop</i>	Population on 1 January by age and sex	Eurostat	Positive

Source: IMF, The World Development Indicators, Fraser Institute, The Heritage Foundation, Eurostat.

Table 2: Results of the dynamic panel models

	Value of merchandise exports to Croatia's trading partners a		Value of merchandise imports from Croatia's trading partners b	
	Model (2)	Model (3)	Model (2)	Model (3)
Lagged dependent variable	0.6646*** [0.000]	0.5850*** [0.000]	0.6631*** [0.000]	0.5672*** [0.000]
GDP	0.1713*** [0.002]	0.3130** [0.012]	0.1356*** [0.001]	0.1825** [0.014]
Remoteness	-0.4436* [0.053]	-0.6246** [0.046]	-0.5891** [0.022]	-0.8753** [0.017]
Schengen	0.2408*** [0.000]	0.2063*** [0.009]	0.0548** [0.049]	0.0471 [0.115]
Freedom to trade internationally	2.1165*** [0.000]		2.3472*** [0.000]	
Population	0.1315* [0.079]	0.0315 [0.766]	0.1760*** [0.000]	0.2417*** [0.000]
Index of economic freedom		0.6587** [0.043]		0.5602* [0.075]
C	-4.3422* [0.078]	-1.1720 [0.609]	-3.7394 [0.143]	-0.3252 [0.894]
Number of observations	513	539	513	539
Number of countries	27	27	27	27
m2 test (<i>p</i> -value)	0.1988	0.2076	0.3884	0.3777
Sargan test (<i>p</i> -value)	0.9274	0.9463	0.8608	0.9162

Source: Authors' calculations.

Notes: *, **, *** indicate statistical significance at levels of 10, 5, and 1%; standard errors are in brackets.

the theoretical model, both when analysing exports from Croatia (a) and when analysing imports to Croatia (b). Namely, the coefficient of nominal GDP is positive and statistically significant, indicating a positive impact of GDP growth on exports/imports in Croatia at the 1% level. Moreover, the results show a negative and statistically significant influence of geographical distance.

In Model (3), instead of the variable freedom to trade internationally, the variable index of economic freedom is included in the analysis, which is also one of the ways of checking robustness. This additional variable has an appropriate sign and is significant. Hence, we confirm the robustness of the estimated models presented in several ways; first, regardless of whether Croatian exports to EU members (a) or imports from EU countries to Croatia (b) are analysed, the main conclusion remains. Also, with both proxies for trade liberalisation, i.e. both indexes of economic freedom, the obtained results hold in all models.

It can be concluded that all analysed variables in both variations are statistically significant and of appropriate signs. The results referring to imports are very similar to those obtained for exports. The only exception is the Schengen variable in Model (3)b, which has the appropriate sign but is not statistically significant.

The lower part of Table 2 presents the results of the diagnostic tests (e.g. Arellano–Bond tests for autocorrelation of second order [AR2]). There was no autocorrelation between residuals of the second order in none of the analysed system GMM models, meaning that the models were valid. The validity of the instruments selected for evaluating the model was tested with a Sargan test. Hence, based on the Sargan test, the hypothesis that no correlation exists between the residuals and the instruments was accepted.

The dependent lagged variable was statistically significant and had a positive algebraic sign. Overall, based on the specification tests conducted, it can be concluded that the estimates obtained through system GMM are reliable.

5 Discussion

The openness of the Croatian economy has led to a considerable expansion of its market, resulting in an improvement in its economic performance. The empirical model clearly demonstrates that EU trading partners' GDP growth positively influences Croatian exports. The results are in line with the above-mentioned study performed by Ranilović (2017) and confirm the positive impact on export performance that was not previously found by Družić *et al.* (2011) and Klimczak (2016). This also aligns with macroeconomic theory, which predicts that an increase in foreign incomes increases Croatia's net exports and aggregate demand, thereby contributing to GDP growth. The trade liberalisation increased both exports and imports, but the imports grew faster in comparison with exports before the onset of the global financial crisis. During the observed period, Croatia recorded a merchandise trade deficit, which was partially offset by a trade surplus in international services, except from 2015 to 2017, when the net exports were positive (CNB, 2022). The Croatian economy relies heavily on the tourism sector that drives its high import dependence, which weakens its positive impact on the economy. Exports of services create greater demand for the import of consumption goods as domestic production is not able to satisfy the increasing demand during the peak tourist season and to satisfy preference for foreign-produced goods (Orsini, 2017). Orsini (2017) found that this "leakage effect" in tourism revenues, which is usually associated with small-island tourism economies, also applies to Croatia due to the high import elasticity concerning export of services. To overcome this issue and reduce the "leakage effect," he suggests a less seasonal pattern of tourism, allowing domestic consumption to adjust capacity to the increase in demand, increasing the value of services to move away from the low per-capita spending, and expanding the range of services with lower import content such as medical and cultural services. The positive results achieved in the trade of goods and services during the period 2015–2017 were not the results of improved competitiveness but the consequence of the slower economic recovery of Croatia compared to other EU countries, causing the exports to grow faster than the imports. In the following period, it became obvious

that Croatia could not maintain its external balance and should address structural weaknesses in the economy. In the period 2000–2008, economic growth in Croatia was driven by debt capital inflows mainly from EU countries. However, the investments were not directed towards the tradable sector; instead, they were mainly channelled to financial intermediation. Croatia also missed an opportunity to integrate into GVC as it was the last member to join the EU on 1 July 2013, while most CEEC benefited from their membership in the EU by attracting substantial foreign direct investment, allowing their fast integration in GVC, especially automotive industry (Orsini, 2017). Stojčić *et al.* (2018) also emphasised the importance of the timing of trade liberalisation with the EU as it affected the export performance evolution and the structure and quality of exports, allowing countries that joined earlier to reap the benefits of preferential access to EU markets and increase the share of high technology-intensive industries.

Družić *et al.* (2011) found that the EU was insignificant within the gravity model, since Croatia exported to (or imported from) the EU countries no more than other countries with the same market size and distance. However, the results were obtained for the pre-accession period, using data for 2008, when the share of merchandise trade with the EU was 60%. Our results show that the EU accession increased total merchandise trade volume with the EU countries. Trade with EU member states in 2021 accounted for about 70% of total exports and about 77% of total imports. Moreover, the study unequivocally reveals that remoteness has a negative and statistically significant impact, indicating that geographical distance plays a key role in determining transportation costs. Croatia's largest trading partners have been Germany, Italy and Slovenia, with Slovenia being the partner country to which the most goods were exported in 2021, while the largest share of goods imported in the same year came from Germany (Croatian Bureau of Statistics, 2022), the largest economy in Europe. Moreover, these are also the countries from which traditionally the most tourists come to Croatia, thus representing also the most important partners for exporting Croatian services. Therefore, Croatia returns part of its revenues to the most important tourist markets by importing their goods. The Schengen entry coefficient was positive and also statistically significant, as expected. These results are supported in similar studies, e.g. Braha *et al.* (2015) and Ristanović *et al.* (2020). Concerning the other additional variables – population and freedom to trade internationally – results are qualitatively similar (statistically significant and with appropriate sign) to the baseline model. However, there are some differences in the magnitude of some coefficients.

6 Conclusions

The impact of trade liberalisation between the EU and Croatia, the last country to join the EU, was analysed using the gravity model of bilateral trade. We used data for all EU countries and the UK. We covered the period from 2000 to 2021, and, using panel data, we estimated the system GMM model.

The obtained results show that both imports and exports intensified in the observed period, i.e. during most of the transition and EU accession process. In other words, trade liberalisation, as one of the first structural reforms implemented in Croatia, had a positive impact on improving export performance. The gravity model can largely explain Croatia's trade flows, as the trade volume between Croatia and its EU partners increases with their economic size and decreases with the distance between them. Croatia's most important trading partners are Germany and the neighbouring countries Italy and Slovenia. However, this also makes Croatia highly vulnerable to adverse external shocks in its immediate environment. The coefficient for Schengen accession was positive and statistically significant, suggesting that the Schengen agreement has boosted trade and that we can expect the same for Croatia, especially in the context of simultaneous accession to the euro area and the Schengen area. Moreover, joining the Eurozone (1 January 2023) will increase the credibility of the overall economic policy, ensure the availability of new sources of financing and liquidity, and eliminate the risk of exchange rate fluctuations. Other forms of financial uncertainty, which affect less developed countries more in times of crisis, will also decrease, all of which will contribute to the economy's resilience to future shocks and crises.

This study has potential limitations. The borderline countries, Serbia and Montenegro, were not included in the analysis as they have only recently become EU candidate countries. However, they are important trade partners, with whom Croatia has stable trade relations, and neighbouring countries that benefit from a common border, a very similar language and a common history. Moreover, in this study, the intuitive gravity model was used to explain the trade model from a macroeconomic perspective, without insight into the microeconomic level. A possible avenue for further research could be to examine the impact of trade internationalisation on different sectors and at the company level in Croatia to identify the winners of opening up to trade.

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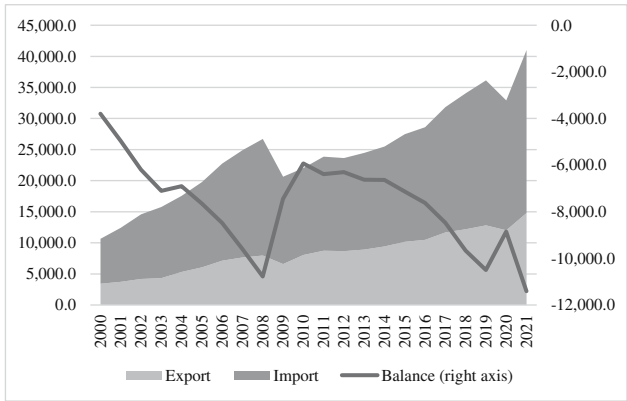
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Appendix

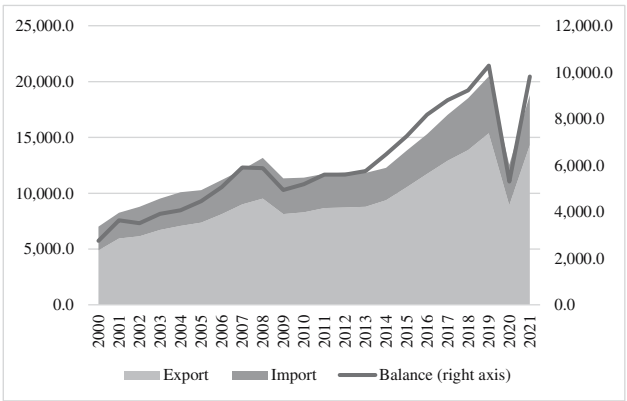
Trade in goods, mil EUR



Source: Croatian National Bank, 2022

Figure A1: Trade in goods, mil EUR.

Trade in services, mil EUR



Source: Croatian National Bank, 2022

Figure A2: Trade in services, mil EUR.