TRADE RELATIONS BETWEEN HUNGARY AND BOSNIA AND HERZEGOVINA: THE EVIDENCE FROM THE GRAVITY MODEL

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With its nominal GDP USD 177.3 billion in 2022, the Hungarian economy is roughly equivalent to the economies of Serbia, Croatia and Slovenia, combined. Yet, these three countries are among the five most important Bosnia and Herzegovina's (B&H) trading partners in exports and imports, while Hungary only ranks eighth among B&H's most significant trading partners. By applying the gravity model, it was found that the basic gravity model (which takes into account only the size of the economy and the distance) is insufficient to explain the volume of trade between Bosnia and Herzegovina and Hungary. Actually, the fact that Bosnia and Herzegovina was once a member state of the Former Yugoslavia still has a significant impact on explaining the international trade of Bosnia and Herzegovina, simultaneously indicating the importance of historical, cultural, and political ties between the countries. The results obtained in this research study pertaining to the ten most significant trading partners of Bosnia and Herzegovina also suggest that the distance between the major cities more strongly influences exports than imports. Taking into consideration the size of the Hungarian economy and the distance, these results suggest that the trade volume between Bosnia and Herzegovina and Hungary is far below the expected level.

Keywords: traditional trade patterns, regional economic integrations, gravity model, cross-border cooperation

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INTRODUCTION

According to the data obtained from the Foreign Trade Chamber of Bosnia and Herzegovina (B&H)

in the year 2022, this country exported to Hungary goods whose worth was USD 205,061,169[1], and imported from Hungary goods whose worth was USD 529,704,800. Hence, the import coverage by export coefficient in Bosnia and Herzegovina's trade with Hungary was only 38.7% in 2022, whereas the coefficient for Bosnia and Herzegovina and all of its other trading partners was 63% in the same year.

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In a time characterized by the flare-up of trade wars and the spreading sanctions and people starting to talk more often about the process of the deglobalization of the world economy (Goldberg-Reed, 2023; Chase-Dun, Álvarez & Liao, 2023), there were two related questions that the authorities of Bosnia and Herzegovina had imposed upon themselves to answer. The first question was whether trade relations with Hungary had sufficiently been developed given the fact that Hungary is geographically close to Bosnia. If the answer to the first question is negative, the other/second question of how to improve the position of Bosnia and Herzegovina in this exchange arises. Since one paper is not enough to answer both questions, this paper will try to find an explanation for the first question.

This paper does not deal with the structure of exports between the two analyzed countries but only focuses on values. Certainly, however, the intensification of Bosnia and Herzegovina's international trade with Hungary, as well as with the other Western Balkan countries where there is a huge yet untapped export potential (Lazarov & Miteva-Kacarski, 2023) can improve B&H's export structure and make it use its natural resources in a proper way, which is currently not the case (Krajišnik & Krčmar, 2017).

Yet, before starting dealing with the central issue of this research study (i.e. the trade relations between Bosnia and Herzegovina and Hungary) and given the tumultuous times we live in, the wish was to clearly emphasize the fact that the fundamental standpoint of economic science from its very beginnings to date, i.e. the fact that trade enriches all its participants, is still being advocated. Given the fact that, in principle, the Introduction does not cite the literature that supports the premise which the study is based on but introduces the reader to the subject, goal and structure of the study instead, a few most influential papers having shaped our point of view regarding the usefulness of international trade are presented in the relevant literature review.

It is of great importance for the paper itself, however, to point out the results of one of the last IMF's studies (Georgieva & Okonjo-Iweala, 2023), which indicate that, if the deglobalization process continues, its continuation will lead to the formation of trade blocs between geographically (and politically) close countries (as is the case of Hungary and B&H). Moreover, even if deglobalization leads to a drop in the world GDP (which, according to the IMF's forecasts, could be between 0.2 and 7% of the GDP, for some countries even up to 8 to 12% of the GDP), one part of that decline could be compensated for by deeper integrations and trade development within those blocs.

Using precisely the IMF's results, this research study aims to verify the statement that a significant untapped potential for increasing the wellbeing of the citizens of Bosnia and Herzegovina and Hungary lies in the deepening of the economic (in particular trade) relations between the two countries, based on the axiom that more trade means better wellbeing. Accordingly, the following hypothesis is tested in this study:

H1:   The trade exchange volume between Bosnia and Herzegovina and Hungary is lower than it is suggested by the basic gravity model based on the size of the economies and the geographic distance.

The method employed to evaluate the proportions of the unused potential in trade between Bosnia and Herzegovina and Hungary is the "classical" gravity model. Although the model lacks a clear theoretical basis (Cieślik, 2009), the same has empirically been proven. According to J. E. Anderson, the gravity model could explain 80–90% of the variation in trade flows in most empirical studies (Anderson, 2010). However, the fact that neither Anderson nor most other authors refer to a simple gravity model, but different variations of this model that include the various additional variables that account for the trade volume between the two countries, should be emphasized as such. Indeed, according to the group of the authors of the EBRD who compiled the Transition Report 2003 (EBRD, 2003) "The gravity model is, therefore, quite flexible, and numerous variables can be added to assess other factors governing trade between countries". Due to the success of the gravity model, there have been attempts to apply it to the fluctuations of some other economic phenomena

(capital flows, the labor force movement, the sectoral structure of the economy, etc.). Nonetheless, although the gravity model is typically successful, there are exceptions throughout the world, i.e. the examples of significantly higher/lower trade between countries that should be consistent with the predictions obtained by applying the gravity model.

This paper is structured into five segments. After the Introduction, the Literature Review presents the research results of the previously published works that dealt with the economic relations of B&H with the other Western Balkans countries by applying the gravity model. Since those papers are scarce (only about 15 had been found for this research study), it was decided that the relevant literature would be expanded so as to include those dealing with the trade relations of the other Southeastern European countries applying the gravity model. In the third part, the research method and data sources used are introduced. The fourth part provides the obtained research results and discussion, whereas the fifth part concludes with the economic interpretation of the obtained results.

LITERATURE REVIEW

The oldest paper in which the gravity model was applied to the trade relations of Bosnia and Herzegovina and the countries of Southeastern Europe or the Western Balkan countries is that written by E. Christie dating back in the year 2002. It is entitled "Potential Trade in Southeast Europe: A Gravity Model Approach" (Christie, 2002). Applying the gravity model, E. Christie concludes that Serbia and Croatia, the two largest economies established after the disintegration of the SFRY, continue to trade significantly less than their potential might allow them to at that moment, whereas North Macedonia is shown to be the regional leader in the trade volume compared to its GDP.

B. Kaminski and M. De La Rosha (2003) confirmed the fact that the trade volume between Serbia and Croatia was still below its potential, whereas the

mutual trade volume between the other states having been established after the disintegration of the SFRY had almost reached its potential level. This paper also deduces that the trade volume between the countries established after the disintegration of the SFRY and the Southeast European countries (Romania, Bulgaria and Albania) is still far below its potential.

The beginning of the 2000s was of great importance for the Southeastern European countries since it was then that they, as well as the EU and international multilateral institutions, decided on the further directions of the reform (transition) of these countries, which is noticeable in the IMF's 2003 Working Paper authored by A. Adam, J. McHugh and T. Kosma (2003), who suggested that there were three possible paths before the Southeastern European countries at that moment. First, there was a special free trade zone for this group of countries (SEEFTA). Second, there was the expansion of CEFTA (which had not expanded to Southeastern Europe yet at that moment) onto these countries. Third, they could have opted for the harmonization of the bilateral trade agreements between these countries that were in force at that time (Mamuti, Zubović & Boztepe, 2023). Analyzing CEFTA's and BFTA's experiences in terms of the trade volume and the trade pattern and applying the basic gravity model as the indicator of the "normal" or expected trade level, these authors predicted a considerable increase in the trade volume among these countries and with the EU.

The study carried out by M. Bussière, J. Fidrmuc and B. Schnatz (2005), written for the needs of the European Central Bank, confirms the fact that trade between the Southeastern European countries and the EU was still well below the estimated "normal" level at that time. The paper compares the experiences gained by the countries of Central and Eastern Europe and those of Southeastern Europe and deduces that the first group of the countries have made much greater progress in their integration with the EU.

J. P. Damijan, J. Sousa and O. Lamotte (2006) verified the conclusion of the previous study but also provided an additional insight since it was not only about applying the gravity model to trade between Southeastern

European countries and the EU. According to this paper, Southeastern European countries have reached the top level of mutual cooperation while still being below the average level of trade with the EU and the rest of the world. Another intriguing feature of this paper reflects in that it is the first to document that there was a significant increase in nontariff barriers after the reduction of the customs barriers between the Southeastern European countries and between these countries and the EU.

The work by D. Kernohan (2006) is interesting because this is the first paper in which the gravity model is applied to the trade of the countries established after the disintegration of the SFRY (although without Slovenia) and Albania, Bulgaria, Romania and Turkey, and in which one author explicitly advocates the creation of a customs union between these countries. He sees the customs union as a solution to the problem of the excessive dependence of the countries of the former Social Federal Republic of Yugoslavia (SFRY) on trade with other countries, which emerged after the disintegration of the former Yugoslavia.

J. Herderschee and Z. Qiao (2007) advocated the creation of a customs union of the Southeastern European countries. This paper is interesting since the CEFTA 2006 agreement joined by the countries of the former Yugoslavia had already been signed. However, the paper investigated the influence of bilateral agreements on trade liberalization between the countries of the Western Balkans (plus Ukraine) and the rest of the world (mainly the EU) by applying the gravity model. The study concluded that those agreements had had a significant positive impact on the trade volume.

Lj. Pjerotić (2008) backs the creation of a customs union of the countries established after the disintegration of the former SFRY. This paper is interesting because it is one of the first to suggest that trade between the countries established after the disintegration of Yugoslavia exceeded the natural level by far (it is said to be as much as 300% of potential trade) whereas trading between these countries and Bulgaria, Romania and Albania was still far below the expected level at that particular moment.

O. B. Kucharčuková, J. Babecký and M. Raiser (2012) point to the importance of institutions for increasing the trade volume. In this paper, a group of authors from the Czech Republic applied the gravity model to trade to the three groups of countries, namely to SEE, CIS and CEE, and concluded that if the Southeastern European countries reached the development level of the institutions of the Central European countries, that would lead to an increase in the trade volume with the EU by as much as 150%.

Most of the above-mentioned papers indicate that trade with the countries of the Western Balkans not established after the disintegration of the SFRY is still below the expected level. One such Albanian gravity-model-based research study conducted by A. Pllaha (2012) indicates that Albania's trade with the other countries of the Western Balkans was at only 10% of the real potential at that moment. This research study also considers the influence of the three extra factors (i.e. free trade agreements, ties from the past, and the neighborhood) in addition to the size of the economy and the distance.

A. Gjipali, E. Jorgji and E. Liko (2012) even more explicitly quantified the importance of these factors, concluding that the shared border increased the trade volume twice, the shared language increased it three times, while belonging to the former Yugoslavia increased it even four times.

P. Bjelić, R. Dragutinović-Mitrović and I. Popović-Petrović (2013) used the gravity model to estimate the impact of nontariff barriers both on the intra-regional trade volume of the Southeastern European countries and on the trade volume of these countries with the EU. They concluded that, of all the types of nontariff barriers, technical barriers represented the biggest obstacle to exporting to the EU market (which naturally includes Hungary as well). The authors also deduced that administrative barriers were the biggest obstacle to a further increase in the trade volume of these countries, both intra-regionally and with the EU and third countries.

The oldest paper found which applies the gravity model exclusively to B&H's trade relations with other countries (and does not consider B&H only as one of a

broader group of countries) is that by V. Nastić (2013), who analyzes Bosnia and Herzegovina's exports to 37 countries (including Hungary, too) from 2002 to 2011. By employing the gravity model, the author reaches somewhat surprising conclusions, i.e. the potential for the growth of B&H's exports to the EU countries was already drained in 2011, while the potential for the expansion of exports to the other CEFTA member countries was not exhausted. V. Nastić also points out the fact that the export structure of Bosnia is unfavorable since it only concerns the relatively simple products whose export depends on the price competitiveness, which is supported by the result according to which an increase in the distance (transportation costs) by 1% leads to a drop in the value of exports by as much as 2.121%.

K. Toševska-Trpčevska and D. Tevdovski (2014) believe that administrative barriers are the biggest impediment to a further increase in the volume of international trade in the Southeastern European countries, simultaneously pointing to the importance of the influence of the past trade patterns on the current trade. Specifically, they also find that being a member country of the former Yugoslavia and the shared border are the factors that significantly determine modern trade patterns.

In their paper, S. Kurtović and S. Talović (2015) employ the gravity model to analyze the trade between the CEFTA countries and the EU in the period from 2007 to 2013. Their goal is to determine whether the trade liberalization of these countries contributed to their trade deficit reduction. The obtained results led to the conclusion that trade liberalization between those countries and the EU had led to a reduction in the trade deficit of the first group of countries. Yet, it is noted that this was merely a consequence of the fact that most EU countries went through the 2008 crisis much better than the Western Balkan countries, rather than a consequence of the increase in the national competitiveness of the Balkan countries in the observed period.

In an interesting paper, J. Trivić and Ł. Klimczak (2015) expand the distance between countries from purely geographic to those communicative (the

importance of the language) and historical (a shared history) and indicate that the noneconomic factors (such as the common language and belonging to the same religious groups) have greater importance with respect to trade patterns than purely economic factors.

A. Fejzić and E. Čovrk (2016) applied the gravity model to B&H's trade with its 15 biggest trading partners from 2005 to 2014, their goal being to determine how the transportation infrastructure affected Bosnia and Herzegovina's trade with the other countries through transportation costs. The results suggest that an increase in the distance by 1% voids a decrease in trade between Bosnia and Herzegovina and its trading partners by 1.27%. The results they obtained showed how flawed B&H's transportation infrastructure was, i.e. a 1% increase in the quality of B&H's transportation infrastructure would cause an increase in the trade volume between Bosnia and the other countries by as much as 2.83%!

The central question in the paper by R. Dragutinović-Mitrović and P. Bjelić (2015) is whether the Western Balkan countries' accession to the European Union could lead to a shift in trade patterns. They endeavored to answer this question by applying the gravity model to the experiences gained by the Central European countries. Since the trade of the Southeastern European countries with the Central European countries (including Hungary as well) that are the members of the EU is especially considered, it is interesting to deduce that the lower competitiveness on the part of the Southeastern European countries helped achieve the most significant increase in the exports of those countries in the early stages of the EU integration, i.e. when asymmetric trade liberalization was considered in favor of the Southeastern European countries. Also, a more significant increase in trade owing to CEFTA rather than to the SPP indirectly suggests that the very act of these countries entering the EU might not significantly change the existing trade pattern.

The study whose results differ from the results of almost all the other papers and studies in this field is that carried out by E. Pere and E. Ninka (2017), written on nearly 140 pages, which was a part of the

research done by the Vienna Institute for International Economic Studies (WIIW), whose research subject was the trade of the Western Balkan countries with the EU 28 in the period from 2001 to 2015. According to the results obtained in this study, Bosnia and Herzegovina's membership in CEFTA did not have a positive effect on its exports (in contrast to trade liberalization with the EU), and the distance did not play a significant role in its exports, either.

S. Kurtović, B. Halili and N. Maxhuni, (2017) analyzed the impact of trade liberalization on Bosnia and Herzegovina's exports to and imports from the ten most significant trading partners (including Hungary, too) in the period from 2005 to 2014 period. Nonetheless, in contrast to the paper of S. Kurtović and S. Talović (2015), in Kurtović *et al* (2017) they conclude that trade liberalization with more developed countries does not result in a decrease in the B&H's trade deficit (quite contrary to that, it results in its growth). Also, trade liberalization with countries at a similar development level contributes to B&H's trade deficit reduction.

F. Ćejvanović, D. Miličević, and A. Kamerić's (2018) findings are similar to those in the research study presented in this paper in terms of their goal and the applied methodology, except for the fact that it explores Bosnia and Herzegovina's economic relations with another country. In their paper, the gravity model is used to assess whether B&H's trade with Montenegro has reached its full, expected potential in such a way that the full potential is the level suggested by the gravity model. The results indicate that there is additional room for the growth of exports from Bosnia and Herzegovina to Montenegro (the actual exports were USD 149 million in 2013, whereas the expected exports were USD 207 million) and a much greater scope for the growth of imports to Bosnia and Herzegovina from Montenegro (the actual imports to Bosnia and Herzegovina from Montenegro were USD 30 million in 2013, whereas the expected imports were USD 149 million). Regardless of the said, this paper notably does not include the exports and imports of services, whereby Montenegro has undoubtedly exported services to B&H thanks to significant income from tourism, whose value far exceeds the exports of goods.

Using an extended gravity model, Ł. Klimczak and J. Trivić (2018) analyze the impact of the three factors on the volume and patterns of trade, namely the impact of the bilateral trade liberalization agreements that preceded CEFTA, the impact of CEFTA itself, and the impact of the efficiency of institutions in the CEFTA countries. They inferred that the bilateral agreements had a more significant positive effect on the trade volume growth than CEFTA did. They also concluded that the way the institutions worked and operated could play a vital role in boosting the trade volume in the future. It can be interpreted as a fact that reducing administrative barriers to increase the efficiency of institutions in the importing country positively affects the increase in exports to that market from the other CEFTA member countries.

Yet another paper employing the gravity model to assess the impact of trade liberalization on the trade relations between Bosnia and Herzegovina and the EU is that written by H. Omerika and M. Hadžović (2019), who include data on the trade between Bosnia and Herzegovina and the EU in the period from 2005 to 2015 in the gravity model in their study. The results are interesting since it was concluded that the effectiveness of B&H – EU trade liberalization had varied over time. Thus, when movements in the period from 2005 to 2012 are concerned, it was concluded that Bosnia and Herzegovina had not had any particular benefits from the liberalization of trade with the EU (which is in line with the findings of V. Nastić (2013) and S. Kurtović *et al* (2017). It was also concluded, however, that the situation had significantly changed for the better in the period from 2013 to 2015.

The study conducted by the Ministry of Foreign Affairs of the Republic of Poland in cooperation with the OECD on the occasion of the Western Balkan Summit in Poznan 2019 entitled *Unleashing the Transformation Potential for Growth in the Western Balkans* (OECD, 2019) does not employ the gravity model but provides an interesting analysis of the potential for the growth of exports from Bosnia and Herzegovina both in the short term and in the long term instead. Thus, according to the study, the most significant part of the short gains in B&H's exports refers to the

additional exports of the existing B&H products to the other Western Balkans countries. On the other hand, the most extensive part of the long bets in B&H's exports (as much as 75%) is hidden in the inclusion of the companies from Bosnia and Herzegovina in the German–Central European Supply Chain (GCESC), which primarily refers to the companies operating in the automotive industry. Hungarian companies account for a significant part of this chain, so a more powerful inclusion of Bosnia and Herzegovina in this production chain would inevitably imply the strengthening of the trade relations between Bosnia and Herzegovina and Hungary.

H. Jošić and M. Bašić (2021) also agree with the conclusion that CEFTA more significantly stimulated the increase in the trade volume than accession to the EU. Nevertheless, the EU accession greatly impacted trade diversification, at least in Croatia.

The most recent paper to mention, which used the gravity model for the analysis of trade in the CEFTA countries, is that by I. Marković, I. Popović-Petrović and P. Bjelić (2021), who analyze the 100 nontariff impediments that emerged after the 2006 CEFTA establishment. There are concrete examples of how nontariff barriers "succeeded" in replacing the tariffs limiting interregional trade.

It is said in the Introduction of this paper that it rests upon the assumption that trade benefits all its participants, which is the reason why several outstanding works that support and explain that premise in the Literature Review are listed (Romer, 1986; Lucas, 1988; Romer, 1989; Rivera-Batiz & Romer, 1991; Edwards, 1993; Frankel & Romer, 1996; Edwards 1998; Greenaway, Morgan & Wright, 2002; Lee, Ricci & Rigobon, 2004). As can be assumed, most of the foregoing papers came to light at the end of the 1980s and during the 1990s, when the globalization process seemed to be irreversible.

In order not to be accused of bias (Shevchenko, 2023), it should be emphasized herein that, even in the developed globalization era, very prominent authors disagree upon the premise that international trade is always beneficial for participants. Most often, their criticism has gone towards proving the unequal

distribution of benefits from mutual trade between participating countries (Chang, 2016) or the unequal distribution of benefits from international trade between different social groups within one country participating in international trade.

RESEARCH METHODS AND DATA

This paper applies the international trade gravity model to the data pertaining to Bosnia and Herzegovina. The determinants of international trade in goods for 2021, i.e. at a one-time point (a cross-sectional study) are analyzed. The ten biggest importers and exporters are considered, and the method of ordinary least squares is used.

There are different sets of the variables used to estimate the gravity model by different researchers. Also, various econometric models are used for the purpose of estimating the gravity model (Ranilović, 2017; Ristanović & Tošović-Stevanović, 2020; Zaninović, 2022). The standard variables used as the dependent variable(s) usually include the GDP of the country for which the model is being estimated, the GDP of the trading partners, and the distance (Zaninović, 2022). Yet, most researchers expand the basic set of the variables by including the population and the artificial variables indicative of sharing the border and the common language (Ristanović & Tošović-Stevanović, 2020), as well as the existence of the historical ties and bilateral and multilateral trade agreements between the countries included in the study (Ranilović, 2017).

The empirical model used in this study generally uses the variables also used by the researchers previously referred to and is represented by the following regression equation:

$$\ln MT_{ij} = \alpha + \beta_1 \ln dist_{ij} + \beta_2 \ln(gdp\_cons_i * gdp\_cons_j) + \beta_3 \ln gdp\_pc\_cons_j + \beta_4 dummy\_ex\_Yu_{ij} + \varepsilon_i$$

where i represents Bosnia and Herzegovina and j denotes the trading partner country. MT stands for international trade, exports, imports or their sum, depending on whether the dependent variable in the model implies exports from Bosnia and Herzegovina

to the country *j*, imports from the country *j* to Bosnia and Herzegovina, or the total trade between them, i.e. the sum of the exports from Bosnia and Herzegovina to the country *j* and the imports from the country *j* to Bosnia and Herzegovina. *Dist* is the distance between the capital of Bosnia and Herzegovina and the trading partner country. Given the fact that the gravity model predicts that a higher GDP of the exporting and importing countries implies more significant international trade between the two countries, the regression used the variable that represents the product of the GDP in the two countries in constant dollars since 2015. A higher GDP *per capita* in the importing country will also mean higher exports from Bosnia and Herzegovina (Cherepovskyi, 2022). Hence the third variable in the model is the indicator that reflects the purchasing power of the foreign market. International exchange is also affected by cultural, linguistic and historical similarities. Therefore, the artificial variable with the value 1 for Serbia, Croatia and Slovenia is introduced. These countries were among the ten most important trading partners of Bosnia and Herzegovina in 2021. All the variables, except for the artificial ones, are used in the econometric analysis in the logarithms. Since it is a log-log model, all the coefficients are interpreted as percentage changes, except for the artificial variable. The specification of the variables is given in Table 1.

Predictably, the longer distance between the capital of Bosnia and Herzegovina and the trading partner country will have a negative impact on international trade due to higher transportation costs (Castanho, Loures, Lousada, Gómez & Cabezas, 2022). Therefore, the expected sign of the coefficient with this variable is negative. If the GDP is high in Bosnia and Herzegovina and in its trading partner countries, greater international exchange is expected. While a higher GDP *per capita* in the country to which Bosnia and Herzegovina exports should result in higher exports due to the greater purchasing power. Therefore, the expected sign for the variables indicating the GDP is positive. Cultural, linguistic and historical similarities mean more significant international trade, and it is anticipated that Bosnia and Herzegovina, as the country belonging to the ten most important trading partners, exports more to the countries with which it used to be a member of the former Yugoslavia, with the other conditions being equal.

Table 1 The specification of the variables used in the model

Variable	Type	Notation	Source
Exports from Bosnia and Herzegovina in 2021	Dependent	Lnx	Foreign Trade Chamber of Bosnia and Herzegovina (2022)
Imports to Bosnia and Herzegovina in 2021	Dependent	Lnm	Foreign Trade Chamber of Bosnia and Herzegovina (2022)
The sum of the exports from and imports to Bosnia and Herzegovina in 2021	Dependent	Lntrade	Foreign Trade Chamber of Bosnia and Herzegovina (2022)
The distance between the capital of Bosnia and Herzegovina and the trading partner country	Independent	Lndist	The *Here WeGo* application is used, where no air distance was considered but the length of the road that takes the least time to arrive from one city to another.
GDP in constant USD in 2021	Independent	gdp_cons	World Bank (2022)
GDP *per capita* in constant USD in 2021	Independent	gdp_pc_cons	World Bank (2022)
The artificial variable indicating cultural, linguistic and historical similarities (the former YU countries)	Control	dummy_ex_Yu	Authors

Source: Authors

RESEARCH RESULTS AND DISCUSSION

As is shown in Table 2, the top ten trading partners comprise almost 76% of the total trade of Bosnia and Herzegovina in 2021. Croatia was the main trading partner, with which USD 3.11[2] billion of the total trade was recorded, only to be followed by Serbia and Germany. It is important to stress that, among the top ten trading partners, the trade surplus is only recorded with Germany and Austria. In 2021, Hungary was the eighth biggest trading partner of Bosnia and Herzegovina, with the total export from Bosnia and Herzegovina USD 156.9 million and the total imports USD 468.8 million, which means that the recorded trade deficit was USD 311.9 million. The share of trade in goods with Hungary was only 2.96% of Bosnia and Herzegovina's total foreign trade.

The descriptive statistics of the other variables used in the econometric analysis are shown in Table 3. Among the top trading partners, China is the major country according to the total GDP and the population, whereas the richest countries measured by the GDP *per capita* are Austria, Germany and Italy. China is the most distant country, while Serbia is the closest, measured by the distance between the two capitals.

Table 4 shows the results of the regression analysis presented in the research methods. The four models are considered, whereby the regression equation related to the exports is evaluated twice – first, using the dependent variables also used to evaluate the total trade model (Model 1) and the import model (Model 2); second, adding the variable indicating the purchasing power of the export market, i.e. the GDP *per capita*, in the importing country at constant prices.

Model 1 shows the estimation of the regression equation related to the total trade represented by the sum of the exports from Bosnia and Herzegovina and imports to one of the ten major trading partner countries. All the variables are significant at the 1% level of statistical significance. The adjusted determination coefficient (Adj. R-squared) shows that 87.2% of the variation is in the dependent variable, i.e. the total trade, explained by the variations in the explanatory variables. The greater the distance between Bosnia and Herzegovina and the trading partner country, the smaller its international trade, because transportation costs represent the limitations to the specialization based on comparative advantages. An increase in the distance between the capital cities by 1% reduces trade by 1.37%. Also,

Table 2 The top ten foreign trading partners of Bosnia and Herzegovina in 2021

No.	Country	The export of goods (in million USD)	The import of goods (in million USD)	Total trade in goods (in million USD)	Share in total trade
1	Croatia	1,043.89	2,001.84	3,111.10	14.72%
2	Serbia	1,046.46	1,865.70	2,912.16	13.78%
3	Germany	1,245.29	1,219.67	2,464.96	11.66%
4	Italy	934.83	1,115.35	2,050.19	9.70%
5	Slovenia	716.87	1,095.29	1,812.18	8.57%
6	Austria	745.45	655.69	1,401.14	6.63%
7	Turkey	209.98	650.28	860.26	4.07%
8	Hungary	156.94	468.87	625.81	2.96%
9	Poland	133.63	319.59	453.20	2.14%
10	China	21.11	336.23	357.33	1.69%
11	Total	6,319.81	9,728.51	16,048.32	75.93%
12	Total (Bosnia and Herzegovina with all the countries)	8,450.47	12,684.89	21,135.36	100.00%

Source: Authors

Table 3 The indicators for Bosnia and Herzegovina's top trading partners in 2021

No.	Country	GDP (in billion USD, constant prices, 2015=100)	GDP *per capita* (in USD, constant prices, 2015=100)	The distance from Bosnia and Herzegovina (in km)	The population (in millions)
1	Croatia	59.13	15,165	425	3.89
2	Serbia	48.61	7,113	300	6.83
3	Germany	3,554.67	42,726	1,494	83.20
4	Italy	1862.3	31,506	849	59.11
5	Slovenia	52.16	24,743	562	2.11
6	Austria	405.14	45,238	790	8.96
7	Turkey	1,131.03	13,341	1,608	84.78
8	Hungary	150.68	15,518	551	9.71
9	Poland	598.3	15,850	1,392	37.75
10	China	15,801.91	11,188	10,717	1,412.36
11	Bosnia and Herzegovina	19.17	5,861		3.27

Source: Authors, based on The World Bank – World Development Indicators (WDI), 2023, and the *Here WeGo* application

Table 4 The assessment of the parameters of the gravity model for Bosnia and Herzegovina

Model variable	(Model 1) ln*trade*	(Model 2) lnm	(Model 3) lnx	(Model 4) lnx
ln*dist*	-1.374***	-1.021***	-2.388***	-1.907***
	[0.223]	[0.154]	[0.476]	[0.322]
$\ln(gdp\_cons_i * gdp\_cons_j)$	0.741***	0.589***	1.035**	0.807***
	[0.144]	[0.099]	[0.306]	[0.197]
ln*gdp_pc_cons*				0.821**
				[0.244]
ex_yu	1.617***	1.551***	1.560*	1.810***
	[0.325]	[0.225]	[0.693]	[0.426]
Constant	23.742***	22.267***	26.878***	34.498***
	[0.863]	[0.597]	[1.839]	[2.522]
Observations	10	10	10	10
R-squared	0.915	0.941	0.863	0.958
Adj. R-squared	0.872	0.912	0.794	0.924
Prob>F	0.001			
AIC	6.012	-1.384	21.128	11.286
BIC	7.222	-0.174	22.339	12.799

Note: The standard errors are given in brackets; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Authors

the GDP growth in Bosnia and Herzegovina and its main trading partner countries is a stimulus for international exchange, because the coefficient with the variable that indicates the GDP product of the participating countries is positive.

Model 2 illustrates the regression equation evaluation related to the imports from the partner country to Bosnia and Herzegovina. All the explanatory variables are significant at a 1% level of statistical significance in this model. The adjusted determination coefficient (Adj. R-squared) shows that 91.2% of the variations in the imports can be explained by the variations in the distance, the GDP of the participating countries, and cultural and historical similarities. The greater the distance between Bosnia and Herzegovina and the major trading partner country, the lower the import. An increase in the distance between the capital cities by 1% reduces the imports by 1.02%. Furthermore, the GDP growth in Bosnia and Herzegovina and the importing country increases imports to Bosnia and Herzegovina.

When comparing the coefficients and the variables indicating the geographic distance, it is clear that they are higher in the models 3 and 4, i.e. in those models accounting for the assessment of the export determinants, especially when compared to the import model (Model 2), which means that the greater distance between the capital of Bosnia and Herzegovina and the trading partner country represents more significant export barriers than import barriers. Thus, an increase in the distance by 1% reduces exports from Bosnia and Herzegovina from 1.91% to 2.39%. The determination coefficient

related to the exports is higher in Model 4 (being 92.4%) compared to Model 3, where the variations in the independent variables are responsible for 79.4% of the changes in the exports. The lower values of the AIC and BIC information criteria prove that Model 4 is better. What is evident in Model 4 is that an increase in the purchasing power of the foreign market by 1% measured by the GDP *per capita* growth increases exports to a specific country by 0.82%. This variable is significant at a 5% level of statistical significance. On the other hand, it implies that, when trading partner countries are affected by a crisis, a decline in their GDP *per capita* means a considerable drop in exports from Bosnia and Herzegovina.

In order to accept the model as relevant for drawing conclusions, it is necessary that the model specification and whether the OLS assumptions have been met should be checked (Žarković, Krajišnik & Gligorić, 2014). Table 5 shows the results of the model testing, i.e. the testing of the assumptions of the linear regression model. Given the fact that it is a cross-sectional analysis characterized by heteroskedasticity problems (the variability of variances), variance testing was conducted, and the tests showed that the variances were constant in all the models.

The results of the Jarque-Bera test also indicate that the residuals in all the evaluated models are normally distributed, while the Ramsey test shows that the model specification is suitable, i.e. no significant variables are omitted in the evaluated models.

Table 5 The postestimation results for the gravity models

Model	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Heteroskedasticity test – *Breusch-Pagan / Cook-Weisberg (Prob > chi2)*	0.8519	0.829	0.670	0.692
Normality test – *Jarque-Bera (chi2)*	0.678	0.747	0.686	0.817
Model specification test – *Ramsey RESET test (Prob > F)*	0.339	0.308	0.251	0.250

Source: Authors

CONCLUSION

This paper provides several theoretical contributions to applying the trade gravity model to the case of Bosnia and Herzegovina and Hungary. First, the paper shows that the basic gravity model (which only takes into account the size of the economy and the distance) is not sufficient to explain the low level of trade between these two countries. Second, an additional variable indicative of Bosnia and Herzegovina's having been a member state of the former Yugoslavia is introduced as a factor that may affect trade flows. This variable has a significant impact on explaining the international trade of Bosnia and Herzegovina and indicates the importance of the historical, cultural and political ties between the countries. Third, this paper uses data on the distance between the capital cities as a measure of the geographic distance instead of the usual measured distance between the geographic centers of the countries. This measure better reflects the actual transportation and communication costs between the two countries. Fourth, this paper differentiates the effect of the distance on Bosnia and Herzegovina's exports and imports and shows that the distance is more important for exports than for imports, which suggests that Bosnia and Herzegovina faces greater barriers to placing its products on foreign markets.

This paper has several policy and managerial implications for Bosnia and Herzegovina and Hungary. First, the research results obtained in this study show that the basic gravity model is not sufficient to explain the low level of trade between these two countries and that the fact that Bosnia and Herzegovina had once been a member country of the former Yugoslavia has a significant positive effect on its trade flows, which on its part suggests that historical, cultural and political ties play an important role in shaping trade patterns and preferences. Therefore, both countries should take into account these factors when designing and implementing their trade policies. Second, the results of this study also show that the distance has a negative effect on Bosnia and Herzegovina's exports, not its imports, which is implicative of the fact that Bosnia and Herzegovina faces greater barriers to accessing foreign markets than importing from them, for which very reason it should seek to reduce these barriers by improving its export competitiveness, diversifying its export products and destinations, and negotiating preferential trade agreements with strategic partners. Third, the results of this research indicate that there is still room for increasing trade flows between Bosnia and Herzegovina and Hungary by reducing trade frictions. Improving the transportation infrastructure, harmonizing the standards and regulations, facilitating the customs procedures and promoting cross-border cooperation are just a few potential measures that may help enhance trade facilitation between the two countries and lower the transportation and communication costs between the two countries, simultaneously increasing their mutual trust and confidence. Finally, the analysis carried out in this study is not deprived of certain limitations and caveats that should be taken into account, e.g. the data on the distance between the capital cities as a proxy for the geographic distance which may not capture the variation in transportation costs across regions within each country. Tariffs are also assumed to be exogenous and not to affect trade flows directly, which may not be realistic in some cases. Moreover, the linear specification of the gravity model is used, which may not account for possible nonlinearities or interactions among the explanatory variables. Furthermore, ordinary least squares are applied as the research study's estimation method, which may suffer from endogeneity issues. Therefore, future research should address these limitations using alternative data sources and models.

Analyzing the trade between Bosnia and Herzegovina and its most important trading partners, the gravity model applied in this study has once again proved to be useful. Nonetheless, the details are particularly attention-grabbing. The obtained results for Bosnia and Herzegovina's ten most significant trading partners suggest that the distance between the major cities more strongly influences the exports than the imports. The imports depend more on Bosnia and Herzegovina's and its trading partners' GDPs. Thus, while the 1% increase in the distance between Bosnia and Herzegovina and its trading partners causes a 1.37% decrease in the trade volume, the decrease in the exports is much more pronounced (1.91% to 2.39%) compared to the drop in the imports (1.02%).

As was expected, the movement of the Bosnian GDP has no significance for its exports, whereas the 1% drop in the GDP of the trading partner leads to the 0.82% drop in the Bosnian exports to that trading parting country.

Considering the size of the Hungarian economy and the distance, the research results suggest that the trade volume between Bosnia and Herzegovina and this country is far below the expected level. Hence, the "B&H once having been a member country of the former Yugoslavia" variable had to be included in the analysis in order to help the explained level of Bosnia and Herzegovina's international trade to be as much as 87.2%, at the 5% statistical significance level.

This study has the limitations that should be taken into consideration and addressed in future research, which could use panel data to account for the time effects and unobserved heterogeneity across countries. Second, this study used the basic gravity model that only considers the economic size of and the distance between two countries as the explanatory variables. Future research could extend the model by including the other variables that may affect trade flows, such as trade policies, cultural similarities, institutional quality, transportation costs and so forth. Third, this study has only focused on the bilateral trade flows between Bosnia and Herzegovina and Hungary, which may not reflect the multilateral trade relations among the countries in the region. Future research could use the multilateral gravity model that incorporates the effects of third countries on bilateral trade flows.

ENDNOTES

1 The Central Bank of Bosnia and Herzegovina's average exchange rate for the US Dollar (USD) against Bosnia and Herzegovina's Convertible Mark (BAM) was 1.833 convertible marks for 1 American dollar on 31st December 2022. Available at: https://www.cbbh.ba/CurrencyExchange/

2 The Central Bank of Bosnia and Herzegovina's average exchange rate for the US Dollar (USD) against Bosnia and Herzegovina's Convertible Mark (BAM) on 31st December 2021 was BAM 1.725 for USD 1. Available at: https://www.cbbh.ba/CurrencyExchange/

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