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PATTERNS AND DETERMINANTS OF INTRA-INDUSTRY TRADE IN AGRI-FOOD PRODUCTS BETWEEN BOSNIA AND HERZEGOVINA AND CEFTA 2006

ABSTRACT: *The paper aims to identify patterns and country-specific determinants of intra-industry trade (IIT) in agri-food products between Bosnia and Herzegovina (BiH) and other CEFTA 2006 parties in the period 2008–2018. The purpose of the paper is to contribute to filling the gap in the empirical literature on IIT of the South East European countries, especially in regard to non-manufacturing sectors. To investigate IIT intensity and structure the analysis employed Grubel-Lloyd indices and GHM methodology based on relative unit values. In order to examine the impact of various determinants on IIT in agri-food products, a random-effects Heckman selection model was estimated, following a sector-level approach in the analysis. The analysis indicates a lower level of IIT than expected and a strong dominance of its vertical type in all BiH bilateral relations within CEFTA 2006. The empirical results also suggest that the major determinants positively affecting IIT in agri-food products include the size of the trading economies, the similarity in their ethnic structure, membership in the common regional trade agreement, and common borders. By contrast, the results indicate that IIT is negatively affected by differences between the trading economies in terms of productivity and gross domestic product per capita.*

KEY WORDS: *intra-industry trade (IIT), agri-food products, country-specific determinants, Bosnia and Herzegovina (BiH), CEFTA 2006*

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1. INTRODUCTION

After years of research into the intra-industry trade (IIT) phenomenon, the conditions under which IIT between countries will intensify and even predominate are by now well known. More intensive intra-industry trade is likely to occur between countries that are similar in the size of the economy, level of economic development, and culture, particularly if they form a common economic integration. Moreover, IIT occurs to a greater extent in industrial rather than primary products. Industrial products are more differentiated than primary products, and product differentiation spurs trade within industries between similar countries. Therefore, IIT in industrial products is much more often the subject of empirical research. Still, the effects of individual IIT determinants are occasionally unexpected, depending on the sample of countries or kind of products, which inspires new research and enriches the empirical literature.

Due to a lack of research into IIT in primary and food products, the question arises as to how important for agri-food products are IIT determinants based on similar characteristics of trading countries that were mostly studied in relation to industrial products. An increasing number of studies have attempted to answer this question, though less so regarding the less advanced transition countries of South East Europe (SEE). While there have been a few studies of IIT in SEE countries for the case of Croatia there has been little research specifically on IIT in agri-food products in the region.

Therefore our research is, in general, motivated by the gap in the empirical literature on IIT in agri-food products in the SEE region. An additional motivation is found in investigating whether theoretical statements concerning IIT of similar countries that are members of the same integration are also valid in the case of countries of the region that experienced conflicts in the recent past. Particular attention is paid to investigating the significance and impact of an IIT determinant which is a specificity of this region and which is especially connected with habits in consumption of agri-food products – namely ethnic similarity.

The paper focuses on identifying the characteristics and determinants of IIT in the agri-food sector through the example of the intra-regional trade of Bosnia and Herzegovina (BiH). The research results should therefore contribute to

determining the position of the BiH agri-food sector in the country's bilateral relations within the SEE region. The time framework refers to the period 2008–2018. In this period, trade between BiH and most countries of the region occurred pursuant to the Agreement on Amendment of and Accession to the Central European Free Trade Agreement (CEFTA 2006), which was also signed by Albania, Montenegro, Croatia[1], Kosovo[2], Moldova, North Macedonia, and Serbia. This agreement and its additional protocols[3] significantly liberalised trade in agri-food products in the region.

Previous research focusing on the IIT of BiH can be found in several papers published mostly over the last decade (Domazet, 2008; Klimczak, 2012; Brkić, 2010, 2012a, 2012b, 2013, 2018; Mrdalj et al. 2017). Only one of them – Mrdalj et al. (2017) – analyses IIT in agricultural products, though without modelling IIT determination. So far, the determinants of IIT in agri-food products have not been studied using the example of BiH.

Considering the geographic proximity and similarities between BiH and most of the listed CEFTA 2006 parties in the context of already existing trade liberalisation, we tested the hypothesised impact of the trading countries' characteristics on the resulting patterns and intensity of IIT in their mutual trade in agri-food products. We hypothesised that a significant and positive impact on IIT in agri-food products would come from bilateral economic size, trade liberalisation (in the form of the common economic integration), common

[1] Croatia was a member of the 'old' CEFTA and later of CEFTA 2006 from its establishment to mid-2013, when the country joined the European Union; however, due to its strong intra-regional ties this country is included in the research in the whole observed period.

[2] The name does not prejudge the status of Kosovo and is in line with the Resolution of the United Nations Security Council (UNSC 1244) and the opinion of the International Court of Justice (ICJ) on the Declaration on Kosovo's Independence of 2008. The United Nations Interim Administration Mission in Kosovo (UNMIK) signed the CEFTA agreement on behalf of Kosovo. For the purpose of this research, Kosovo is treated as a separate customs territory.

[3] The additional protocol signed between most CEFTA 2006 parties on 23 February 2011 established free trade in agricultural products within CEFTA 2006. From the start, BiH negotiated free trade in agricultural products with almost all CEFTA 2006 signatories, and it was fully implemented after the period of temporary asymmetry in favour of BiH expired. It was subsequently implemented only with Albania, by an additional protocol signed on 23 November 2013. However, the trade regime between Croatia and other CEFTA 2006 parties became less liberal for some kinds of products when the country joined the EU in 2013.

border, the common state and ethnic similarity. On the other side, we expected a negative impact of geographic distance, income inequality, and differences between trading partners in the endowment of agricultural land and in the productivity of agricultural production[4].

In order to identify the determinants of IIT and their effects, we use an econometric analysis that encompasses a larger number of variables pertaining to country characteristics than the other studies focusing on transition countries. The use of the random-effects Heckman selection model allowed us to account for the missing data for the dependent variable in the case of absence of trade. Due to its comprehensiveness and elimination of selection bias, such an analytic approach is a new and significant contribution to the earlier related empirical literature.

The paper is structured as follows. Following the introduction, the second section of the paper presents the conceptual framework which explains the theoretical foundations of IIT determination. The third section describes the research methodology and data used. Research results are presented and discussed in the fourth section, while the conclusions derived from the results are presented in the final, fifth section.

2. CONCEPTUAL FRAMEWORK

The main hypothesis tested in this research is that similarity between countries in terms of economic performance and the communication proximity expressed through geographic, historical, and ethnic factors contribute to a greater intensity of mutual IIT in the agri-food sector, particularly if the trade is significantly liberalised. Some additional determinants specific to IIT in agri-food products, such as arable land and agricultural productivity, are also considered.

[4] The two determinants – trade intensity (TI) with the expected positive sign and differences in foreign direct investment stock (DFDI) with the expected negative sign – have been included in the preliminary specification of the model but because of their high correlation with almost all other variables and, at the same time, an insignificant impact on IIT, they have not been further elaborated.

H1: *Economic integration increases IIT intensity in agri-food products between member countries.*

The experiences of more-developed economic integrations in the world, such as the European Union (EU), lead to the conclusion that economic integration primarily results in the increase of intra-industry rather than inter-industry trade. Starting from the 1960s and 1970s, studies of the effects of economic integration mostly focused on the European Community (Drèze, 1961; Balassa, 1963, 1966; Grubel and Lloyd, 1975) and then on the correlation between IIT and economic integration, i.e., trade liberalisation in general[5] (Drabek and Greenaway, 1984; Greenaway, 1987; Bergstrand, 1990; Torstensson, 1996; Kandogan, 2003; Sharma, 2004; etc.). All of them confirmed the positive effect of economic integration on the intensity of IIT. Brkić (2010) also established the positive effect of trade liberalisation in the SEE on BiH IIT in all products. According to the theoretical concepts on relations between economic integration and trade flows as well as most empirical findings on IIT, we hypothesised a significant and positive impact of trade liberalisation within the CEFTA 2006 framework on IIT in agri-food products between BiH and other CEFTA parties.

H2: *The bilateral economic size of countries has a positive effect on their mutual IIT in agri-food sector.*

Country size pertains to economic size, i.e., the ability to produce with economy of scale and absorb a large number of differentiated products (Lancaster, 1980). The greater the average market size of two countries, the greater the IIT share in their mutual trade. With respect to agri-food products, the positive effect of bilateral economic size on IIT was established by Jing et al. (2010), Jambor (2013), Jambor and Torok (2013), Bojnec and Ferto (2016), and Chakraborty (2017).

H3: *Income inequality between trading countries negatively affects their mutual IIT in agri-food products.*

Similarity between countries in the level of economic development will positively affect the intensity of their mutual IIT. The theoretical reasons underlying this

[5] Trade liberalisation pertains to lowering or removing trade barriers, which can be unilateral, bilateral, regional, or multilateral.

claim differ depending on whether it is viewed from the standpoint of demand (effect of the structure of demand on IIT) or from the standpoint of supply (effect of the factor endowment on IIT). According to Linder's (1961) hypothesis on overlapping demand, countries with similar levels of per capita income have similar structures of demand, which create a market for differentiated products and the possibility of increased IIT. On the other hand, per capita income reflects a similarity or a difference in capital and labour between trading partners. Helpman (1981), Krugman (1981), and Helpman and Krugman (1985) established that IIT will be greater if the ratio between two countries' capital and labour is more similar, i.e., if the countries are more similar in their respective factor endowments. By analogy, differences in per capita GDP should have a negative effect on IIT. Jing et al. (2010) on the case of IIT in the U.S. agricultural sector and Leitao (2011) on the case of China's IIT in agricultural products confirmed the negative effect of the difference in GDP per capita.

H4: *Differences in factor endowment between trading countries i.e. differences in arable land and productivity in agricultural production have a negative impact on IIT.*

Differences in arable land should affect IIT in the case of agri-food products. A country with a large area of fertile arable land is able to produce a greater quantity of high-quality products, which ultimately leads to greater IIT, and vice versa (Chakraborty, 2017). Jambor (2015), Jambor et al. (2016), and Chakraborty (2017) established that greater differences in arable land between partner countries will result in a lower share of IIT. Similarly, IIT is affected by agricultural productivity. Jambor (2015) analysed the effect of productivity on IIT in the agri-food products in Visegrad countries and established a negative effect.

This research also examined the significance of some other non-economic factors for IIT in BiH intra-regional trade, specifically communication proximity expressed through three dimensions – geographic, historical, and cultural.

H5: *The intensity of IIT between two countries decreases with the geographic distance between them.*

Geographic distance represents transport costs, and the availability and costs of information necessary for trade in differentiated products. According to

Krugman (1980), there is always a negative correlation between transport costs and IIT. Krugman's thesis and its theoretical rationale have been confirmed in many empirical studies: Bergstrand (1983), Balassa (1986), Balassa and Bauwens (1987), Stone and Lee (1995), and Amiti and Venables (2002). On the other hand, geographic proximity decreases transport costs, which positively affects any form of trade.

H6: *Adjacent countries will have more intensive IIT in agri-food products.*

Although the determinant 'common border' could apparently be considered as a separate case within the determinant 'geographic distance', econometric models approximate them separately, since it is believed that a common border has an additional and independent effect on IIT intensity.

H7: *If countries used to belong to the common state in the past, they would have greater IIT in agri-food products.*

Historical, political, and cultural 'affinity', which is particularly important for lowering the costs of 'unfamiliarity' in international trade, highly correlates with geographic proximity. In this group of characteristics we include shared or colonial history, in terms of the existence of a common state and a single market of individual countries in the past. Countries being in a common state or in a colonial relationship in the past, share a number of economic, cultural, ethnic, and other characteristics and ties, which are important for the mutual trade in general, and for IIT in particular. Effects of political and historical factors on bilateral trade were studied by Mansfield and Bronson (1997), Gowa and Mansfield (2004), and on the example of intra-regional trade in SEE by Trivić and Klimczak (2015).

H8: *Ethnic similarity positively affects IIT in agri-food products between two countries.*

Ethnic ties are a distinctive synthesis of identical language, religion, tradition, social values, and other socio-cultural features. Rauch (1996, 1999) underlined the significance of ethnic ties in international trade, particularly trade in differentiated products. Jing et al. (2010) confirmed the positive effect of language similarity on IIT but in less differentiated – agricultural – products. This research

also starts from the hypothesis that the greater ethnic similarity between BiH and its regional trading partners leads to the greater intensity of IIT in agri-food products.

3. APPLIED METHODOLOGY

The analysis of the intensity and structure of BiH's IIT was performed on trade data of the Agency for Statistics of BiH (BHAS), grouped in the three-digit levels of Standard International Trade Classification (SITC). According to the classification used by the World Trade Organization (WTO), the agri-food sector includes 42 product groups in the following SITC sections/divisions: SITC section 0 – Food and live animals (excluding SITC division 03), SITC section 1 – Beverages and tobacco, SITC section 4 – Animal and vegetable oils, fats and waxes, and SITC division 22 – Oilseeds, oleaginous fruits.

For the purpose of this research, IIT intensity has been measured by standard and aggregate Grubel-Lloyd indices (Grubel and Llyod, 1971, 1975), which are the most commonly used IIT measures in the empirical literature.

The standard Grubel-Lloyd index is calculated as follows:

$$GL_{ij} = \frac{\left(X_{ij} + M_{ij}\right) - \left|X_{ij} - M_{ij}\right|}{X_{ij} + M_{ij}} \quad 0 \leq GL_{ij} \leq 1 \tag{1}$$

where GL_{ij} is the standard Grubel-Lloyd index (IIT share) for the given industry i in trade between the given country and another country/country group j; X_{ij} is exports of industry i from the given country to another country/country group j; M_{ij} is imports of industry i of the given country from another country/country group j.

The Grubel-Lloyd index can be calculated as an aggregate index for the total trade of all industries of a country, as follows:

$$GL_j = \frac{\sum_{i=1}^{n}\left(X_{ij} + M_{ij}\right) - \sum_{i=1}^{n}\left|X_{ij} - M_{ij}\right|}{\sum_{i=1}^{n}\left(X_{ij} + M_{ij}\right)} \quad 0 \leq GL_j \leq 1 \tag{2}$$

where GL_j is the Grubel-Lloyd index, i.e., IIT share in total trade (trade of all industries *i*) between the given country and another country/country group *j*; *i* = 1, … , n – the number of industries.

The GL index value 0 indicates purely inter-industry trade, while index value 1 means that the entire trade is of the intra-industry type. However, for trade in a given industry to be labeled as inter-industry or intra-industry, the cut-off value of IIT index should be determined, which was done following the approach by Qasmi and Fausti (2001).[6]

Industries with dominant horizontal IIT (HIIT) were separated from those with dominant vertical IIT (VIIT) using the methodology developed by Greenaway, Hine, and Milner (1995) and based on the pioneering paper by Abd-El-Rahman (1986). The so-called Greenaway-Hine-Milner (GHM) methodology is based on the assumption that the relative difference between the unit values of exports and imports reflects the difference in the quality of exported and imported products. GHM methodology uses the relative unit value (RUV) index, calculated as follows:

$$RUV_{ij} = \frac{UV_{ij}^{X}}{UV_{ij}^{M}} \tag{3}$$

where RUV_{ij} is the ratio between export and import unit values for industry *i* in trade with country *j*; UV^{X}_{ij} is the unit value of exports for industry *i*; and UV^{M}_{ij} is the unit value of imports for industry *i*.

Horizontal IIT exists when the unit values of exports are relatively approximate to the unit values of imports of a given product, i.e., when the ratio of the unit value of exports to the unit value of imports ranges within the interval ±0.15 or ±0.25, depending on the chosen dispersion factor (parameter α).

$$HIIT: 1-\alpha \le \frac{UV_{ij}^{X}}{UV_{ij}^{M}} \le 1+\alpha \Rightarrow 0.85 \le \frac{UV_{ij}^{X}}{UV_{ij}^{M}} \le 1.15 \; for \; \alpha = 0.15 \tag{4}$$

[6] For the interpretation of IIT levels see the Appendix, Table 1.

Trade in products whose unit values are beyond this interval is identified as vertical IIT.

$$VIIT: \frac{UV_{ij}^{X}}{UV_{ij}^{M}} < 1-\alpha \; and \; \frac{UV_{ij}^{X}}{UV_{ij}^{M}} > 1+\alpha \Rightarrow$$

$$\frac{UV_{ij}^{X}}{UV_{ij}^{M}} < 0.85 \; and \; \frac{UV_{ij}^{X}}{UV_{ij}^{M}} > 1.15 \; for \; \alpha = 0.15 \tag{5}$$

The hypothesis concerning the impact of individual determinants on the intensity of bilateral IIT as a dependent variable (expressed using the standard GL index) was tested by estimating an empirical model.

Ethnic similarity is not expressed using a dummy variable, as is usual in most empirical research,[7] but by using a special formula that has only been applied in a few studies on intra-regional trade, and, as far we know, never in modelling IIT determination. To express bilateral ethnic linkages between the given country and country *j* for ethnic group *k*, the following formula is used (Guo, 2004; Noland, 2005):

$$ETHNIC_{jk} = min\left(x_k, y_k\right) \qquad 0 \le x_k, y_k \le 1 \tag{6}$$

where min is minimization of the variables within parentheses; x_k is the share of population belonging to ethnic group *k* in the total population of the given country; and y_k is the share of population belonging to ethnic group *k* in the total population of country *j*.

[7] Some studies, such as Havrylyshyn and Pritchett (1991), suggest that the use of a binary variable does not measure the level to which countries are ethnically related, particularly if one of the countries is inhabited by several ethnic groups.

Table 1: Expected Impact of Determinants on the IIT Share in Agri-Food Sector

Variable	Variable description	Data source	Expected effect
$ASIZE_{jt}$	economic size expressed as the average of the nominal GDPs of BiH and country *j* (in current EUR) in year *t*	IMF[8]	+
$DGDPC_{jt}$	the inequality in per capita income measured as the absolute difference in GDP per capita (in current EUR) between BiH and country *j* in year *t*	IMF[9]	–
$DIST_j$	the geographical distance as a direct straight-line distance in kilometers between the capital cities of BiH and country *j*	CEPII	–
$BORDER_j$	the common border represented by a dummy variable that equals 1 if BiH and country *j* have a common border and 0 otherwise	CEPII	+
$DLAND_{jt}$	the difference in agricultural land expressed as the absolute difference between BiH and country *j* in agricultural land measured in 000 hectares in year *t*	FAO	–
$DPROD_{jt}$	the difference in productivity measured as the absolute difference of the value added by an agricultural worker in BiH and country *j* in year *t*	FAO	–
$ETHNIC_j$	the ethnic similarity between BiH and country *j*	UNSTAT/ BHAS	+
$STATE_{jt}$	the common history represented by a dummy variable that equals 1 if BiH and country *j* formed a common state in the past, and 0 otherwise	-	+
$LIBER_{jt}$	trade liberalisation represented by a dummy variable that equals 1 if BiH and country *j* have mutual free trade in agri-food products, and 0 otherwise	MoFTER	+

Legend: IMF – International Monetary Fund; CEPII – Center for Research and Expertise on the World Economy; FAO – Food and Agriculture Organisation; UNSTAT – UN Statistics Division; MoFTER – Ministry of Foreign Trade and Economic Relations of BiH.

Overall ethnic similarity between the given country and country *j* is expressed as follows:

[8] IMF, World Economic Outlook Database 2019

[9] IMF, Ibid.

$$ETHNIC_j = \sum_{k=1}^{n} min(x_k, y_k) \quad (7)$$

The value of the variable ranges between 0 and 1, 0 indicating the non-existence of ethnic similarity and 1 indicating complete ethnic similarity between the observed countries.

To investigate the effects of the previously discussed determinants on the intensity of IIT in agri-food products, we specified and estimated an econometric model. The focus of this segment of the empirical analysis is the bilateral agri-food trade of BiH with CEFTA 2006 economies. As there is no single correct way of specifying the model, the modelling was guided by the related literature and the specification tests, while including the potentially relevant determinants. The descriptive statistics of the sample used are provided in Table 2.

Table 2: Descriptive Statistics

Variable	Observations	Mean	Std. dev.	Min	Max
IIT_{ijt}	2,285	0.178	0.272	0	0.998
T_{ijt}	3,234	0.707	0.455	0	1
$ASIZE_{jt}$	3,234	19490.86	10214.89	10133.13	44700.81
$DGDPpc_{jt}$	3,234	2357.331	2743.296	9.238	11218.51
$DIST_j$	3,234	346.79	224.935	171.89	883.068
$BORDER_j$	3,234	0.429	0.495	0	1
TI_{jt}	3,234	0.072	0.096	0	0.271
$DLAND_{jt}$	3,234	1115.462	528.103	89.3	1971.7
$DPROD_{jt}$	3,234	5078.758	6675.239	131.663	31720.46
$ETHNIC_j$	3,234	0.145	0.155	0.004	0.389
$STATE_{jt}$	3,234	0.714	0.452	0	1
$DFDI_{jt}$	3,234	8945.706	9547.068	428.148	35778.67
$LIBER_{jt}$	3,234	0.87	0.336	0	1

Source: Authors' calculation. Note: T refers to dummy variable, which takes a value of 1 if there is any trade in a particular observed 3-digit SITC product group between the countries, and 0 otherwise. TI_{jt} refers to trade intensity calculated as the share of trading partner's market in the foreign trade of BiH in agro-food products in year *t*. $DFDI_{jt}$ refers to absolute difference between foreign direct investment stock in BiH and in country *j* in year *t*, calculated on UNCTAD data. TI and FDI were included in the selection, but not in the IIT equation in the empirical model.

A notable feature of our sample is that the observed countries do not trade at all in certain product groups and years. In these instances, which make up 29.34% of our sample, the value of our dependent variable (IIT_{ijt}) cannot be determined. As noted by Helpman et al. (2008), these observations cannot simply be excluded, as such an approach would lead to selection bias, loss of information, and erroneous conclusions. To avoid this, these missing observations need to be explicitly factored into the model. To achieve this, we used Heckman's (1979) sample selection model. As the preliminary statistical analysis indicated the significance of individual and time effects, a random-effects variant of Heckman's sample selection model was used. This allowed us to factor in the unobserved heterogeneity in the analysis.

Our model consists of two equations: the selection equation determining the propensity to trade and the equation describing the intensity of IIT, provided the countries do trade. This can be represented as:

$$IIT_{ijt}^{*} = x_{ijt}\beta + u_{ijt} \tag{8}$$

$$T_{ijt} = z_{ijt}\gamma + v_{ijt} \tag{9}$$

where:

$$IIT_{ijt} = IIT_{ijt}^{*}\ if\ T_{ijt} = 1 \tag{10}$$

$$IIT_{ijt} = \varnothing\ if\ T_{ijt} = 0 \tag{11}$$

and:

$$T_{ijt} = 1 if\ Trade_{ijt} > 0 \tag{12}$$

$$T_{ijt} = 0 if\ Trade_{ijt} = 0 \tag{13}$$

The dependent variable (IIT_{ijt}) takes a non-negative value of the determined GL index (IIT^{*}_{ijt}) if the economies trade in a particular product group and is unobservable if the economies do not trade. Whether the economies trade or not

is determined by a Probit model, where the dependent variable (T_{ijt}) takes a value of 1 if the trade value between the countries in a particular product group is positive, and the value of 0 if the trade value is zero. The composite error terms u_{it} and v_{it} are assumed to be significantly correlated (the correlation is denoted by the parameter ρ). If the equations are related, i.e., if $\rho \neq 0$, estimating only the first equation would lead to sample selection bias. The preliminary analysis revealed this was the case, and to address this problem both equations were estimated using a maximum likelihood method (Wooldridge, 2002).

The selection equation includes the usual determinants of the propensity to trade. The same selection equation was used in all specifications of the IIT model. Using the Probit model we determined the Inverse Mills Ratio, which was used to correct for sample selection bias in the IIT equation.

Initially, all the theoretically and empirically relevant variables previously described were considered. However, we detected multicollinearity issues with some of the variables.[10] The results of the correlation analysis used for this purpose are presented in Table 2 in the Appendix. Due to the aforesaid issues, we specified three concurrent IIT models. In all three specifications the linear-logarithmic functional form was used, as it was a better fit for the data, as well as reducing the potential problem of heteroskedasticity and balancing the different scales in which the continuous variables of the model are measured. In all specifications, time effects were encompassed by dummy variables, whereas the individual effects were treated as components of the error term.

4. RESULTS AND DISCUSSION

With respect to BiH trade in agri-food products, the significance of the region viewed as 'CEFTA 2006' until 2013 and 'CEFTA 2006 plus Croatia' thereafter is considerable. CEFTA 2006 participation in BiH agri-food product exports is 60.4% on average and in imports is 48.0% (with 72.1% in exports and 50.1% in imports until Croatia's exit in 2013). The export share of CEFTA 2006 decreased significantly, from 75.4% (2008) to 49.2% (2018), while the import share

[10] Due to the multicollinearity problem, i.e., a high correlation with almost all other variables, and due to the insignificant impact on IIT, variables TI_{jt} and $DFDI_{jt}$ were excluded from the IIT model specification.

decreased only by a couple of percentage points, from 48.2% to 45.3%.[11] BiH trade is also highly concentrated geographically within the integration, as both exports and particularly imports are mostly with Serbia and Croatia, followed by Montenegro and North Macedonia. Compared to these countries, trade with other CEFTA 2006 parties – Kosovo, Albania, and particularly Moldova – is negligable.

The countries with which BiH trades most within CEFTA 2006 are also the ones with which it has the greatest intensity of IIT in agri-food products. In 2018 the most intensive IIT was with North Macedonia (0.42), followed by Croatia (0.38), Serbia (0.22), and Montenegro (0.19). On average, IIT is the largest with Croatia (0.35) and the smallest with Moldova (0.1), since the entire trade with the latter is of the inter-industry type. The greatest increase in IIT was registered in trade with North Macedonia, from an initial level of 0.20 to the level of 0.42 at the end of the period. The intensity of IIT with the other countries was fairly even, i.e., with few oscillations, except with Albania where, from having totally inter-industry trade, the intensity of IIT grew to a level of 0.28 in 2013, and then decreased again to 0.06. (Table 3)

In the trade in agri-food products with all CEFTA 2006 signatories, inter-industry trade prevails, viewed both by the aggregate GL index and by the number of product groups where GL≤0.50. Intra-industry trade is of lower intensity and predominantly of the vertical type. The average vertical IIT index for the three countries that had the most intensive IIT with BiH is a few times higher than the horizontal IIT index: VIIT amounts to about 0.29 with Croatia (a growing trend), 0.25 with North Macedonia, and 0.16 with Serbia (a stable trend), while HIIT is at the level of only 0.05, 0.04, and 0.07 respectively (Table 4).

BiH has no trade with Moldova, Albania, and Kosovo* in a large number of product groups (on average in 35, 22, and 15 respectively), while in most remaining groups the trade is one-way (OWT). IIT dominates only in a few groups (on average in 0, 2, and 3 respectively). The patterns do not change significantly before the end of the observed period. Trade with Montenegro also

[11] The share of agri-food products almost doubled in the observed period: it increased from 20.9% to 40.7%. Agri-food products were more important in imports (an average share 33.6%) than in exports (an average share 14.9%). (Authors' calculation based on data from BHAS.)

includes a large number of groups with OWT (20 on average) and with strong inter-industry trade (12 on average). IIT dominates only in 3 to 4 groups. The greatest changes occurred in IIT with North Macedonia. From 2013 on, IIT intensity increased incessantly, while the number of groups with OWT decreased in favour of the categories with the highest GL index and with a GL index up to 0.25. In 2018 the strongest IIT was in fruit and fruit preparations (SITC 058), chocolate and cocoa preparations (SITC 073), vegetable fats and oils (SITC 422), cheese and curd (SITC 024), and other meat (SITC 012). Trade with Croatia also experienced changes, though mostly in IIT categories rather than in the overall intensity of IIT. Compared to 2008, the number of groups with OWT doubled, but the number of groups with the strongest IIT also increased. In 2018 the highest GL indices were in fruit, fruit preparations and nuts (SITC 058, 057), vegetables (SITC 054), cereals and preparations (SITC 048), and non-alcoholic beverages, n.e.s. (SITC 111). A decade earlier the list was very different: dairy, meat, and tobacco products prevailed. It is therefore assumed that the less liberal trade regime with Croatia, compared to when it was a CEFTA 2006 member, contributed to the change in the IIT structure. Viewed by trade category, the situation in trade with Serbia is very similar to that of Croatia: a low number of groups with OWT (8 compared to 11 for Croatia), the same number with dominant IIT (9 on average), and dominant VIIT in the groups where IIT occurs (24 and 25 respectively). However, IIT with Serbia is characterised by the most stable patterns. In both 2008 and 2018, GL indices are the highest in dairy products (SITC 02), meat products (SITC 016,), and eggs (SITC 025).

Table 3: Intra-Industry Trade between BiH and CEFTA 2006 Parties

	Aggregate GL index											
CEFTA 2006 party	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Average**
Albania	0.00	0.01	0.00	0.00	0.00	0.28	0.22	0.11	0.07	0.06	0.06	0.07
Croatia	0.34	0.37	0.35	0.36	0.36	0.34	0.32	0.28	0.33	0.37	0.38	0.35
Kosovo*	0.02	0.02	0.03	0.04	0.05	0.05	0.06	0.05	0.06	0.07	0.09	0.05
Moldova	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.04	0.01
Montenegro	0.23	0.24	0.25	0.27	0.26	0.20	0.20	0.18	0.16	0.17	0.19	0.21
North Macedonia	0.20	0.26	0.23	0.21	0.22	0.24	0.33	0.32	0.36	0.36	0.42	0.29
Serbia	0.20	0.24	0.25	0.22	0.22	0.25	0.23	0.23	0.23	0.21	0.22	0.23

Source: Authors' calculation on the basis of data from BHAS.

Table 4: Intra-Industry by Type between BiH and the Selected CEFTA 2006 Parties

CEFTA 2006 party	**IIT type**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Average**
Croatia	HIIT	0.10	0.09	0.06	0.08	0.10	0.03	0.05	0.00	0.00	0.03	0.06	0.05
	VIIT	0.24	0.28	0.29	0.28	0.26	0.31	0.27	0.28	0.33	0.34	0.32	0.29
North Macedonia	HIIT	0.02	0.11	0.07	0.03	0.05	0.06	0.01	0.00	0.02	0.03	0.02	0.04
	VIIT	0.18	0.15	0.16	0.18	0.17	0.18	0.32	0.32	0.34	0.33	0.40	0.25
Serbia	HIIT	0.07	0.08	0.10	0.06	0.06	0.12	0.08	0.07	0.04	0.05	0.06	0.07
	VIIT	0.13	0.16	0.15	0.16	0.16	0.13	0.15	0.16	0.19	0.16	0.16	0.16

Source: Authors' calculation on the basis of data from BHAS.

Legend: HIIT – horizontal IIT; VIIT – vertical IIT.

Table 5: Estimation Results

Model	**Model (1)**		**Model (2)**		**Model (3)**	
Variable	**Dependent variable**		**Dependent variable**		**Dependent variable**	
	T	IIT	T	IIT	T	IIT
$\ln(ASIZE_{jt})$	1.818***	0.215***	1.841***	0.264***	0.550*	0.099**
	(0.208)	(0.023)	(0.295)	(0.030)	(0.295)	(0.043)
$\ln(DIST_j)$	–1.406***	–0.016	–0.815***		–1.289***	
	(0.241)	(0.021)	(0.246)		(0.323)	
$BORDER_j$		0.054**				
		(0.025)				
$\ln(DPROD_{jt})$	0.104	–0.013**	0.187**		0.185**	0.009
	(0.071)	(0.006)	(0.075)		(0.083)	(0.010)
$LIBER_{jt}$	0.235	0.039***	0.452**	0.039*	0.306	0.040*
	(0.175)	(0.013)	(0.197)	(0.023)	(0.195)	(0.024)
$\ln(DGDPpc_{jt})$				–0.009		–0.022**
				(0.009)		(0.009)
$\ln(DLAND_{jt})$				0.004		
				(0.013)		
$\ln(ETHNIC_j)$				0.023***		
				(0.007)		
$STATE_{jt}$						–0.021
						(0.025)
$\ln(DFDI_{jt})$	0.175		0.470***		0.338**	
	(0.114)		(0.145)		(0.162)	
$\ln(TI_{jt})$	0.394***		0.376***		0.399***	
	(0.063)		(0.073)		(0.098)	
Constant		–1.851***		–2.357***		–0.697
		(0.218)		(0.359)		(0.431)
Total observations	3,234		3,234		3,234	
Selected observations	2,285		2,285		2,285	
Log-likelihood	–349.689		–445.851		–377.033	
Wald test	356.213		124.904		22.711	
	(0.000)		(0.000)		(0.009)	
ρ	–0.251		–0.342		–0.329	
	(0.038)		(0.025)		(0.007)	
λ	0.777		0.836		0.373	
	(0.000)		(0.000)		(0.000)	
RESET test (p-value)	0.422		0.807		0.312	

Source: Authors' calculation.

Note: Robust standard errors are presented in the parentheses. ***, **, and * denote coefficients significant at 1%, 5%, and 10% significance levels, respectively. Wald denotes the Wald test statistics and the corresponding p-value, provided in the parentheses. ρ and λ refer to the estimates of the corresponding parameters and the values in parentheses underneath represent the corresponding p-value. Time dummies were estimated but not reported.

The remainder of this section presents and discusses the estimation results of the econometric model, which are presented in Table 5. Three columns denoted by 'IIT' signify the estimation results of the three specifications of the IIT trade model, mentioned in the previous section. 'T' columns denote the estimation results for the selection equation jointly estimated with the IIT models.

Every specification was estimated using all 3,234 observations (the entire balanced panel), where the number of selected observations was 2,285. Wald test results show that each of the presented specifications is statistically significant as a whole at the 1% significance level. The results of the Ramsey Regression Equation Specification Error Test (RESET) show no evidence of misspecification for the presented estimated models. Both correlations between the error terms in the selection and IIT equation and the Inverse Mills Ratio differ from zero by at least a 5% significance level, implying the existence of sample selection bias and the appropriateness of applying Heckman's model in the analysis.

The estimation results of the selection equation are in line with the theoretical expectations of the gravity trade model (Tinbergen, 1962), which say that the size of an economy positively affects the propensity to trade, whereas the effect of geographic distance is significantly negative. Finally, general openness to the trade of a trade partner, encompassed by the TI, was also shown to significantly and positively affect the likelihood that the two economies will trade. DFDI and DPROD, as well as the variable LIBER, were all shown to positively affect the propensity to trade, although the result is not robust in all specifications.

The major determinant of IIT is trading economies' size. The results indicate a statistically significant and positive effect of the $ASIZE_{jt}$ variable at at least a 5% significance level in all presented specifications, thus substantiating our hypothesis H2. Another variable statistically significant at at least a 10% significance level is $LIBER_{jt}$. As it has been expected according to the hypothesis H1, the results imply that membership in the common economic integration affects IIT intensity in the agri-food products trade between BiH and its partner economies from the CEFTA 2006. The empirical results also confirm the hypothesis H6 indicating that the bordering economies have a higher share of IIT in agri-food products. Furthermore, the ethnic similarity between the trading

economies[12] significantly and positively affects their mutual IIT at the 1% significance level, as assumed in the hypothesis H8. The same key determinants of IIT were recently emphasised by the results of the study conducted by Brodzicki et al. (2020).

Differences between the economies in terms of agricultural productivity and GDP per capita significantly and negatively affect IIT in agri-food products, thus confirming partly our hypothesis H4 and fully our hypothesis H3, respectively. However, the aforementioned effects of differences in economic characteristics are not robust to changes in specification. Similar indices of negative effects of differences in GDP per capita were reported by Jing et al. (2010).

The hypothesis H5 related to the geographic distance, the hypothesis H7 related to the common state in the past as well as the part of hypothesis H4, related to the differences in agricultural land, have not been verified by this research. In contrast to the selection equation, distance was not found to be a significant determinant when it comes to IIT. The same is true for differences between countries in terms of agricultural land endowments, which contrasts with the findings related to the IIT of Visegrad countries reported by Jambor (2015). Finally, belonging to the same country in the past does not significantly affect IIT between BiH and its CEFTA 2006 trading partners.

5. CONCLUSION

Despite expectations due to the similarity of the economic and non-economic characteristics of BiH and other countries of the region, it turned out that the inter-industry component dominates in BiH intra-regional trade in agri-food products. The identified IIT characteristics of the country's agri-food sector primarily indicated a low level of convergence with the agri-food sectors of its regional trading partners. Viewed both by country and by product group, the intra-regional IIT of BiH is at a relatively low level, and predominantly of the vertical type. Bilateral IIT patterns were relatively stable in most of the observed period. The exceptions are trade with North Macedonia, where a growing IIT trend was observed; trade with Croatia, where some changes by IIT categories

[12] Values of the ethnic similarity variable are presented in the Appendix, Graph 1.

appeared; and trade with Albania, where a short-term reversal in IIT trend was registered. In all three cases, these changes occurred after 2013.

The empirical results also suggest that the country-specific determinants mostly show the expected impacts on IIT intensity, even in less differentiated products such as agri-food products. The most significant determinants positively affecting the extent of IIT in agri-food products include the size of the trading economies, the similarity in their ethnic structure, the presence of a common border, and their membership in a common economic integration, while IIT is negatively affected by differences between the trading economies in terms of productivity and per capita gross domestic product. The presented empirical results support the initial hypotheses and the underlying theory. With some aforementioned exceptions, the results are also in line with the findings of the most closely related empirical studies.

However, although the country-specific determinants indicate the existence of the potential for BiH having more intensive IIT with the region, this potential has not been sufficiently exploited to date. The observed IIT patterns and performance of BiH in its bilateral trade in agri-food products within the region can broadly be treated as indicators of competitiveness, and demonstrate some concerns regarding the international competitiveness of the BiH agri-food sector. Some general recommendations could be proposed, arising from the fact that BiH's IIT with CEFTA 2006 mostly consists of vertically differentiated products. Future efforts in the sector should be oriented to the supply-side measures for raising productivity and economies of scale (affecting price competitiveness). They should also be oriented to some demand-side measures, giving more attention to macromarketing activities (such as geographical indication, branding and promotion) for those domestic products that successfully compete on the basis of their quality in the regional market.

In order to fully determine BiH agri-food sector's position in its important trade relations and to give specific policy recommendations, some further research should be carried out in the future. This should focus a more comprehensive sector-specific analysis of BiH international competitiveness, conducted on more disagreggated data and by employing additional indicators of specialisation (including differentiation between high and low vertical IIT by product groups to

separate quality competitiveness from price competitiveness, and revealed comparative advantages indices), as well as an analysis of BiH' IIT determinants based on sector-specific characteristics. Such an in-depth analysis could provide more precise conclusions which would contribute to developing an appropriate sectoral policy.

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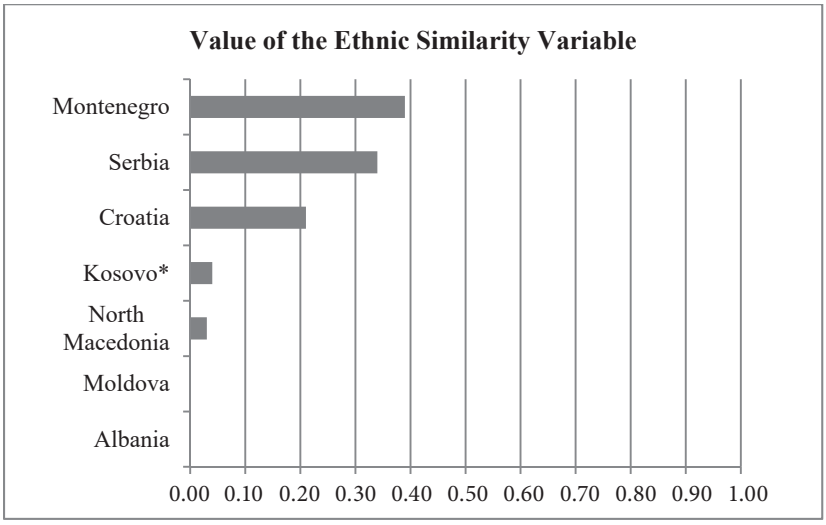
APPENDIX

Table 1: Interpretation of IIT Index Levels

IIT index value	Interpretation
0.75<GL≤1.00	Strongly dominant intra-industry trade
0.50<GL≤0.75	Moderately dominant intra-industry trade
0.25<GL≤0.50	Potential for intra-industry trade
0.00<GL≤0.25	Strongly dominant inter-industry trade
GL=0.00	Complete inter-industry trade, i.e., one-way trade

Source: Prepared by author, following Qasmi and Fausti (2001).

Graph 1: Value of the Ethnic Similarity Variable



Source: Authors' calculation.

Table 2: Correlation Matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) IIT	1											
(2) ln(GDP)	0.226*	1										
(3) ln(DGDPpc)	0.042*	0.391*	1									
(4) ln(DIST)	−0.085*	−0.196*	−0.002	1								
(5) BORDER	0.176*	0.601*	0.538*	−0.598*	1							
(6) ln(TI)	0.267*	0.713*	0.105*	−0.709*	0.712*	1						
(7) ln(DLAND)	−0.001	−0.035*	−0.133*	−0.902*	0.311*	0.523*	1					
(8) ln(DPROD)	−0.065*	−0.308*	0.478*	−0.103*	0.268*	−0.096*	0.091*	1				
(9) ln(ETHNIC)	0.186*	0.453*	0.303*	−0.756*	0.893*	0.828*	0.554*	0.297*	1			
(10) STATE	0.176*	0.282*	−0.007	−0.703*	0.548*	0.808*	0.639*	0.238*	0.857*	1		
(11) ln(DFDI)	0.197*	0.879*	0.511*	−0.185*	0.669*	0.650*	−0.043*	−0.179*	0.549*	0.345*	1	
(12) LIBER	−0.006	−0.255*	−0.168*	0.009	−0.056*	−0.049*	0.077*	0.000	0.105*	0.183*	−0.182*	1

Source: Authors' calculation.