MACROECONOMIC DETERMINANTS OF ROMANIAN INTRA-INDUSTRY TRADE. A STUDY OF KEY CONTRIBUTORS TO EXPORT SALES

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Abstract: This study examines the main macroeconomic determinants of intra-industry trade between Romania and its major trading partners during the period 2001-2012. Using data at four-digit level for eight sections and based on a static panel data approach, we analyzed the country-specific characteristics. The results of the econometric analysis confirm the theoretical background. According to our estimations, the intra-industry trade is positively correlated to market size and negatively to differences in per-capita income and geographical distance, but there are also other specific factors of influence for each sector.

JEL classification: F1, C2

Keywords: intra-industry trade, OLS with logistic transformation, fractional logit regression model

1. Introduction

The classical and new classical theories of international trade, beginning with the absolute advantage theory and following with the comparative advantage one and Heckscher-Ohlin (HO) theorem explain the trade between different industries.

These approaches fail to explain why the commercial partners also exchange similar products between them, i.e. the so-called intra-industry trade (IIT). This phenomenon appeared in the ’60 along with many studies that tried to explain it. The intra-industry trade is the results of imperfect competition, making possible the exchange with substitutes meant to satisfy consumer’s different preferences.

Another motivation for studying this topic is that the experiences of economic integration indicate that this promotes intra-industry trade rather than inter-industry trade. In other words, once the commercial barriers are reduced, the intra-industry trade is expected to increase (Balassa, 1977, Grubel and Lloyd, 1975).

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The purpose of this paper is to measure the importance of intra-industry trade for Romania with its major trading partners and to identify the macroeconomic determinants that influence it. Most of the studies analyze IIT for all the traded products, but just a few of them focuse on the determinants on different groups of products, ignoring the fact that they may be different. This paper seeks to fill this gap in three ways. Firstly, it uses the latest estimation methods and data in this field. Secondly, it identifies the country-specific determinants of intra-industry trade for those groups of products that were important for Romanian trade between 2001 and 2012. And finally, it takes into consideration the latest evolution of trade and, at the same time also the last financial crisis.

The article is structured as follows: in the next section we will present the literature review on this topic and the applied methodology. The descriptive analysis together with the results of estimation methods can be found in the third section. The last paragraph presents the main findings of the study.

2. Theoretical background

In this section we review, first of all, the indicators used in the literature to measure the intra-industry trade, followed by some relevant empirical studies that measure the impact of main determinants of intra-industry trade. At the end of this section, we will sum up some of the country-specific determinants of IIT that are used more frequently in the literature and underline the hypothesis for this study.

2.1 Measurement of intra-industry trade

Grubel and Lloyd tried to answer theoretical questions raised by the phenomenon of intra-industry trade and to quantify its importance for a country. According to them, the intra-industry trade in one industry is the export value compensated by the import value in the same industry, the IIT being complete when the difference $\left| X_{ij} - M_{ij} \right|$ is zero. Moreover, they argue that this phenomenon is not compatible with the classical and neo-classical theories of trade (Grubel and Lloyd, 1971).

The measurement of the intra-industry trade starts from the idea that the whole trade of one country sums the trade with different and similar goods. Therefore, the intra-industry trade for a good *i* equals the difference between the whole trade of that good ($X_{ij} + M_{ij}$) and the net export or import given by $\left| X_{ij} - M_{ij} \right|$.

$$IIT_{ij} = \left(X_{ij} + M_{ij}\right) - \left|X_{ij} - M_{ij}\right|$$

In order to compare this indicator between economies, it is useful to use not an absolute indicator but a relative one, computing the shares of each type of trade (intra- and inter-) in total trade (Grubel and Lloyd, 1971: 496). In this way, we become the following relation:

$$\%IIT_{ij} = \frac{\left(X_{ij} + M_{ij}\right) - \left|X_{ij} - M_{ij}\right|}{\left(X_{ij} + M_{ij}\right)} \cdot 100$$

which gives us the expression of Grubel-Lloyd Index, GL_{ij}, (Grubel and Lloyd, 1971: 498):

$$GL_{ij} = 1 - \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})}$$

where:

- *i* represents a good;
- *j* represents a country;
- IIT_{ij}, $\%IIT_{ij}$ and GL_{ij} represents the size of intra-industry trade;
- X – value of exports;
- M – value of imports.

This indicator has the advantage of being a direct measure of intra-industry trade, taking values between zero (lack of IIT) and one (complete IIT). In other words, when there are no exports or imports which implies no IIT, the index value is 0. When the export value equals with the import value of the same industry, which means the the complete IIT occurs, Grubel-Lloyd Index takes the value one.

Using an index similar to the previous one, Finger (1975) argues that the presence of intra-industry trade does not contradict the neoclassical theories of trade. His opinion is that the interpretation depends on the definition of industry. If the industry is defined as a certain input-ratio, then the trade with similar products contradicts the HO model. But, if the products do not correspond in reality to this concept, then there is no contradiction in the fact that they do not belong to the same industries. Therefore, it is necessary not only to analyze the existence or nonexistence of simultaneous export and import within an industry but also to show that the input-ratio do not differ significantly from product to product.

The indicator developed by Finger is called *Trade Overlap Index* and, using an index similar to the previous one. If the relation of the last one is to be explained, than we have two situations:

(1) if $X_{ij} - M_{ij} > 0$, then the index becomes:

$$TO_{ij} = \frac{(X_{ij} + M_{ij}) - (X_{ij} - M_{ij})}{(X_{ij} + M_{ij})} = \frac{2 \cdot M_{ij}}{(X_{ij} + M_{ij})}$$

or

(2) if $X_{ij} - M_{ij} < 0$, then the relation is:

$$TO_{ij} = \frac{(X_{ij} + M_{ij}) + (X_{ij} - M_{ij})}{(X_{ij} + M_{ij})} = \frac{2 \cdot X_{ij}}{(X_{ij} + M_{ij})}$$

Generalizing, we reach to another intra-industry measurement developed by Finger (1975) it can be applied to analyze the IIT at the industry level:

$$TO_j = 2 \cdot \frac{\sum_{i=1}^{N} min(X_{ij}, M_{ij})}{\sum_{i=1}^{N} (X_{ij} + M_{ij})} = 1 - \frac{\sum_{i=1}^{N} |X_{ij} - M_{ij}|}{\sum_{i=1}^{N} |X_{ij} + M_{ij}|}, where\ i = \overline{1, N}$$

i represents in this case (and for the rest of this paper) the commodity traded by the country *j* and *N* represents the number of commodities in an industry. It can be noticed that the results of these indicators depend on how aggregated the export and import values are.

The intra-industry trade indices at the industry level can be also determined as a weighted arithmetic average of Grubel-Lloyd indices at the product level (Ekanayake, 2001: 94).

$$GL_j = \sum_{i=1}^{N} w_{ij} \cdot \left[1 - \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})}\right]$$

where: $w_{ij} = \frac{X_{ij}+M_{ij}}{\sum_{i=1}^{N}(X_{ij}+M_{ij})}$, represents the share of the trade with good *i* in the whole industry.

Another improvement to this measure is to use the relative import and export values of each good (as percentage in the total export or import) instead of their absolute value, as follows (Aquino, 1978):

$$GL_j^* = 1 - \frac{\sum_{i=1}^{N}\left|\frac{X_{ij}}{\sum_{i=1}^{N}X_{ij}} - \frac{M_{ij}}{\sum_{i=1}^{N}M_{ij}}\right|}{\sum_{i=1}^{N}\left(\frac{X_i}{\sum_{i=1}^{N}X_{ij}} + \frac{M_i}{\sum_{i=1}^{N}M_{ij}}\right)} = 1 - 0{,}5 \cdot \sum_{i=1}^{N}\left|\frac{X_{ij}}{\sum_{i=1}^{N}X_{ij}} - \frac{M_{ij}}{\sum_{i=1}^{N}M_{ij}}\right|$$

Both above-mentioned measures of intra-industry trade can take values between 0 and 1, as we already explained. The larger their value is, the more intra-industry specialization exists.

2.2 Literature review

The studies on the topic of intra-industry trade can be classified into many groups (Andersen, 2003). One group encompasses the studies focused on developing and improving indicators meant to measure better the amplitude of this phenomenon, mainly for the developed countries and less for the developing one. Another group of studies deals with types of IIT: vertical and horizontal. The vertical intra-industry trade takes into consideration the fact that goods are similar but differ in terms of quality, meanwhile the horizontal trade refers to products differentiated by other factors than quality. There is also a third type of studies, to which also belongs our paper that focuses on the determinants of intra-industry trade, at microeconomic, macroeconomic level or both.

To draw a picture about the main determinants and estimation methods, in this section we will present some empirical studies that are relevant for our research. The first group of articles investigates both the country- and industry-level explanatory variables.

Hu and Ma (1999) study the intra-industry trade of China with its major 45 trading partners over industrial groups of SITC 5 to 8. The influence of determinants was estimated using a cross-country OLS (Ordinary Least Squares) and Tobit method. The whole trade with similar products is disentangled into vertical and horizontal types, which are affected by different factors. While the vertical intra-industry trade is mainly influenced by human-capital intensity, the horizontal trade is more related to product differentiation and economies of scale. A similar research of Zhang and Clark (2009) identifies country- and industry-level determinants of intra-industry trade as well as of its components (vertical and horizontal). Based also on

Tobit estimates, it is concluded that US intra-industry trade with its main 40 commercial partners is dominated by horizontal rather than vertical IIT and their determinants differ. The horizontal IIT is influenced by distance, foreign direct investments (FDI), economies of scale and seller concentration. However for the vertical IIT development expenditures, trade orientation and trade imbalance are more meaningful. The result may differ substantially when the number of partner countries is restricted to just one region and/or one group of determinants (i.e. micro- or macroeconomic). Taking into consideration just the NAFTA partners, Ekanayake et al. (2009) observes that US intra-industry trade is almost entirely due to vertical differentiation, although the share of horizontal IIT has increased significantly. The explanatory variables are just industry-specific ones and among them product differentiation, quality differences, firms' concentration and industry size proved to be significant. Without splitting the intra-industry trade into horizontal and vertical, Sharma (2000) identifies both the micro- and macroeconomic determinants of Australian trade. Econometric estimations of an OLS model with logit transformation indicate a positive correlation of intra-industry trade with product differentiation and economies of scale and a negative one with the levels of industry protection and foreign ownership. Instead of studying the intra-industry trade as a whole, Sotomayor (2012) focuses on manufacturing industry in Mexico in the 1994-2006 period. The author adjusts the Grubel-Lloyd index with its maquiladora component, which overestimates the IIT index and the Mexican trade benefits with NAFTA partners. After adjustment, the determinants of the non-maquiladora intra-industry trade are analyzed both at the industry- and country-level. In addition to the OLS with logit transformation, the generalized linear model is also used. The results reveal the importance of differences in economic development and factor endowments.

In the second group of studies, only the macroeconomic determinants are analyzed. For example, in the case of Mexican intra-industry trade Ekanayake (2001) shows that, on one hand, it is positively correlated with the average income levels, average country size, trade intensity, trade orientation, common borders and language and the integration agreements. On the other hand, the intra-industry trade in Mexico is negatively influenced by income differences, inequality in country size, distance and trade imbalance. The results are estimated, using pooled OLS with logit transformation across the years 1996-1998. There are also articles that focus on macroeconomic determinants in intra-industry trade, but for a specific industry. In the case of Portugal automobile industry, Leitão and Faustino (2009) use country characteristic as explanatory variables and OLS with time dummies, Tobit and GMM-system as estimation methods. They find a positive correlation between the IIT and the difference in GDP per capita between countries, explained that in automobile components the vertical specialization is dominant. But, other results are according to the literature, i.e. the factor endowments, market size and culture similarities influence positively the trade with similar products. In the same industry, but for the USA between 1989-2006, Turkcan and Ates (2010) show that the main part of the automobile intra-industry trade was vertical. It was positively corelated with the average market size, differences in per capita GDP, outward FDI and geographical distance. Compared to other studies, the paper indicates that the intra-industry trade is also favored by a depreciation of the national currency (see Thorpe and Zhang (2005). More recently, Onogwu (2013) analyzes the country-specific determinants of

intra-industry trade in residues and wastes from food mill industry. The study is conducted for Nigeria in relation with the member countries of the Economic Community of West African States in the period 1981-2010. Using a logistic transformation and a non-linear least square technique, there are some influence factors that could be identified. Among them, the most significant were the partners' GDP, population and value added in manufacturing.

There are also studies that identify the macroeconomic determinants for the European countries. Among these, some authors (Leitão and Faustino, 2006; Faustino and Leitão, 2007) used both a static and a dynamic panel model to study the country-specific characteristics of Portuguese intra-industry trade during 1995 and 2003. The study confirms the demand similarity (Linder's) hypothesis indicating a negative relationship between per capita income and intra-industry trade and that Portugal has comparative advantages in lower quality products. With respect to the Czech Republic, Janda and Münich (2004) show that one of the most important determinants of IIT in this country is the quality of labor force. Another European country for which there are studies on the topic of intra-industry trade but, in the agro-food industry, is Hungary. Fertő and Hubbard (2002) separate the Hungary's intra-industry trade with its 14 EU trade partners for the period 1992-1998 into their components. Another analysis (Fertő, 2008) is extended and tests the smooth adjustment hypothesis suggesting that trade liberalization has not influenced the employment degree in Hungarian food industry. Botrić (2013) provides an analysis for Western Balkan countries and the EU between 2015 and 2010. It identifies relative income level, geographical distance, factor endowments and trading costs as significant factors of influence. Jámbor (2013) focuses on agro-food trade of Czech Republic, Hungary, Poland and Slovakia (the so-called Visegrad countries) with EU members. He concludes that the intra-industry trade is dominated by the vertical type and reveals the positive impact of economic size and the negative impact of geographical distance on IIT. Another study on the same group of countries was conducted by Molendowski (2014) for the period 2004-2012 for the four Visegrad countries with EU-10 and with EU-15 respectively. The purpose was to underline the impact of economic crisis on IIT. It proved to be more resilient to negative events. Among this group of economies, there is a recent study (Lapiňska, 2015) on Poland intra-industry trade between 2002 and 2011. The macroeconomic determinants proved to be trade barriers and the trade imbalance in Poland's bilateral trade.

For Romania, there are just a few studies, for instance Surugiu and Surugiu (2014) on the IIT for motor vehicle parts. They underline the determinants for the period 1995 and 2012, using a panel GMM as estimation method for a dynamic model. The study indicates a high degree of persistence, a negative relationship between IIT and partner's factor endowments and a positive one with respect to economic growth.

2.3 Country-specific determinants of IIT and estimation methods

From the previous sections, it can be concluded that the economic literature offers some theoretical explanations at the macroeconomic and microeconomic level. They are meant to explain the magnitude of trade with similar products.

To have a better overview of the expected signs, we present in the next table the first significant analyzes along with the explanatory variables and their

significance.[1] The newest studies take into consideration various combinations of these variables.

Table 1. Macroeconomic determinants of intra-industry trade on the basis of some empirical analyses

Variables	Balassa (1986a)	Balasa (1986b)	Helpman (1987)	Bergstrand (1990)	Hummels, Levinsohn (1995)
Country GDPs			(+/–)*		+/–
Average GDP	+*	+*		+*	
Sum of GDP			+		
Average GDP /capita	+*	+*		+/-	
Difference in GDP/capita			–*	–*	–*
Inequality index		–*			
Inequality/capita index		–*			
Average Capital-Labor Endowment				–*	
Capital-Labor Endowment Inequality				–	–
Land-Labor Endowment Inequality					–*
Distance	+*	–*			–*
Border dummy	+*	+*		+*	
Integration dummy		+*			
Inequality of tariffs				–*	

* Significance level at 10%
Source: adapted after Andersen, 2003: 29.

As we already mentioned, our study focuses on the group of macroeconomic determinants. Among these, there are: economic development of trade partners, market size, geographical proximity, degree of economic integration and trade barriers. Based on above-mentioned papers, we can make the following assumptions:

H1: The higher the income per capita of the trade partner is, the more intense the intra-industry trade. At low levels of income per capita, the demand is mainly for standardized products. The higher the income, the higher the demand for differentiated goods. By taking into account this variable, we expect to obtain a positive effect on Grubel-Lloyd index meant to reflect a rising demand for the differentiated products. This determinant was determined as real GDP/capita expressed in USD.

H2: If the trade partners are very different in their level of development, then the intra-industry trade will be lower. In other words, a large discrepancy between incomes per capita leads to a difference between consumers' preferences and/or factor endowment. Therefore, if the differences are large, then the propensity for trade with similar products is reduced. The GDP/capita discrepancy was determined according to Balassa and Bauwens (1987):

[1] We chose only those factors of influence that are also meaningful for our research.

$$DifGDPC = 1 + \frac{w_j \cdot \ln(w_j) + (1 - w_j) \cdot \ln(1 - w_j)}{ln2}$$

where: $w_j = \frac{\text{GDP/capita}_{\text{Romania}}}{\text{GDP/capita}_{\text{Romania}} + \text{GDP/capita}_{\text{country j}}}$

This index takes values between 0 and 1. The larger the value, the higher the degree of inequality.

H3: The higher the market size, the more important the intra-industry trade. In large economies, the production process is more likely to exhibit economies of scale when producing differentiated products. On the other hand, there is a higher probability that these products are demanded, leading to a higher intra-industry trade. The market size was measured as real GDP in mil. USD.

H4: Moreover, the larger the discrepancy between markets sizes, the lower the intra-industry trade. The relative difference was measured similar with GDP/capita.

H5: Geographical proximity should (also) positively influence the trade with similar products. The explanation lies, on one hand, in the fact that transport costs are lower and, on the other hand, in the fact that neighboring countries tend to be more similar regarding consumers' tastes and/or resources. This variable is measured as the straight line distance between Romania and its trade partners.

H6: The impact of bilateral exchange rate on IIT is not clearly explained by this theory. Generally speaking, depreciation (appreciation) of national currency makes the exports more (less) and the imports less (more) competitive. But because the GL index uses both exports and imports, we do not have expected sign for the coefficient of this variable.

H7: The more intense the trade between countries, the higher the intra-industry trade. Trade intensity (TINT) was calculated as the share of Romania's foreign trade with a certain economy in total Romanian trade.

H8: The trade with similar products is (also) positively influenced by the existence of common borders. In this respect, we used a dummy variable (BOR) of all Romania's neighbours.

H9: Intra-industry trade is (also) stimulated by participation to different free trade agreements. Romania's membership in EU should stimulate intra-industry trade. A dummy variable is used to quantify for EU members or for other countries with which Romania has a commercial agreement.

Given these hypotheses, the purpose of this paper is to estimate the following model:

$$GL_{jt} = \beta_0 + \beta_1 \cdot X_{jt} + u_{jt}$$

where:

- *t* represents the time;
- *j* represents a country;
- GL_{jt} is the Grubel-Lloyd index between Romania and each of the 44 countries in each year between 2001 and 2012, with $j = \overline{1,44}$;
- X_{jt} is the matrix of independent variables and
- u_{jt} the error term.

The explanatory variables are:

1. LPCI (*logarithm of per capita income*), the average income per person calculated as GDP/person and expressed in logarithm of USD, real values;
2. RDPCI (*relative difference of PCI*), inequalities in PCI and calculated according to the formula from H2.
3. LGDP (*logarithm of gross domestic product*), meant to measure the market size expressed in logarithm of mil. USD, real values;
4. RDGDP (*relative difference of GDP*) differences in GDP levels;
5. LDIST, geographical distance between countries measured in logarithm of km;
6. EXC (*logarithm of bilateral exchange rate*) determined with the aid of cross exchange rates versus USD. For the countries that already adopted Euro, we determined the present theoretical exchange rates using the exchange rate between national currency and Euro at the moment of its introduction and EUR/USD evolution. We use the direct quotation, an increase of the value meaning a depreciation of RON versus other currencies.
7. TINT (*trade intensity*) calculated as the share of Romanian foreign trade with a certain trade partner in total Romanian trade;
8. BOR (*border*) is a dummy variable, taking the value 1 if there are common borders with the partner countries and 0 otherwise;
9. INT (*integration*) is also a dummy variable being 1 if Romania has free trade agreements with the partner country and 0 otherwise;
10. CRISIS is a dummy variable for the years 2008-2009 to measure the impact of last financial crisis on Romania's intra-industry trade.

As for the estimation methods, most of the studies use the pooled OLS estimates to analyze the main determinants of intra-industry trade. This approach causes at least two problems. On one hand, the dependent variable takes values between zero and one, being a fractional response form, and OLS estimation may lead to values outside this interval. Therefore, the logistic transformation is often used: ln(GL/(1-GL)). But it also has a drawback (Balassa, 1986a, 1986b) if the GL index is zero or one, because the logarithmic function is not defined in these points. Using this method would cause much of the observations to be lost. On the other hand, the estimated coefficients are difficult to interpret even when the missing values do not represent a main problem, because of the transformed dependent variable. In this situation, it is hard to obtain the marginal effects of explanatory variables on the GL index.

Because we want to capture the geographical distance and this variable is time-invariant, we can not use fixed effects model. For this reason, a random effects model with logit transformation was estimated, using generalized least square.

Recently Lee and Han (2008) have used specific estimation methods designated to models that have a continuous fractional or proportional dependent variable. It is called the Fractional Logit Regression Model (FLRM), proposed by Papke and Wooldridge (1996) and uses Quasi-Maximum Likelihood Estimation (QMLE). It has the advantage in solving the logarithm problem therefore not losing the zero and one values, and the marginal effects are obtained quite easily.

3. Data and results

In order to calculate the GL indices, we collected data regarding the export and import at four-digit HS Classification from the International Trade Center database. We took into consideration Romania's main 44 commercial partners[2] covering about 90% of its trade, between 2001 and 2012, obtaining a balanced panel data with 528 observations. It is important to mention that more than 70% of Romanian trade is intra-EU trade. For the rest of the variables, except export and import flows, we used UNCTAD database.

Because there are industries with neither exports nor imports, and to avoid using too many values of zero for GL index, we chose to analyze those sections of products that are meaningful for our country. After 1990 until 2008, Romania mainly exported the following products: 44 – Wood and articles of wood; 61, 62 – Articles of apparel and clothing accessories; 64 – Footwear; 72, 73 – Iron, steel and articles thereof; 84 – Nuclear reactors, boilers, machinery and mechanical appliances; 85 – Electrical machinery and equipment and parts thereof; 87 – Vehicles and parts and accessories thereof, 94 – Furniture.[3] Their importance varied accros the years. After the financial crisis, the main export goods are the capital and technology intensive such as machinery and vehicles. In our study, we analyze some of these groups of products, along with other so-called "traditional" belonging to the chemical industry. These are mineral, chemical and plastic products (see in Table 2).

In this study, we chose the period 2001-2012 because we also wanted to reveal if Romania's accession to EU in 2007 had or had not influenced the intra-industry trade. In this respect, we calculated the Grubel-Lloyd index for each trading partner, product and year. As previously mentioned, we used various approaches, from pooled OLS (POLS) and random effect (RE) with logit transformation to Tobit and Fractional Logit Regression Model (FLRM).

In Table 2, we summarized the results of all the estimation methods, keeping the sign of the coefficient that proved to be statistically significant at minimum 5% significance level in at least three estimation methods. The detailed results and their significance are presented in the annex.

[2] In alphabetically order, they are: Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Czech Republic, Cyprus, China, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Holland, Hungary, Ireland, Israel, Italy, Japan, Kazakhstan, Latvia, Lithuania, Luxemburg, Malta, Rep. of Moldova, Norway, Poland, Portugal, Russia, Serbia, Syria, Slovakia, Slovenia, South-Korea, Spain, Sweden, Switzerland, Turkey, Ukraine, UK and USA.

[3] Our purpose is not to present the evolution of Romanian trade and its structure as there are other papers in this respect (Ban, 2009, 2010).

Table 2. Estimation summary

Section / Variables	25-27 Mineral products	28-38 Products of the chemical industry	39-40 Plastics, rubber and art. thereof	44-49 Wood and articles of wood	50-63 Textiles and textile articles	72-83 Base metals and articles thereof	84-85 Machinery and electrical equipment	86-89 Vehicles
PCI					+	+	+	+
RDPCI		–	–	–			–	–
GDP	+	+	+	+		+	+	+
RDGDP		+						
DIST	–	–	–	–	–	–	–	–
EXC				+			+	
TINT								
BOR		+		+				
INT								
CRISIS		–						

Note: We considered the results to be robust if the coefficients are statistically significant at minimum 5% significance level in three out of four estimated methods.
Source: own estimation.

As it can be seen in Table 2, the results confirmed our theoretical hypotheses. Analyzing the eight "traditional" sections, most of them (were) being important for Romanian foreign trade, it can be noticed that the macroeconomic determinants of intra-industry trade differ from one industry to another.

For almost all the products, there are some common factors of influence. For example, the market size (measured by GDP) is positively correlated with the intra-industry trade, no matter what the method. This means that larger export/import markets favor the intra-industry trade. Geographical distance proved also to be statistically significant in every estimated method and also has a negative impact on the intra-industry trade. This means that the further a country is from another, the less important the trade between them with similar products is.

Besides this group of common determinants, we also have some factors of influence that influence most, but not all of them. Firstly, the per capita income proved to be significant just for products such as textiles, base metals, machinery and vehicles and not important for minerals, plastics, wood and articles of the chemical industry. A possible explanation could be that the latter products are rather standardized, and demand differences influenced by higher income do not play anymore an important role in this case. Secondly, the differences in per-capita

income influence negatively the intra-industry trade with the majority of products, except articles made of mineral, base metal, and textiles. This means that the higher the discrepancies between countries, the more different the preferences and the trade with similar products is less likely to occur. Thirdly, somehow unexpected is the coefficient for the difference in GDP, variable that is important in explaining the Romanian intra-industry trade with chemical products. This variable is also known as "economic distance" and the larger the discrepancies in market size, the lower the intra-industry trade should be. Our results indicate the opposite. This situation can be explained if the trade with similar products is dominated by vertical (quality differentiated goods) instead horizontal (variety differentiated goods) IIT, our results being consistent with the neo-Heckscher-Ohlin trade theory (Chemsripong et al., 2005). A decisive answer could be provided, only if the total intra-industry trade is decomposed into its components and analyzed separately.

The remaining factors of influence were just sporadically significant, and this is the case of exchange rate. According to our results, the depreciation of RON increases the trade with similar products when speaking about wood and machinery.

The last three factors of influence are measured by dummy variables. According to our estimations, the common borders have a significant positive effect in the case of chemical and wood articles. The EU accession had no impact on Romanian intra-industry trade with the products we analyzed, meanwhile the financial crisis affected negatively mainly the intra-industry trade with chemical products.

4. Conclusions

The purpose of this article is to study the country-specific determinants of Romanian intra-industry trade with its main commercial partners. The research was conducted for certain industries that are relevant for this country, namely: mineral products, chemical articles, plastics, wood, textiles, base metals, machinery, and vehicles.

We tried to fill the gap in the literature as follows: firstly, there are just a few studies that analyze Romania's intra-industry trade and fewer that focus on certain industries. Secondly, we used a recent estimation method called Fractional Logit Regression Model, not used yet for IIT. Thirdly, our data is up-to-date also integrating the evolution during the last financial crisis.

We applied four methods to the estimation, and the empirical results indicate that the macroeconomic determinants differ from product to product. For the majority of them, market dimension, and geographical distance proved to be significant.

Besides these common determinants, there are others that influence the intra-industry trade in specific sectors. For example, the per capita income is significant just for textiles, base metals, machinery and vehicles. For these groups of products, demand differences influenced by higher income play an important role. Another example refers to the discrepancies between countries (measured as differences in per-capita income), that influence negatively the intra-industry trade with the majority of products. An unexpected result was the coefficient for the "economic distance" (measured as difference in GDP) that was positive instead negative. It implies that the larger the discrepancies in market size are, the higher the intra-industry trade is. This conclusion has a theoretical explanation if the trade

with similar products is dominated by quality instead variety differentiated goods. To answer this question, a further study is necessary in which to decompose IIT into its components.

Last but not least, there are also some products that are sensitive to exchange rate fluctuations, common borders and, respectively, the occurrence of economic crisis. A depreciation of national currency could intensify the IIT with wood products and machinery, meanwhile the common borders are especially significant for wood articles and chemicals. The latter was the only section negatively influenced by the economic crisis.

In our opinion, the present study has important policy implications. It indicates that the economic instruments should be adapted to each group of exported commodity in order to increase their competitiveness. Currency depreciation proved not to be that important compared to market size, economic and geographical distance. To stimulate the intra-industry trade, the policy makers should have a good perspective of all these determinants.

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Annex

Estimation results

25-27 Mineral products				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.259 (.200)	.603* (.341)	.010 (.032)	.158 (.151)
RDPCI	.626 (1.239)	-.918 (1.499)	-.145 (.160)	.011 (.709)
GDP	.706*** (.100)	.572*** (.189)	.078*** (.016)	.364*** (.069)
RDGDP	1.870*** (.482)	2.852*** (.916)	.042 (.080)	.354 (.317)
DIST	-2.472*** (.216)	-2.689*** (.409)	-.209*** (.035)	-1.074*** (.130)
EXC	.090* (.050)	.057 (.106)	.005 (.009)	.043 (.030)
TINT	-8.218** (3.770)	-7.514 (6.708)	.334 (.647)	.453 (1.745)
BOR	-.599 (.435)	-.946 (.920)	-.002 (.078)	.025 (.267)
INT	.354 (.331)	.115 (.404)	.069 (.042)	.296 (.208)
CRISIS	-.003 (.263)	-.100 (.230)	.039 (.028)	.186 (.170)
N	463	463	528 (64 left and 1 right censored)	528

28-38 Products of the chemical or allied industries				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.209 (.135)	.367 (.241)	.049** (.020)	.332*** (.123)
RDPCI	-7.744*** (.826)	-7.543*** (1.001)	-.683*** (.095)	-6.405*** (.657)
GDP	.444*** (.067)	.370*** (.135)	.043*** (.010)	.297*** (.056)
RDGDP	1.367*** (.3196)	1.373** (.655)	.058 (.051)	.487** (.246)
DIST	-.8725*** (.136)	-.776*** (.289)	-.066*** (.022)	-.510*** (.102)
EXC	-.008 (.032)	.012 (.077)	.003 (.005)	.025 (.021)
TINT	-2.480 (2.543)	-.748 (4.730)	-.288 (.406)	-1.893 (1.495)
BOR	.948*** (.293)	1.170* (.671)	.185*** (.050)	.781*** (.163)
INT	.058 (.227)	.1102 (.272)	.033 (.025)	-.075 (.131)
CRISIS	-.351** (.178)	-.357** (.152)	-.043*** (.016)	-.319** (.126)
N	484	484	528 (44 left and 0 right censored)	528

Significance level at 1% (***), at 5% (**) and at 10% (*). Standard errors are in parenthesis.
Source: own estimation.

39-40 Plastics, rubber and articles thereof				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.038 (.109)	.265 (.193)	.063* (.037)	.087 (.092)
RDPCI	-4.877*** (.661)	-1.824** (.784)	-.331** (.143)	-4.168*** (.527)
GDP	.308*** (.052)	.301*** (.107)	.045** (.019)	.223*** (.040)
RDGDP	-.295 (.258)	-.052 (.523)	-.029 (.095)	-.205 (.203)
DIST	-.585*** (.112)	-.560** (.231)	-.081* (.042)	-.415*** (.087)
EXC	.107*** (.027)	.095 (.062)	.016 (.011)	.087*** (.019)
TINT	1.984 (2.167)	.347 (3.824)	.120 (.684)	1.857 (1.279)
BOR	.212 (.242)	.633 (.539)	.129 (.100)	.131 (.186)
INT	-.068 (.185)	.457** (.198)	.094*** (.033)	-.022 (.130)
CRISIS	-.289* (.148)	-.218* (.120)	-.033* (.020)	-.199** (.098)
N	517	517	528 (11 left and 0 right censored)	528

44-49 Wood and articles of wood				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.744*** (.145)	.622** (.265)	.049* (.028)	.115 (.102)
RDPCI	-4.015*** (.874)	-2.730** (.932)	-.326*** (.114)	-2.034*** (.532)
GDP	.276*** (.073)	.218 (.167)	.061*** (.015)	.299*** (.050)
RDGDP	1.059*** (.348)	1.463* (.793)	.079 (.073)	.536** (.212)
DIST	-1.076*** (.151)	-1.074*** (.376)	-.113*** (.032)	-.622*** (.091)
EXC	.140*** (.036)	.103 (.104)	.017** (.008)	.083*** (.018)
TINT	3.860 (2.858)	5.568 (4.935)	.302 (.552)	.366 (1.293)
BOR	1.660*** (.319)	1.422 (.888)	.320*** (.075)	1.216*** (.167)
INT	.049 (.248)	-.002 (.228)	.048* (.029)	.167 (.151)
CRISIS	-.142 (.198)	-.074 (.127)	-.024 (.018)	-.109 (.106)
N	501	501	528 (27 left and 0 right censored)	528

Significance level at 1% (***), at 5% (**) and at 10% (*). Standard errors are in parenthesis.
Source: own estimation.

50-63 Textiles and textile articles				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.333*** (.093)	.635*** (.175)	.072*** (.024)	.211** (.090)
RDPCI	-.684 (.561)	-1.519** (.670)	-.285*** (.090)	-1.019* (.530)
GDP	.222*** (.045)	.165 (.102)	.021 (.014)	.202*** (.037)
RDGDP	-.188 (.219)	-.403 (.490)	-.016 (.066)	.242 (.217)
DIST	-.977*** (.097)	-.822*** (.226)	-.104*** (.030)	-.925*** (.087)
EXC	.037 (.023)	.045 (.061)	.003 (.008)	-.002 (.019)
TINT	-1.959 (1.853)	.038 (3.424)	.116 (.476)	-3.895*** (1.188)
BOR	.388* (.204)	.780 (.518)	.116 (.070)	.097 (.151)
INT	.130 (.156)	.242 (.161)	.042* (.022)	.164 (.117)
CRISIS	.177 (.128)	.101 (.099)	.011 (.013)	.127 (.104)
N	512	512	528 (16 left and 0 right censored)	528

72-83 Base metal and articles thereof				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.769*** (.118)	.850*** (.218)	.097*** (.029)	.449*** (.094)
RDPCI	-1.239* (.702)	.944 (.835)	.011 (.114)	-.408 (.496)
GDP	.479*** (.056)	.392*** (.125)	.063*** (.016)	.306*** (.037)
RDGDP	1.132*** (.281)	1.116* (.611)	.112 (.079)	.587*** (.206)
DIST	-1.346*** (.118)	-1.192*** (.274)	-.184*** (.035)	-.997*** (.092)
EXC	.077*** (.029)	.014 (.074)	.003 (.009)	.053*** (.018)
TINT	-2.827 (2.303)	-3.938 (4.253)	-.089 (.576)	.471 (1.090)
BOR	.625** (.260)	.801 (.647)	.071 (.082)	.176 (.152)
INT	.048 (.199)	.397* (.213)	.077*** (.029)	-.047 (.106)
CRISIS	-.008 (.159)	.062 (.124)	.012 (.017)	.074 (.100)
N	518	518	528 (10 left and 0 right censored)	528

Significance level at 1% (***), at 5% (**) and at 10% (*). Standard errors are in parenthesis.
Source: own estimation.

84-85 Machinery and electrical equipment				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.832*** (.120)	.689*** (.199)	.108*** (.030)	.597*** (.094)
RDPCI	-2.300*** (.713)	-2.670*** (.824)	-.537*** (.135)	-2.079*** (.585)
GDP	.396*** (.057)	.375*** (.109)	.061*** (.016)	.259*** (.039)
RDGDP	.103 (.285)	.163 (.534)	.005 (.078)	-.072 (.225)
DIST	-.866*** (.123)	-.907*** (.236)	-.138*** (.034)	-.554*** (.093)
EXC	.197*** (.030)	.213*** (.063)	.028*** (.009)	.122*** (.020)
TINT	.236 (2.384)	1.458 (3.983)	.416 (.612)	2.636** (1.293)
BOR	.854*** (.266)	.601 (.547)	.080 (.079)	.499*** (.169)
INT	.2627 (.203)	-.020 (.209)	.018 (.034)	.143 (.111)
CRISIS	-.093 (.165)	-.089 (.130)	-.012 (.022)	-.063 (.112)
N	525	525	528(3 left and 0 right censored)	528

86-89 Vehicles				
Variables	POLS with logit transformation	RE with logit transformation	Tobit	FLRM
PCI	.920*** (.184)	.713** (.313)	.111*** (.035)	.554*** (.152)
RDPCI	-8.222*** (1.128)	-7.966*** (1.345)	-1.097*** (.168)	-5.390*** (.966)
GDP	.388*** (.093)	.289* (.173)	.065*** (.018)	.301*** (.062)
RDGDP	1.811*** (.444)	1.339 (.833)	.088 (.087)	.395 (.349)
DIST	-1.372*** (.186)	-1.215*** (.364)	-.154*** (.038)	-.726*** (.124)
EXC	.131*** (.045)	.127 (.096)	.012 (.009)	.059** (.026)
TINT	-.467 (3.554)	2.881 (6.226)	.096 (.697)	.922 (1.571)
BOR	-.245 (.405)	-.452 (.843)	.020 (.086)	-.125 (.235)
INT	-.242 (.321)	-.498 (.388)	-.028 (.044)	-.170 (.165)
CRISIS	-.086 (.247)	.002 (.214)	.001 (.028)	-.031 (.143)
N	492	492	528 (35 left and 1 right censored)	528

Significance level at 1% (***), at 5% (**) and at 10% (*). Standard errors are in parenthesis.
Source: own estimation.