DETERMINANTS OF INTRA-INDUSTRY TRADE OF THE NEW MEMBER STATES

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ABSTRACT

The paper aims to analyze the determinants of intra-industry trade (IIT = simultaneous export and import of similar goods produced in one industry) of the New Member States (NMS defined as 14 countries accessing the EU in the years 2004 and 2007). In our empirical analysis we use panel data with variables controlling for membership of these countries in the EU. Though the time series contain the years before the EU enlargement, we mainly focus on the period since the EU-Eastern enlargement (2004-2013). We estimate the determinants for EU members and NMS what permits us to find out, whether the changes in trade specialization differ between the old and the new EU members. We expect more intensive IIT as a proof of progress of economic integration of the NMS in the framework of the EU membership. Moreover, we examine additional impact of regionalism on IIT that represents the EU Common Commercial Policy (CCP) impact.

Keywords: *intra-industry trade, New Member States*

1. INTRODUCTION

Intra-industry trade (IIT) defined as simultaneous export and import of similar goods produced in the same industries is an exchange of highly differentiated goods produced by manufacturing sectors well developed especially in industrialized countries. The demand for differentiated goods comes mainly from the same group of industrialized countries since their citizens are relatively wealthy, so their consumption is dominated by normal and luxury goods usually produced in many varieties (on the contrary – inferior goods are often homogeneous and constitute a dominant part of purchases of the poorer consumers). Volume of IIT increases as a result of technological progress. More and more goods (final as well as intermediate) become differentiated (qualitatively or non-qualitatively). Additionally, many goods that were non-tradable in the past become tradable also in respect to IIT[1].

[1] Tis true for services but trade with them goes beyond the subject covered in this paper.

As IIT symbolizes simultaneous import and export of goods under same product-level classification it can be calculated by the Grubel-Lloyd (*GL*) index as follows:

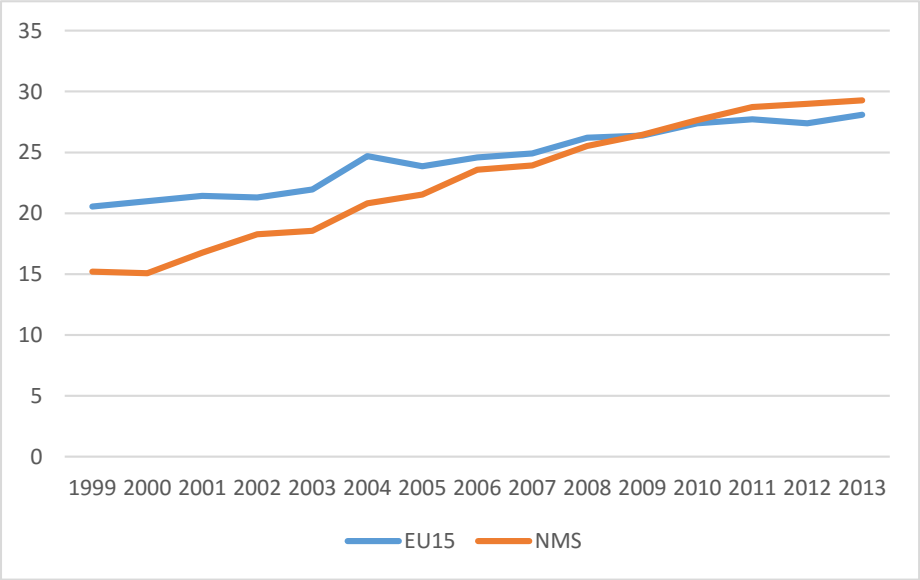
$$IIT_{R,P,j,t} = 1 - \frac{\sum_{R}\sum_{P}\sum_{i \in j} \left| X_{RPit} - M_{RPit} \right|}{\sum_{R}\sum_{P}\sum_{i \in j} (X_{RPit} + M_{RPit})} \cdot 100$$

where:

R – reporter; P – partner; i – commodity (goods at 8-digit level of CN codes), j – product group.

The *GL* index ranges from 0 to 100. Intra-industry trade is a difference between total trade and inter-industry trade[2]. The higher the *GL* index is, the more intensive is the intra-industry trade (extreme cases: the whole trade is IIT $\sum_{i=1}^{n} X_i = \sum_{i=1}^{n} M_i \Rightarrow IIT = 100$; the whole trade is inter-industrial: $\sum_{i=1}^{n} X_i = 0$, or $\sum_{i=1}^{n} M_i = 0 \Rightarrow IIT = 0$).

Graph 1. Changes in the level of IIT in trade between NMS and EU15 and among NMS



The significant growth in intra-industry trade (IIT) between the EU15 and NMS (the EU15-line in Graph 1) was observed after 1999. This trend continued after the accession, what indicates a structural change in the nature of NMS trade and their economic adjustment as well as a real convergence to the EU. These processes are accompanied by an increase in varieties domestically produced, better exploitation of increasing returns to scale (IRS) in production, and closing technology gaps against competitors. The recent increase of IIT share symbols

[2] GL index is primarily calculated in mutual (bilateral) trade of two countries. Than based on GL indexes in bilateral trade we obtain aggregate values of the indexes for groups of trading partners (e.g. for the whole EU). Starting with the calculation of the GL indexes for groups containing more than two partners can result in aggregation error (overestimation of IIT).

creation of manufacturing capacity, expansion of export capability, increased involvement in global production networks, and change in trade pattern.

This paper examines main factors which contribute to growth of IIT after the NMS EU accession. The main goal of the paper is to study the impact of integration in the framework of the EU on this type of trade. This empirical test is important, because, as well known, IIT can be determined by various factors. Some of them are related to the characteristics of trading partners, whereas the others to industries (the detailed analysis of these factors see eg. Czarny (2002)). In empirical analysis some authors refer to the theory of intra-industry trade, whereas the others accept the assumptions that are not based on theory but rather made *ad hoc*. In this paper we analyze the macroeconomic factors influencing intra-industry trade intensity. We provide analysis of main macroeconomic determinants outlining the role of economic integration (based on the observation of NMS IIT).

2. DETERMINANTS OF IIT

We analyze the changing trade pattern of NMS during their adjustment as well as during the time of their EU-membership. The investigation focuses on the increase in NMS intra-industry trade (IIT) with their trading partners from the EU and from the rest of the world.

The earliest IIT theory models emphasized that this type of trade is intensive mainly between countries with similar levels of economic development. That's why IIT is traditionally considered as a phenomenon most intensively occurring between two similar trading partners. Partners with extensive differences in factor endowments, GDP levels and technologies used, are assumed generally to engage in inter-industry trade, which refers to the exchange of commodities differing in characteristics and produced in different industries. This indicates that not only systemic transition, pre-EU accession adjustment processes and accession itself, but catching-up process, convergence of NMS towards income and development levels of the EU15, should generate growth of their IIT as well.

Helpman and Krugman (1985) confirmed that intensity of IIT is determined by relative factor endowment and the size of the two trading economies. In particular, high degree of similarity in factor endowment and a small gap in income levels facilitate the development of intra-industry trade. This similarity can be represented by the small difference in GDP *per capita* of trading partners.

The size of the trading countries measured by the size of their GDP relates to increasing returns to scale (IRS). Larger economies with large industries and big domestic markets can better use IRS occuring domestically what was confirmed by Bergstrand (1990, 1223-1224), Balassa (1886b, 123) and Matthews (1998, 89). The large size of a trading country generally positively affects IIT.

One of the most important factors contributing to the development of intra-industry trade is the existence of a common border between two trading partners. The common border simulates adjacency of countries and is an approximation of low transport costs (see eg. Balassa (1986b, 109 and 123), Clark (1998, 352), Matthews (1998, 89)). With the increase of the distance between the countries, import becomes more expensive and is potentially easier replaced by domestic production or substituted by import from the other countries. It is usually expected that bilateral trade falls sharply as distance increases. Many authors, especially recently, noticed, that the term distance is attributable not only to geography, but e.g. to culture, financial and legal systems as well (more see e.g. Irac, 2006, 14-15; Czarny, Menkes, Śledziewska, 2010).

Intra-industry trade also becomes more intense with the increase of the openness of the economy. The main reason is a big sensitivity of products being (imperfect) substitutes on protection and trade barriers used under this trade policy. International trade naturally intensifies competition on the domestic market and makes domestic products compete with the foreign ones.

Simultaneously, IIT (especially its horizontal form) leads to relatively low (at least lower than vertical IIT and inter-industry trade) adjustment cost. This explains why liberalization of IIT is less politically contentious than Heckscher-Ohlin type of exchange and why the post WWII expansion of trade did not generate much political protest (Krugman, 1981). It visualizes one important aspect of difficulty with North – South relations as compared with the North – North ones. Inflow of FDI not only boosts export growth, but also helps in the transition of exports from low value-added to high value-added products (Xing 2007). FDI improves production capacities, allows to increase number of product varieties and directly intensifies IIT. This is especially true in the developing and catching-up countries. Empirical evidence supporting the causal relationship between FDI and IIT can be found in Hu and Ma (1999), Zhang et al. (2005), Xing and Zhao (2007).

The pioneering theories of intra-industry trade were developed in relation to the signing of the first regional trade agreements, in particular between countries of the European Economic Community. Most of the early empirical studies found some evidence that regional trade agreements (RTAs) stimulate intra-industry trade (i.e. Grubel and Lloyd 1975, Balassa and Bauwens 1987). Other studies relate to the reduction of tariff and non-tariff barriers as factors positively influencing IIT and present after creation of an RTA. In other words, intra-industry trade may rise as countries gradually open their domestic markets (and allow to import from all partners (as under Most Favoured Nation rule) or from selected partners (as in the framework of a RTA). Many studies (e.g., Balassa, 1986; Falvey, 1981, Bergstrand 1990) showed that the share of intra-industry trade increases with decreasing difference in the level of tariffs.

Bergstrand, Egger and Larch (2010) proved that countries located closer to each other (in terms of physical distance) as well as partners with relatively large GDPs and with similar economic sizes are better candidates to form a RTA or to enlarge an existing one (or to do it sooner). Such countries have higher probability of success than partners that do not share the mentioned characteristics.

Frankel and Wei (1995) found that a pair of EC Member States trades with each other almost 50% more intensive than other similarly-placed countries. The authors confirmed as well 50% fall of variability of bilateral exchange rates among EC – members during the 1980s. However they add, that endogeneity of the currency regime decreases the estimated effect of bilateral exchange rate variability.

Other empirical studies (e.g. Rodas-Martini 1998) show however that the impact of RTAs on IIT is statistically insignificant. They suggest that the removal of trade barriers intensifies competition among local and foreign firms and a relatively less developed countries may not be capable to exploit benefits of the opening towards new markets. Similarly, market opening may induce deeper specialization based on revealed comparative advantages and revive one-way (inter-industry) trade.

We will control for the integration process of NMS in the EU[3]. That's why we use the dummy variable for intra-EU trade. Simultaneously, since after 2004 NMS are the partners in different

[3] Though another class of models is aimed at studying the impact of currency blocks on trade of their member states (with pioneering work of Frankel and Wei, 1993). We omit this type of models as only a few NMS joined

RTAs in the framework of the EU Common Commercial Policy (CCP), we evaluate not only the EU internal integration process but also discriminatory external trade liberalization with the participation of the EU. We first include the dummy variable RTA (equal to 1 when there is any RTA signed between two trading partners) and than separate dummy variables for free trade agreements (FTA), customs union (CU) and economic integration agreements (EIA)[4].

3. DATA DESCRIPTION AND ESTIMATION RESULTS

We use a gravity approach borrowed by economists from Newtonian mechanics. Although the gravity model is already a commonly accepted and a standard tool to study the trade flows, the specification of the equation for estimation purposes differs according to the approaches of different authors. The most remarkably, Silva and Tenreyro (2006) have raised a problem that has been ignored so far by both the theoretical and applied studies. In particular they argued, that the logarithmic transformation of the original model is not relevant approach to estimate elasticities. Namely, the multiplicative trade models with multiplicative error do not satisfy the assumption of the homoscedasticity of the error term since there is dependency between the error term of transformed log-linear model and the regressors, which finally causes inconsistency of the ordinary least squares estimator or the random and fixed effects estimator.

As an alternative, authors propose the estimation of the gravity model in levels using the PPML estimator. Besides tackling with the problem of heteroscedasticity of the error term, the estimator deals with the zero value observations in trade flows. Additionally, unlike to the standard Poison approach, PPML does not require the data to be Poison type, in other words, that it does not require the dependent variable to be an integer. Finally, PPML allows to identify effects of time invariant factors. In this paper we follow Silva and Tenreyro (2006) who have proposed the Poisson pseudo-maximum-likelihood (PPML).

Variable Name	Description	Source	Expected sign
lnGDPi	Natural logarith of GDP in current US dollars of reporter country (country i) representing the country size variable	WDI	+
lnGDPj	Natural logarithm of GDP in current US dollars of partner country (country j) representing the country size variable	WDI	+
lnFDI/GDP	Natural logarithm of the share of FDI in GDP of a partner country	WDI	+
lntrade/GDP	Natural logarithm of openness of the partner's economy measured by the share of trade in goods and services in GPD.	WDI	-
lndGDPpc	Natural logarith of the absolute value of difference of GDP per capita in purchasing power parity (PPP) of reporter and partner countries as a measure of the impact of factor proportions on bilateral trade	WDI	-
lndistance	Natural logarithm of geographic distance between trading country pairs as a measure of the impact of trade costs.	CEPII	-
contig	Dummy variable indicating that reporter and partner country are neighbors (measure of contiguity)	CEPII	+
EU	Dummy variable indicating that partner country is the EU members		+
RTAs	Dummy variable indicating that reporter and partner countries have singed regional trade agreement (RTA)	WTO	+

Table 1. Variables used in the gravity model

the European monetary union (Baltic countries, Slovakia and Slovenia) concentrating our attention exclusively on the determinants of NMS IIT.

[4] We are aware of the fact that EIA are never independent RTAs. They accompany a discriminatory liberalization of trade in foods in the framework of FTA or CU. We separately analyze EIA as it becomes more and more import ant form of discriminatory liberalization of international economic co-operation nowadays.

To test the model empirically, we use the data set covering the period from 1988 to 2013. As reporter countries we analyze EU Member States and NMS. Partners are all the countries in the world according to the data availability.

We split the period of analysis into two sub-periods. The first one refers to the years before the accession of 10 New Member States to the EU (we run the equation only for EU15 countries). The second one contains the period 2004-2013 and applies for all EU member states. In Table 2 we present the estimation results.

From the results shown in Table 2 we conclude that our calculations correspond well with the literature. Increase of GDP of both the exporter and the importer in a pair of countries has a *ceteris paribus* positive impact on the IIT share. The distance between the trade partners has a negative impact on the expected IIT level and the dummy for contiguity yields the positive and statistically significant coefficient. The common border and the decreasing distance play the important role in IIT development. The other significant determinant of IIT is the openness of the economy.

Also impact of difference in GDP per capita and the FDI share in GDP impact IIT level although not during the whole analyzed period and not for all countries. Difference in GDP per capita appears not significant as a determinant of NMS IIT (before as well as after the accession) what can be explained by their lower level of welfare and the transition period. FDI share to GDP was not significantly influencing IIT of the EU-countries after 2004.

Dummies representing the integration (intra EU and CCP) that have been introduced should be interpreted as reflecting the *ceteris paribus* difference between the averaged situation of a given pair of countries in terms of their participation in integration (when the two countries participate in the same regional trading agreement) as compared to export in a pair of countries that are not engaged together in integration process. This integration process is deep (as in the case of European integration) or shallow, concerning only trade liberalization (as regionalism in general).

Estimation results confirm the positive impact of integration process within and with EU countries on IIT level: before and after 2004. Additionally, the impact of regionalism is positive although the coefficient representing the influence of European integration is higher.

(Table following on the next page)

Table 2. Estimation results for IIT of the EU and the NMS in different periods

	(1) EU	(2) NMS	(3) EU after 2004	(4) NMS after 2004
lnGDPi	0.303***	0.312***	0.272***	0.329***
	(74.28)	(18.51)	(52.40)	(17.16)
lnGDPj	0.297***	0.287***	0.310***	0.262***
	(51.45)	(19.16)	(39.13)	(14.90)
lnFDI/GDP	0.0179**	0.0637***	0.0126	0.0409**
	(2.76)	(4.70)	(1.56)	(2.79)
lntrade/GDP	0.382***	0.444***	0.468***	0.439***
	(22.94)	(11.29)	(21.80)	(10.12)
lndGDPpc	-0.0866***	-0.0229	-0.0703***	-0.00383
	(-14.69)	(-1.85)	(-8.73)	(-0.27)
Lndistance	-0.332***	-0.394***	-0.257***	-0.290***
	(-35.94)	(-17.59)	(-20.62)	(-10.61)
Contig	0.308***	0.529***	0.353***	0.611***
	(17.81)	(13.23)	(15.89)	(12.77)
EU	**0.515*** **	**0.647*** **	**0.724*** **	**0.894*** **
	(28.01)	**(16.27)**	**(27.75)**	**(16.22)**
RTAs	**0.337*** **	**0.371*** **	**0.337*** **	**0.424*** **
	(18.72)	**(10.54)**	**(11.54)**	**(6.91)**
_cons	-8.731***	-9.296***	-9.810***	-10.23***
	(-57.16)	(-28.65)	(-45.90)	(-27.05)
N	72457	27989	43244	19413

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Furthermore we can conclude that the positive and significant semi-elasticity representing the role played by regionalism in the growth of IIT of EU members including NMS can be explained by the positive impact of Common Commercial Policy (CCP). This interesting finding can be expanded by the detailed analysis of regional trade agreements concluded by the EU. We propose division of these RTA into 3 groups: free trade agreements (FTA), customs union (CU) and economic integration agreements (EIA). We estimate the regression for EU and NMS to judge if the impact of CCP is different for NMS than for the whole EU (Table 3). This time we use data for the period 2004-2013 to analyze only the effect of CCP and not of trade polices of NMS dated before the accession.

Table 3. Estimation of the results for IIT of EU and NMS

	(5) EU after 2004	(6) NMS after 2004
lnGDPi	0.272***	0.325***
	(52.27)	(17.27)
lnGDPj	0.311***	0.266***
	(39.54)	(15.27)
lnFDI/GDP	0.00815	0.0312*
	(1.01)	(2.15)
lntrade/GDP	0.479***	0.469***
	(22.49)	(10.93)
lndGDPpc	-0.0685***	-0.00700
	(-8.53)	(-0.51)
Lndistance	-0.289***	-0.316***
	(-24.24)	(-12.50)
Contig	0.324***	0.559***
	(14.53)	(12.33)
EU	0.643***	0.874***
	(27.00)	(17.16)
CU	0.466***	0.568***
	(11.65)	(6.92)
EIA	0.387***	0.501***
	(6.05)	(3.98)
FTA	0.00168	0.326*
	(0.02)	(2.33)
_cons	-9.568***	-10.12***
	(-45.93)	(-27.88)
N	43244	19413

t statistics in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

Interesting conclusions can be drawn from the estimates of parameters on dummies representing the impact of CCP on the EU members' trade specialization. First we should admit that the intra-EU integration is more significant from the perspective of the IIT growth both for old and new EU-members.

The impact of regionalism on IIT growth is significant and positive for all free types of agreements. However this impact differs among the types of RTA. It is stronger for CU and EIA than for FTA (both for the old and the new EU-members). It means that the scope of economic integration matters.

However we have to remember the critics of Eichengreen and Irwin (1998, 34-35) warning against underestimating the role of the historic ties and conflicts. The authors realized that dummy variables for RTA membership can indicate a substantial effects long before the agreement in question is signed and even its predecessors came into operation. Sometimes this variable does not change after a successful conclusion of RTA. In such cases measures of RTA membership are contaminated by omitted-variables bias (these variables are eg. past trade patterns influencing current trade).

4. CONCLUSION

The gravity models are important and popular instruments for estimating the effects of regionalism on IIT. However there is a lack of studies that clearly distinguish between effects based on the different stages of economic integration.

In this paper we have shown that the economic integration plays a significant and positive role in the IIT growth. Our important finding is as well that the stage of economic integration also matters. In general, we can conclude that CCP is beneficial for both: the old and the new EU Member States and the type of RTA plays a crucial role in generating these impacts. The more comprehensive and deeper RTAs, the more positive impact they got on growth of IIT.

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