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Duration of trade of former communist countries at the EU

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Duration of trade of former communist countries at the EU

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Abstract

The article analyses the duration of exports of individual products of former communist countries to the enlarged European Union (EU25) employing survival analysis. The results show that the duration of trade differs across EU10 and EU15 markets, for the majority of countries the length of trade is higher in EU10 markets than in the EU15 markets. The estimations suggest that differentiated products are traded for more extended periods than homogenous products. In addition, trade relationships starting with large initial sales are more likely to survive the observed five year period than those starting with small values. Finally, the estimations are robust to both markets segments.

Keywords: trade, former communist countries, EU

JEL: F10, F14

A posztkommunista országok külkereskedelmének tartóssága az EU-ban

FERTŐ IMRE - SOÓS KÁROLY ATTILA

Összefoglaló

A cikk túlélő elemzés segítségével vizsgálja a posztkomunista országok exportjának tartósságát a kibővült Európai Unióban (EU25). Eredményeink azt mutatják, hogy a külkereskedelem tartóssága különbözik az EU10 és az EU15 piacain, az országok többségében a külkereskedelem időtartama hosszabb az EU10 piacán, mint az EU15-ben. Becsléseink szerint a differenciált termékek esetében a külkereskedelem időtartama hosszabb, mint a homogén termékeknél. Továbbá, a külkereskedelem időtartama hosszabb a nagy kezdeti értékekkel rendelkező termékeknél a periódus elején kis értékkel bíró javakhoz képest. Végezetül, eredményeink robusztusak mindkét piaci szegmensben.

Tárgyszavak: Külkereskedelem, posztkommunista országok, EU

JEL: F10, F14

INTRODUCTION

Recently a growing literature provides evidence on various aspects of changes in trade pattern between former communist countries and the EU. One strand of research concentrates on the trade specialisation and trade dynamics (e.g. Havlik 2001, Landesmann and Stehrer 2002, Wörz 2003, 2005, Yilmaz 2005, Zaghini 2005, Fertő 2007, Fertő and Soós, 2008). Another stream of empirical literature focuses on intra-industry trade, exports quality and exports variety, quality upgrading (e.g. Aturupane et al. 1997, Fidrmuc et al. 1999, Dulleck et al. 2005, Ferragina and Pastore 2005, Fidrmuc 2006, Kandogan 2005, 2006,). However, one question is often not addressed: when do countries trade and how long do their trade relationships last? Our analysis of this latter issue is, among other things, motivated by the finding of recent research that many countries do not trade in any given year and for any given product (Haveman and Hummels 2004, Feenstra and Rose 2000, Schott 2004). Being in or out of the market may be a particularly important issue when the market at stake is one of an expanding economic integration. The enlargement of the European Union in 2004 is a case in point. Our research focuses on the question how new EU member states' (NMS') and Newly Independent States' (NIS countries') trade performs in the EU market before and after the EU enlargement. More specifically, following the recently developed methodology pioneered by Besedeš and Prusa (2006a, 2006b) we analyse the duration of trade between former communist countries and the enlarged European Union, with "trade" always meaning the export of individual products of the NMS and NIS countries.

Our contributions to the literature on the East-West trade are threefold. First, although there is a wealth of literature on the trade between Central-Eastern European countries and the EU member states, but research periods usually end before the last EU enlargement. This paper is one of the first to extend the analysed periods after EU enlargement. Second, in this paper we apply recently developed empirical methods to investigate the trade dynamics of 13 post socialist countries, including eight such Central-Eastern European countries, which joined the EU in 2004 (NMS): the Czech Republic, Estonia, Hungary Latvia, Lithuania, Poland, Slovakia and Slovenia) and five NIS (Belarus, Kazakhstan, Moldova, Russia, Ukraine). Finally, we try to identify the effects of the EU membership for CEE countries in comparison with NIS countries. The rest of the paper is structured as follows. In the next section we explain our methodology and the data used. Thereafter we present the empirical results on the duration trade of post socialist countries. The final section concludes.

METHODOLOGY AND DATA

Since we are interested in investigating how likely a country is to cease exporting a product to the EU, it is only natural that we approach this issue by using duration analysis. The duration analysis of trade is estimated by the survival function, S(t), across product types by using the nonparametric Kaplan-Meier product limit estimator. We assume that a sample contains n independent observations denoted (ti; ci), where i = 1, 2,..., n, ti is the survival time, and ci is the censoring indicator variable C taking a value of 1 if failure occurred, and 0 otherwise of observation i. Moreover, we assume that there are m < n recorded times of failure. The rank-ordered survival times are denoted as t(1) < t(2) < ... < t(m). Yet, nj denotes the number of subjects at risk of failing at t(j) and dj denotes the number of observed failures. The Kaplan-Meier estimator of the survival function is then:

$$\hat{S}(t) = \prod_{t(i)<t} \frac{n_j - d_j}{n_j}, \qquad (1)$$

with the convention that $\hat{S}(t) = 1$ if t < t(1). Given that many observations are censored then we note that the Kaplan-Meier estimator is robust to censoring and use information from both censored and non-censored observations.

In our empirical analysis on the duration of trade at the EU markets, we use detailed trade data of the eight CEE countries and five NIS countries with the EU's 25 member states, as published in Eurostat's Comext database, for the years 2001-2005. We focus on two main product groups: agro-food and engineering products. We have chosen agricultural products due to their political sensitivity, and engineering products due to their relative importance in these countries; the selected categories (mechanical engineering and road and railway vehicles, Harmonised System 84, 86 and 87) largely belong to technologically advanced sectors. Furthermore, the new trade theory following the pioneering work by Krugman (1979) and Helpman and Krugman (1985) implicitly assumes that trade involving homogeneous and differentiated products is different. Agricultural products are traditionally considered as homogenous, while the selected engineering products can be treated as differentiated goods. The sample consists of 310 items each year at four-digit level in HS system. The agri-food products are defined by HS 01-24 whiles the selected engineering products by HS 84, 86 and 87, respectively.

EMPIRICAL RESULTS

DURATION ACROSS MARKETS SEGMENTS

We may hypothesise that the new EU25 market is not homogeneous in terms of exports destinations for former communists countries, thus we divide the EU markets into old EU15 and new EU10 segments. Therefore our results are presented in both markets separately. We also expect that in the length of duration of trade, especially in the EU15 markets, there is a divide between New Member States (NMS) and NIS countries due to the former's preparations to EU accession and also because they are more advanced on the way to become market economies.

Table 1

Estimated Kaplan-Meier survival rate across market segments

	EU10	E15
Czech Republic	0.8706	0.7970
Estonia	0.5894	0.5162
Hungary	0.7529	0.7745
Latvia	0.6279	0.3442
Lithuania	0.7204	0.4747
Poland	0.8326	0.8565
Slovakia	0.8368	0.5870
Slovenia	0.3084	0.6115
Belarus	0.2346	0.1672
Kazakhstan	0.0284	0.1135
Moldova	0.0774	0.1492
Russia	0.5128	0.4790
Ukraine	0.4640	0.3915

Source: Own calculations based on Eurostat data

We begin by examining benchmark data, containing all observations independently of initial size of trade. We report our findings in table 1 showing the Kaplan-Meier survival rates for each country. The duration of trade differs in the two EU market segments. Interestingly, for the majority of countries the duration of trade is longer in EU10 markets than in EU 15 markets except Hungary, Kazakhstan, Moldova, Poland and Slovenia for total trade and both product groups. However, it must be noted that the export survival rates of the three CEE countries are much higher than for Kazakhstan and Moldova. Ranking countries by survival rates in the EU15 markets shows that the duration for new EU member states is significantly higher than that for the NIS countries. Within the NMS countries we can distinguish two groups: Central European and Baltic States. The former have higher survival rates as compared to the latter. The relative performances on the EU10 markets display a somewhat different picture. In general the new member states also have higher survival rates as

compared to the NIS countries. Surprisingly, the duration of trade for Slovenia is low not only compared to the NMS, but even less than for the Baltic States, Russia and Ukraine.

DURATION ACROSS COUNTRIES – CROSS-COUNTRY FACTORS OF EXPORT STIFFNESS

We try to explain the cross-country differences in duration of trade focusing only on engineering products. Graph 1 shows the survival rates of engineering products after two and five years. Results clearly reveal the differences across countries in duration of trade, namely CEE5 countries have the highest survival rates, followed by Baltic states, Russia and Ukraine, and last are Belarus, Moldova and Kazakhstan.

We apply canonical correlation analysis, where dependent variables are the Kaplan-Meier survival rates for each year and independent variables (let us label them factors of export stiffness) are GDP per capita, foreign direct investment (FDI) and total value of exports to the EU15 markets.

In using GDP per capita (average for 2001-2005, measured in PPP, 2000 US dollars, source: IBRD WDI database), we apply Besedeš and Prusa's (2006a) finding, according to which richer countries tend to have longer product export duration values. As concerns FDI (total net inflow over the period 1989-2005 in current US dollars, source: EBRD) , it tends to improve product quality, see Lankes and Stern (1999) and more generally to improve competitiveness, see e.g. Salabert-Céré (2001), which implies that more FDI should be conducive to longer product export duration. (And beyond that, FDI in European former communist countries largely means the inclusion of partly old, partly new factories into European production networks, implying the creation of almost guaranteed export absorption for these factories' output.) Finally, total exports to EU15 (over 2001-2005, source: Eurostat, measured in US dollars) can also be expected to be a factor of export stiffness. This indicator amalgamates country size and trade openness (and thus yields somewhat better estimation results than population size). Behind country size's impact on export stiffness we guess stronger domestic competition and/or bigger series of output (and consequent scale economies) in larger countries. And as concerns the "openness" attribute of our indicator, our interpretation of its importance is the hypothesis that producers in more open economies are, as they have to be more competitive.

Table 2

Measures of overall model fit and multivariate tests of significance

Canonical function	Canonical correlation	F	P value
1	0.9707	2.0335	0.0950
2	0.4527	0.2534	0.9700
3	0.2820	0.2015	0.8921
Tests of significance of all canonical correlations			
	Statistic	F	P value
Wilks' lambda	0.0422	2.0335	0.0950
Pillai's trace	1.2267	0.9686	0.5156
Lawley-Hotelling trace	16.684	4.0783	0.0118
Roy's largest root	16.339	22.8759	0.0003

Source: Own calculations based on Eurostat data

Our estimations produced 3 canonical functions with their canonical correlations as presented in Table 2. The first, second and third canonical correlation were 0.9707, 0.4527 and 0.2820, respectively. The F value of canonical functions revealed that only the significance of the first canonical functions exceeds the critical value at the 0.10 level. Multivariate test statistics except Pillai's trace also supported that this three function solution fitted the data well. The use of a single criterion to decide on whether or not a canonical function should be included in the interpretation is so restrictive that the redundancy index needs to be examined in addition to the level of significance. It is important to interpret only those canonical functions that explain a large proportion of independent variables.

Table 3

Canonical redundancy index analysis

Canonical function	Variance extracted in trade variables	Canonical R2	Redundancy index	Proportion of redundancy (%)
1	0.524	0.942	0.792	98.3
2	0.298	0.205	0.012	1.5
3	0.178	0.080	0.002	0.2

Source: Own calculations based on Eurostat data

Table 3 summarises the redundancy index analysis for trade related (stiffness) variables. The results indicate that total redundancy index was 0.806 meaning that 80.6 per cent of the variance in trade related variables set was explained. More specifically, the first canonical function explained 98.3 percent, while the second and third only accounted for less than 2 per cent of total redundancy. In other words, the first function contributed most to the total redundancy. The findings from both statistical significance tests and the redundancy analysis indicate that only the first canonical function should be interpreted as the solution.

Table 4

Results of canonical correlation analysis

Variables	Canonical loadings		
	1	2	3
Survival rates			
year 1	0.8909	0.2715	0.2084
year 2	0.8938	0.2743	0.1573
year 3	0.9121	0.2569	0.1487
year 4	0.9319	0.2383	0.0868
year 5	0.9534	0.1425	0.0452
Factors of export stiffness			
gdppc01_05	0.8976	0.4202	-0.1330
fdi89_05	0.6128	-0.6384	-0.4657
EU15expusd	0.6260	-0.5558	0.5470

Source: Own calculations based on Eurostat data

Canonical loadings between individual variables and their corresponding canonical functions are presented in Table 4. Variables with canonical loadings of 0.45 or greater should be included in the interpretation. Results show that all variables highly exceed the 0.45 cut-off value. All survival rates have high negative coefficients with an increasing trend over time among factors of export stiffness. On this same function the independent variable with highest value was GDP per capita (0.897) followed by total exports to EU15 (0.626) and FDI (0.612). In other words, GDP per capita was the strongest predictor of survival rates. Overall, canonical correlation analysis indicates highly significant relationships between both sets of variables.

DURATION ACROSS PRODUCT TYPES

Besedeš and Prusa (2006b) extend Rauch and Watson's (2003) matching model to generate three hypotheses with respect to differences of trade duration between product types. In this paper we focus on only two of them. In the first step we test the following hypothesis: differentiated products are traded longer than homogenous goods. We begin by examining nonparametric Kaplan-Meier estimates of survival function across product types. Estimations for benchmark cases in EU15 markets confirm our a priori hypothesis, namely, for each country the duration of trade in food products is less than in selected engineering goods (Table 5).

Table 5

Estimated Kaplan-Meier survival rate across product types

	EU10	E15	EU10	E15
	food		non food	
Czech R.	0.8218	0.7056	0.9643	0.9846
Estonia	0.5251	0.4192	0.7167	0.7280
Hungary	0.7116	0.7207	0.8322	0.8795
Latvia	0.5724	0.2440	0.7349	0.5907
Lithuania	0.6885	0.4045	0.7797	0.6224
Poland	0.7923	0.8129	0.9095	0.9396
Slovakia	0.8022	0.4670	0.9012	0.8613
Slovenia	0.2027	0.4875	0.5942	0.8942
Belarus	0.1224	0.0890	0.5332	0.3651
Kazakhstan	0.0145	0.0687	0.0517	0.2450
Moldova	0.0752	0.1245	0.0807	0.1936
Russia	0.3813	0.3507	0.8123	0.7785
Ukraine	0.3658	0.2950	0.6696	0.6002

Source: Own calculations based on Eurostat data

We also check the equality of survival times across product groups using two nonparametric tests (logrank and Wilcoxon test). Our results using both tests show that we can reject the hypothesis of equality of survival time across product groups for all the countries, except Moldova. Calculations for EU10 markets present similar picture, the duration of trade in selected engineering goods is longer than the duration of trade in food products for all countries. Again, we can reject the hypothesis of equality of survival time across product types for all countries, except Kazakhstan.

DURATION ACROSS PRODUCT TYPES AND INITIAL SIZE

Besedeš and Prusa's (2006b) second hypothesis states that for each product type, the duration of trade increases with initial sale size. In order to investigate whether spells with small values are indeed at greater risk we filtered out small dollar-value observations. Following Besedeš and Prusa (2006b) we eliminated spells with trade in the first year below a minimum level. Table 6 reports survival rates based on dropping all observations where the value of trade in the first year is less than $100,000. Our major findings are the following. First, the duration of trade is significantly longer, as compared to benchmark cases.

Table 6

Estimated Kaplan-Meier survival rate across initial sizes

	Benchmark		Observations>10000 $	
	EU10	E15	EU10	E15
Czech R.	0.8706	0.7970	0.9826	0.9408
Estonia	0.5894	0.5162	0.9001	0.5690
Hungary	0.7529	0.7745	0.9482	0.9041
Latvia	0.6279	0.3442	0.9517	0.8128
Lithuania	0.7204	0.4747	0.9790	0.8527
Poland	0.8326	0.8565	0.9738	0.9552
Slovakia	0.8368	0.5870	0.9862	0.9199
Slovenia	0.3084	0.6115	0.8030	0.9276
Belarus	0.2346	0.1672	0.6837	0.7016
Kazakhstan	0.0284	0.1135	0.1882	0.5953
Moldova	0.0774	0.1492	0.5294	0.7185
Russia	0.5128	0.4790	0.8691	0.8421
Ukraine	0.4640	0.3915	0.8669	0.8158

Source: Own calculations based on Eurostat data

This is true for all countries and product types and both markets (Table 7 and 8). In other words, our estimations suggest that the larger the initial sale, the longer the duration for each product type. Second, contrary to results by Besedeš and Prusa (2006b) our estimates do not show significant differences among product groups for observations with larger than 10,000 dollars. Differences between product types decline as we eliminate the smaller trade observations. Both tests show that we can accept the hypothesis of equality of survival time across product groups for all the countries, except Estonia, at least in one of the two markets.

Table 7

Estimated Kaplan-Meier survival rate across initial sizes for food products

	Benchmark		Observations>10000 $	
	EU10	E15	EU10	E15
Czech R.	0.8218	0.7056	0.9782	0.9058
Estonia	0.5251	0.4192	0.8372	0.4654
Hungary	0.7116	0.7207	0.9545	0.9011
Latvia	0.5724	0.2440	0.9491	0.7875
Lithuania	0.6885	0.4045	0.9848	0.8455
Poland	0.7923	0.8129	0.9663	0.9518
Slovakia	0.8022	0.4670	0.9872	0.8487
Slovenia	0.2027	0.4875	0.7426	0.8906
Belarus	0.1224	0.0890	0.5142	0.5833
Kazakhstan	0.0145	0.0687	0.3717	0.5042
Moldova	0.0752	0.1245	0.5653	0.8396
Russia	0.3813	0.3507	0.8114	0.7893
Ukraine	0.3658	0.2950	0.7779	0.7615

Source: Own calculations based on Eurostat data

Table 8

Estimated Kaplan-Meier survival rate across initial sizes for non food products

	Benchmark		Observations>10000 $	
	EU10	E15	EU10	E15
Czech R.	0.9643	0.9846	0.9889	0.9862
Estonia	0.7167	0.7280	0.9820	0.7417
Hungary	0.8322	0.8795	0.9386	0.9083
Latvia	0.7349	0.5907	0.9547	0.8279
Lithuania	0.7797	0.6224	0.9705	0.8592
Poland	0.9095	0.9396	0.9846	0.9599
Slovakia	0.9012	0.8613	0.9847	0.9897
Slovenia	0.5942	0.8942	0.8346	0.9595
Belarus	0.5332	0.3651	0.8108	0.7734
Kazakhstan	0.0517	0.2450	0.0000	0.6278
Moldova	0.0807	0.1936	0.3771	0.5915
Russia	0.8123	0.7785	0.9270	0.8958
Ukraine	0.6696	0.6002	0.9962	0.8711

Source: Own calculations based on Eurostat data

CONCLUSIONS

The paper investigates the duration of exports of individual products of former communist countries to the enlarged European Union (EU25) employing survival analysis. We have shown that the duration of trade differs across EU10 and EU15 markets, for the majority of countries the length of trade is higher in EU10 markets than in the EU15 markets. This fact can be explained by at least two factors. First, to export to the EU10 markets may be easier for former communist countries than to the EU15, probably due to lower quality requirements. Second, the tradition and border effects can also play important role in exports destinations. This issue needs further investigation. In general, the survival rates are higher in the new member states than in the NIS countries. Explaining the cross country differences in engineering products we have found that GDP per capita, FDI and total exports to the EU15 have strong positive effect on the duration of trade. GDP per capita as a factor of such export stiffness is not a new result, see Besedeš and Prusa's (2006a). However, our observation of a similar role of inward FDI (a factor of product quality and a promoter of inclusion into international production networks) is new, as well as our finding of the role of total exports to EU15 (a measure amalgamating individual countries' two attributes: size and economic openness). With respect to differences of trade duration between product types, our results confirm the hypotheses of Besedeš and Prusa (2006b). First, differentiated products are traded for more extended periods than homogenous products. Second, trade relationships starting with large initial sales are more likely to survive the observed five year period than those starting with small values. Finally, we note that our estimations are robust to both markets segments.

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