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Marginal Intra-Industry Trade and Adjustment Costs

A Hungarian-Polish Comparison

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Abstract

The structure of trade expansion in Hungary and Poland over the period 1990-1998 and its implications for labour-market adjustment is examined. An econometric analysis of trade and employment data suggests that changes in domestic consumption and productivity have significant influence on employment changes. But our results do not provide support for the smooth-adjustment hypothesis of intra-industry trade.

Keywords: Intra-industry trade, adjustment costs

JEL: F19

Marginális ágazaton belüli kereskedelem és alkalmazkodási költségek

Egy magyar - lengyel összehasonlítás

FERTŐ IMRE - SOÓS KÁROLY ATTILA

Összefoglaló

A külkereskedelem expanzióját és annak a munkaerőpiaci alkalmazkodásra gyakorolt hatását vizsgáljuk Magyarországon és Lengyelországban 1990 és 1998 között. A külkereskedelmi és foglalkoztatási adatok ökonometriai elemzése azt sugallja, hogy a belföldi fogyasztás és a termelékenység változásainak szignifikáns hatása van a foglalkoztatás változására. Eredményeink azonban nem támogatják az ágazaton belüli kereskedelem sima alkalmazkodásának hipotézisét.

Tárgyszavak: Ágazaton belüli kereskedelem, alkalmazkodási költségek

JEL: F19

INTRODUCTION

Recent developments in intra-industry trade (IIT) literature focus on the relationships between IIT and adjustment costs associated with changes in trade pattern. The effects of trade liberalisation depend, inter alia, on whether trade is of an inter-industry or intra-industry nature. Whereas the former is associated with a reallocation of resources between industries, the latter suggests a reallocation within industries. The proposition that intra-industry trade (IIT) leads to lower costs of factor market adjustment, particularly for labour, gives rise to the smooth-adjustment hypothesis (Brülhart, 1999, 2000). Recently research focus on developing new measures of labour market adjustment costs using individual level data (Brülhart et al 2006; Elliott and Lindley 2006; Cabral and Silva 2006). Direct empirical support for the smooth adjustment hypothesis is not extensive and focuses exclusively on Western European countries in manufacturing industries but there is no research on Eastern European countries, except Kandogan (2003). The foreign trade of the EU accession countries was liberalised by the 1994 Marrakesh agreement and by the different steps of their accession to the EU (EU Association Agreement, CEFTA and, more recently, full-fledged accession to the EU). It is reasonable to assume that this trade liberalisation should have an effect on trade pattern and employment changes. The aim of the paper is to identify the effects of partial trade liberalisation on adjustment costs, exploiting recent developments in the IIT literature. Our research focuses on Hungary and Poland.

The remainder of the paper is organised as follows. Section 2 briefly reviews the theoretical background on intra-industry trade and adjustment costs. Section 3 outlines the measure of marginal IIT. Empirical models and data are described in section 4. Results are presented in section 5. The last section summarises and offers some conclusions on the implications for the costs of Hungarian and Polish economic integration with the EU market

THEORETICAL BACKGROUND

The proposition that IIT entails lower costs of factor market adjustment than inter-industry trade, was originally made by Balassa (1966). Adjustment costs arise from temporary inefficiencies when markets fail to clear instantaneously in the changes of demand or supply conditions. The most important adjustment costs in the context of trade expansion are those welfare losses that arise in labour markets from temporary unemployment due to factor price rigidity or from costs incurred through job search, re-location and re-training.

Adjustment affects all production factors but the analysis of IIT has been implicitly concerned with adjustment in the labour market. The usual framework for a discussion of adjustment issues is the specific-factors model (Brülhart and Elliott, 2002). This model assumes a small open economy that produces and consumes an exportable and an importable good facing perfect competition in all markets and given world market prices. Labour can move between two sectors (but not between countries), all factors are fixed (the "specific" factors), and there are diminishing returns to factor inputs. Suppose an export boom, which is equivalent to a fall in the relative demand for importables, triggered by some measure of trade liberalisation. If adjustment were perfectly smooth, the economy would instantly attain a new equilibrium where the unique economy-wide wage in terms of the exportables has fallen, and some workers have switched from contracting importing sector to growing export sector. In reality, this transition is likely to be costly. The specific-factor model suggests two sources of adjustment costs: factor price rigidity and factor specificity with the empirical manifestation being unemployment and factor price disparities, respectively (Neary, 1985). In practice, we are likely to find both phenomena simultaneously.

MEASURING MARGINAL INTRA-INDUSTRY TRADE

Adjustment costs are dynamic in nature, thus the static Grubel Lloyd index (GL) is not a suitable measure in this instance. Consequently, recent theoretical developments stress the importance of marginal IIT (MIIT) in the context of trade liberalisation (Hamilton and Kniest, 1991; Greenaway et al., 1994; Brülhart, 1994, 1999 and 2000; Thom–McDowell, 1999). Thus, „...it is the structure of the change in flows of goods (MIIT) which affects adjustment rather than trading pattern in any given time period (IIT)". Several indices of MIIT have been developed. The most popular measure used in recent empirical studies is that introduced by Shelburne (1993) and popularised by Brülhart (1994), which is a transposition of the GL index to trade changes:

$$A_i = 1 - \frac{|\Delta X_i - \Delta M_i|}{|\Delta X_i| + |\Delta M_i|}, \tag{1}$$

where Xj and Mj have the same meaning as in the case of the GL index and __ is the change in trade flows between two years. The A index varies between 0 and 1, where the extreme values correspond to changes in trade flows that are attributable to being entirely of an inter-industry (0) or intra-industry (1) nature, respectively. The A index is defined in all cases, can be aggregated over a number of product groups using appropriate weights.

There are two important issues, which matter for MIIT measures. First, measurements of MIIT indices require a choice of the most appropriate time period. However, there is no guide for the empirical work to identify the relevant time interval. Oliveras and Terra (1997) investigate statistical properties of the A index and point out that there is no general relationship between the A index of a certain period and corresponding indices of any sub-periods. They also find that there is no general relationship between the A index of a given industry and the corresponding indices of any sub-sectors. Consequently, results based on the A index are very sensitive to the choice of time period and sectoral aggregation. However, as Oliveras and Terra (1997) note, this inconsistency may provide additional information about the adjustment process. Brülhart argues that the choice of time period should be investigated carefully in empirical analysis. The second problem in empirical analysis is the inter-temporal sequencing of trade adjustment. Namely, changes in firms' payroll follow changes in sales only with a certain time lag. Since there are no theoretical or empirical priors on the size of time lag, thus this issue should be investigated more in depth.

DATA AND EMPIRICAL MODELS

The data are supplied by the World Bank on Trade and Production 1976-1999 database at the three-digit level of the ISIC in U.S. dollars. The full sample contains 28 industries between 1990 and 1998. The panel is balanced with observations on 18 industries for nine years. Following Brülhart and Elliott (1998), Brülhart and Thorpe (2000) we analyse the relationship between MIIT and the adjustment costs.

The trade theory does not provide to us a fully specified model of labour market adjustment and strong priors on which control variables should be included in a model testing the SAH. However, the earlier empirical and theoretical research gives some useful guide for our work. The empirical literature focusing on industry level changes employs two types of adjustment cost variables. The industry level employment changes (ΔEmpl) have been considered as an inverse proxy for adjustment costs. The higher/lower the employment changes the lower/higher adjustment costs, based on assumption that the lower the employment loss suggested by trade the lower the adjustment costs (e.g. Brülhart and Elliott 1998). However, as Cabral and Silva (2006) point out, the relationship between MIIT and net change in total employment can be negative or positive. To overcome this problem Brülhart (1999) offers the use of an alternative measure – the absolute value of total employment changes (|ΔEmpl|). According to the SAH, the relationship between the absolute value of total employment changes and MIIT should be negative. Because we do have not access to the individual level data on labour market, thus we follow Brülhart and Thorpe (2000) to analyse the relationship between MIIT and the adjustment costs. We consider the following two models.

$$|\Delta Empl|_{it}=\beta_1+\beta_2\Delta PROD_{it}+\beta_3\Delta CONS_{it}+\beta_4 TRADE_{it}+\beta_5 MIIT_{it}+v_i+\varepsilon_{it}, \quad (2),$$

and

$$|\Delta Empl|_{it}=\beta_1+\beta_2\Delta PROD_{it}+\beta_3\Delta CONS_{it}+\beta_4 TRADE_{it}+\beta_5 MIIT_{it}+\beta_6 MIITxTRADE_{it}+v_i+\varepsilon_{it}, \quad (3)$$

After Erlat and Erlat (2006) we also concern dynamic panel models. We apply the following specifications.

$|\Delta Empl|_{it}=\beta_1+\beta_2|\Delta Empl|_{it-1}+\beta_3\Delta PROD_{it}+\beta_4\Delta CONS_{it}+\beta_5 TRADE_{it}+\beta_6 MIIT_{it}+v_i+\varepsilon_{it}$,

(4),

and

$|\Delta Empl|_{it}=\beta_1+ \beta_2|\Delta Empl|_{it-1}+ \beta_3\Delta PROD_{it}+\beta_4\Delta CONS_{it}+\beta_5 TRADE_{it}+\beta_6 MIIT_{it}+$

$\beta_7 MIITxTRADE_{it}+ v_i+\varepsilon_{it}$,

(5)

where $\Delta Empl_{it}$ is the change in employment in the ith industry in the tth time period, PROD is labour productivity (output per worker) and CONS is domestic consumption. TRADE is imports plus exports as a share of production as a proxy for trade openness. MIIT stands for matched trade changes as measured by Aj index defined above. MIITxTRADE is the interaction between trade openness and marginal intra-industry trade.

We expect the following signs for the coefficients of variables: ΔPROD>0, ΔCONS<0, TRADE>0, MIIT<0, MIITxTRADE<0. The absolute value of change in labour productivity is expected to relate positively the absolute value of change in sectoral employment. Industries with expanding domestic demand force fewer worker moves than industries with contracting domestic demand, therefore we expect negative effect on employment changes. According to the SAH, the higher proportion of marginal intra-industry trade the lower the adjustment costs. There is positive relationship between trade openness and employment changes, because higher exposure to trade implies stronger competitive pressures, thus higher necessity of firms and industries to adapt more frequently to changing competitive positions (Brülhart 2000). Therefore an increase in trade openness is positively associated to higher employment changes. Regarding to our additional hypothesis, the coefficient associated with interaction term is expected to be negative.

EMPIRICAL RESULTS

Previous research emphasise that results may be sensitive for the choice of length of period. Brülhart (2000) found that A indexes based on yearly changes give the best results. He and Erlat and Erlat (2006) also concern three yearly changes to test the SAH. Thus, results are presented for both yearly and three yearly changes.

YEAR-ON-YEAR REGRESSION RESULTS

We assume that cross-sectional component of our panel data to be fixed, because the various food industries that make up the panel have not been randomly chosen. Therefore the models in Equations (2) and (3) are estimated employing fixed effect estimator. Recent literature on the panel data emphasise that panel data sets are likely to exhibit substantial cross-sectional dependence, which may arise due to the presence of common shocks and unobserved components that become part of the error term ultimately, spatial dependence, as well as due to idiosyncratic pair-wise dependence in the disturbances with no particular pattern of common components or spatial dependence (Baltagi 2005). Assuming that cross-sectional dependence is caused by the presence of common factors, which are unobserved (and as a result, the effect of these components is felt through the disturbance term) but they are uncorrelated with the included regressors, the standard fixed-effects (FE) and random effects (RE) estimators are consistent, although not efficient, and the estimated standard errors are biased. Using recent test developed by Pesaran (2004) we found evidence the presence of cross-sectional dependence. To correct this we apply the approach proposed by Driskoll and Kraay (1998).

The results of fixed effects panel data model with Driscoll-Kraay standard errors are reported in Table 1. In the first model, the coefficients of productivity and domestic consumption are significant and they have the expected signs, however only the former one is significant for Hungary. In other words, productivity increases relate negatively to employment changes in Hungary. The variable of sectoral trade performance is strongly significant with unexpected signs for all specifications. The Aj index has expected sign with significance for Poland without intertaction term supporting the hypothesis that intra-industry trade expansion entails lower adjustment costs than trade expansion of an intra-industry type. In other cases MIIT indices have unexpected sign without significance. The interaction effects between MIIT and trade openness are significant for both countries, but it has expected sign only for Poland.

Table 1

Employment Changes and Marginal IIT: Year on Year Fixed Effects Panel Estimates

	|ΔEMPL|			
	Hungary		Poland	
ΔPROD	0.818***	0.817***	0.054	0.055
ΔCONS	-0.123	-0.122	0.000	0.000
TRADE	-4.464***	-4.674***	-0.123***	-0.103***
Aj	0.020	0.001	-0.031**	0.009
MIITxTRADE		3.525**		-0.080**
constant	0.034*	0.035*	0.139***	0.129***
Within R^2	0.6199	0.6207	0.1107	0.1216
N	221	221	224	224

Note: significance levels are* 10 per cent, ** 5 per cent, ***1 per cent

For dynamic panel models we apply the first difference generalised method of moments instrumental variables (GMM-IV) estimator (Arellano and Bond (1991) which called sometimes "difference GMM". The estimates of the dynamic model for yearly changes are presented in Table 2.

Table 2

Employment Changes and Marginal IIT: Dynamic Panel Estimates for Yearly Changes

	|ΔEMPL|			
	Hungary		Poland	
|ΔEMPL|-1	0.005	0.004	0.441*	0.412**
ΔPROD	0.929***	0.919***	0.141	0.129
ΔCONS	-0.014	-0.016	-0.004	-0.003
TRADE	-10.127***	-11.620**	-0.680**	-0.643**
Aj	-0.171	-0.244	-0.039	0.014
MIITxTRADE		18.859		-0.104
Arellano-Bond test for AR(2) (p value)	0.557	0.420	0.570	0.671
Hansen test (p value)	0.377	0.271	0.128	0.077
N	166	166	168	168

Note: significance levels are* 10 per cent, ** 5 per cent, ***1 per cent

The Hansen test of of over-identifying restrictions does not reject the validity of the instruments. Furthermore, the Arellano and Bond test reject the presence of second order autocorrelation. We find that the lagged employment changes variable (|ΔEmpl|it-1) positive and significant for both Polish specifications. Similarly to static models, the coefficients of productivity, domestic consumption have expected signs with significance for all specifications, but only the productivity variables are significant for Hungary. The trade openness has the same unexpected sign with strong signficance for all specifications. The coefficients of Aj indices are negative and insignificant for all specifications, except for augmented specifications for Poland. The interaction terms have the same signs, but they lost their significance.

THREE YEARS PERIOD

The values of MIIT indices are sensitive on the length of period. Thus, we test how results are affected if we extend the length of time period for three years. Our dataset covers nine years (1990-98). Thus, the lower and upper bound on possible time periods are two and eight years. Defining the time intervals should be based on the choice of an appropriate base of start and end period. Therefore, the two sub-intervals should not be overlapping and should have the same length. Following Brülhart (2000), we choose the average of years as the base period and as the end period; in order to eliminate the short-term volatility of the data as the interval is extended. To express formally

$$A_{BE} = 1 - \frac{\left|(X_E - X_B) - (M_E - M_B)\right|}{\left|(X_E - X_B)\right| + \left|(M_E - M_B)\right|}, \qquad (6)$$

where B and E denote the base and end period respectively. We define the first year of the interval as t and the number of years in the whole period as I.

$$X_B = \frac{\sum_{y=t}^{t+\mathrm{int}(I/2)} X_y}{\mathrm{int}(I/2)} \quad \text{and} \quad X_E = \frac{\sum_{y=t+I\,\mathrm{int}(I/2)}^{t+I} X_y}{\mathrm{int}(I/2)}, \qquad (7)$$

assuming downward rounding in the integer function. We calculate similarly the start and end period for imports.

Table 3

Employment Changes and Marginal IIT: Fixed Effects Panel Estimates for Three-Yearly Changes

	|ΔEMPL|			
	Hungary		Poland	
|ΔPROD|	0.114	0.145	0.601***	0.552***
|ΔCONS|	-0.375*	-0.466**	-0.002***	-0.003***
TRADE	-10.459***	-17.059***	0.223**	0.348***
Aj	-0.014	-0.190***	-0.113***	-0.044***
MIITxTRADE		51.708***		-0.150***
constant	0.371***	0.406***	0.010	-0.042
Within R2	0.0242	0.0528	0.1555	0.1617
N	84	84	84	84

Note: significance levels are* 10 per cent, ** 5 per cent, ***1 per cent

We re-estimate the model (equation 2 and 3) for three-year periods (Table 3). The productivity variables (ΔPROD) have expected signs but they are significant only for Poland. The coefficients of domestic consumption (ΔCONS) are significant with expected signs for all specifications. The estimated coefficients of the TRADE variable are significant for all cases, and they have expected signs only for Poland. The coefficients on the A index are significant with expected sign expect the baseline model for Hungary. The interaction terms are significant with the same signs, as in previous models.

CONCLUSIONS

This paper focuses on some dynamic aspects of the smooth adjustment hypothesis associated to intra-industry trade. More specifically, the paper investigated how trade liberalisation affects on employment changes in Hungary and Poland between 1990 and 1998. The main interest of our research is the relationships between trade related variables and employment changes. Our results suggest that the growth in domestic consumption have negative effect on employment changes, while the increase of productivity is positively related to employment changes. We find significant and negative relationships between trade openness and employment changes. In some regression specifications, MIIT indices did appear with expected signs and significance. While the impacts of trade openness on employment changes are relatively strong; these effects of MIIT are very small. Contrary the previous studies employing industry level data (Brülhart and Thorpe 2000; Erlat and Erlat 2006) we find negative relationship in some specifications between the A index and employment changes confirming the SAH.

Our results confirm the estimations are sensitive on length of time period of MIIT indices. Contrary to Brülhart (2000) the data are clearly favoured the longer time period, namely the three years period against year-on-year intervals. Our estimations are also sensitive for econometric specifications. We have somewhat different results with and whitout interaction term. Opposite to Erlat and Erlat (2006) we did not find evidence that dynamic panel models provide clearly better results than static fixed effects model.

Finally, we find some evidence to support smooth adjustment hypothesis especially for Poland. However, the effects of intra-industry trade on employment changes are small especially to additional hypotheses. In short, estimations show that partial trade liberalization in Hungary and Poland has led to lower adjustment costs. However, our results should be interpreted only with care due to sensitivity on the length of time period and applied econometric techniques.

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