Reconsidering Adjustment Costs of the Association Agreement. The Case of Hungarian Food Industry

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The structure of Hungary's food trade expansion over the transition period 1995-2003 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. Market concentration has strong positive and significant effects, while FDI has no influence on the employment changes. Our results do not provide clear support for the smooth-adjustment hypothesis of intra-industry trade. However, our results should be interpreted only with care due to sensitivity on the choice of period and lag structure.

Keywords: intra-industry trade, trade liberalisation, adjustment costs, food industry

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1. 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 belief 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). Direct empirical support for the smooth adjustment hypothesis is not extensive and focuses exclusively on Western European countries, but there is no research on Eastern European countries, except Kandogan (2003).

Most of the studies have focused on industrial products and agri-food sectors are usually neglected in empirical works until the end of nineties. The main reason is probably that agricultural markets are usually characterised by perfect competition. But, recent studies support the view that IIT has an increasing role in agricultural trade especially between developed countries who increasingly trade processed or manufactured agri-food products (Henderson et al., 1998). Moreover, a high level of IIT between two countries suggests an advanced degree of economic integration and tends to be positively correlated with participation in a preferential trading area, which is also true for agricultural trade, as has been shown by Qasmi and Fausti (2001) within NAFTA and van Berkum (1999) within the Association Agreement for ten Central European Countries. In additon, recent studies provide further evidence of the importance of IIT in agri-food sectors (Oskana and Levkovych 2004; Bojnec et al. 2005; Fertő 2005; Sarker 2005).

Hungary became a member of the European Union (EU) in 2004. As a precursor to full accession, an Association Agreement, signed in 1991, has promoted partial liberalisation of bilateral trade over the past twelve years. The effects of this step towards closer economic integration 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. Thus, as the Hungarian economy becomes more integrated with that of the EU, the extent and nature of the trade impacts are likely to have important implications for economic adjustment costs. In other words, it is reasonable assume that these partial trade liberalisation should have an effect on trade pattern and employment changes. More specifically, the aim of the paper is to identify the effects of partial trade liberalisation due to Assocation Agreement on adjustment costs in Hungarian food industry employing recent developments in the IIT literature.

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 describes different measures of marginal IIT. Empirical results are presented, in section 4. The last section summarises and offers some conclusions on the implications for the costs of Hungarian food industry's economic integration with the world market.

2. Theoretical background

The proposition, that IIT entails lower costs of factor market adjustment than inter-industry trade, originally made by Balassa (1966). Adjustment costs arise from termporary inefficiences when markets fail to clear instantaneously in the changes of demand or supply conditions. More specifically, the 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. 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 which produces and consumes an exportable and an importable good facing perfect competition in all markets and given world 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 exportable 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 suggest 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 find both phenomena simultaneously.

3. Measuring of marginal intra-industry trade

The adjustment costs are dynamic phenomena, 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 proposed by Brülhart (1994), which is a transposition of the GL index to trade changes:

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

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. The A index is defined in all cases, can be aggregated over a number of product groups using appropriate weights.

Brülhart (1994) also propose other index:

(2) $$C = (|\Delta X| + |\Delta M|) - |\Delta X - \Delta M|,$$

which can be scaled by variables as production, net trade, sales or employment. Menon and Dixon (1997) criticise the C index, because it does not provide information about the extent of changes in trade pattern relating to factor adjustment. Therefore they offer an index, which focus on inter-industry trade.

3) $$UMCIT = |\Delta X - \Delta M|.$$

Azhar and Elliott [2003] propose the following index for measuring of trade induced adjustment:

(4) $$S = \frac{\Delta X - \Delta M}{\mathbf{2}(\max\{|\Delta X|_t, |\Delta M|_t\})},$$

where $t \in N$, N={1, 2, 3, …n}. The S index ranges between –1 and 1, its value negative, if sectoral trade balance is deteriorated, and it takes a positive value if sectoral trade balance is improved.

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 industries. Consequently, results based on the A index are very sensitivity to choice of period and industry aggregation. However, Oliveras and Terra (1997) note, this inconsistency may provide additional information about the adjustment process. Moreover, Fertő and Hubbard (2001) confirmed the sensitivity of results on period choice analysing trade in agri-food products between Hungary and the EU. Brülhart argues that choice of period should be investigated carefully in empirical analysis. Second problem in empirical analysis is the intertemporal 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.

4. Empirical results

The data are supplied by the OECD at the five-digit level of the Standard International Trade Classification (SITC) in U.S. dollars. Trade data are transformed in ISIC four-digit level, the full sample contains 18 industries between 1995 and 2003. The panel is balanced with observations on 18 industries for nine years Production and employment data are from Hungarian Statistical Office, while FDI and market concentration data are from Agricultural Economics Research Institute. Production data are calculated at the real exchange rate in U.S. dollar.

Following Brülhart and Elliott (1998) and Brülhart (2000), we analyse the relationship between MIIT and the adjustment costs. Testable hypotheses are following. First, we expect highly concentrated industries to experience relatively low intra-sectoral employment reallocation. Thus, there is a negative relationship between employment changes and market concentration. Second, an improvement in productivity changes has a negative effect on the employment growth. Third, the increase in domestic consumption positively influences the rise of employment. Fourth, good sectoral trade performance is positively related to employment growth. Finally, there is a positive link between MIIT and employment growth. Following models of employment changes are estimated.

(5)

$$\Delta Empl_{it}=\beta_1+\beta_2\Delta PROD_{it}+\beta_3\Delta CONS_{it}+\beta_4 TRADE_{it}+\beta_5 MIIT_{it}+\beta_6 CONC_{it}+\beta_7 WAGE_{it}+\beta_8 FDI_{it}+v_i+\varepsilon_{it}$$

, where $\Delta Empl_{it}$ is the change in employment in the i^{th} industry in the t^{th} time period, PROD is labour productivity (output per worker) and CONS is domestic consumption. TRADE is imports plus exports as a share of production. MIIT stands for matched trade changes as measured by various MIIT indices defined above. Because there is no agreement between scholars regarding which measure is the best for MIIT, therefore our results may be sensitive on the choice of a particular index. Consequently we apply four different indices and we estimate the model employing each of them separately. CONC is the five-plant concentration ratio. We consider two additional explanatory variables, which are important in shaping employment patterns in Hungarian food industry, but for which there are no clear-cut priors on expected coefficient signs. These variables are sectoral wages and exposure to foreign ownership, so WAGE is the average wage, and FDI is the share of foreign capital in the subscribed capital.

4.1. Year-on-year regression results

The results of fixed effects panel data model are reported in Table 1. The coefficients of productivity and domestic consumption are significant and they have expected signs for all specifications. In other words, an increase in domestic consumption leads to employment growth and productivity increases relate negatively to employment growth. The variables of sectoral trade performance are not significant with expected signs. MIIT indices produce ambiguous results. The A_j index is significant with expected signs, while C index has unexpected sign. Other two MIIT indices are not significant with unexpected sign. The CONC variables are significant with unexpected signs for all specification that is the concentration ratio is positively associated to employment changes. Our results do not confirm our a priori expectation that competitive pressures induced by large number firms and increasing trade openness lead to greater job reallocation within sectors. Surprisingly, the FDI has no significant effects on inter-industry labour adjustment, while the coefficients of WAGE are positive and significant for UMCIT and S specifications. In short, different specifications lead to the nearly results, except MIIT variables.

4.2. The length of period

The values of MIIT indices are sensitive on the length of period. However, except Brülhart (2000), there is no paper, which explicitly focuses on the problem of time interval. Thus, following authors' strategy we investigate carefully this issue. More specifically, we test how results are affected if we extend the length of time period.

Our dataset covers eight years (1995-2003). Thus, the lower and upper bound on possible time periods are two and eight years. Defining of time intervals should be based on the choice of an appropriate base of start and end period. Therefore, two the sub intervals should not be overlapping and should have the same length. Following Brülhart (2000) we choose the average over years 1-4 as the base period and the average over years 5-8 as the end period, due to eliminate the short-term volatility of the data as the interval is extended. To express formally

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

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*.

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

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

The other variables of empirical model needed to be recalculated for the relevant period. The variables ΔEMP, ΔPROD, ΔCONS and TRADE require similar transformation. For CONC, FDI and WAGE the adaptation means simply averaging over time interval I. We re-estimate the model (equation 5) for three-, five- and eight-year periods. The productivity variables (ΔPROD) are robust for all specifications and time intervals (Table 2). The coefficients of domestic consumption (ΔCONS) are significant for three and five years intervals, but they are not significant for eight years period with expected signs. Similarly, the estimated coefficients of TRADE variable are positive and significant for three and five years intervals, but they are not significant for eight years period. The signs of MIIT indices remain the same extending the time interval comparing to one year interval, except the S index. The coefficients on the A index are significant when the size of the interval exceeds one year with unexpected signs for five and eight year's periods. C indices have expected signs with significance for three and five year's period. The coefficients of CONC variable have positive signs and they are significant for eight years period for all MIIT index and for three years time interval for Aj and S index. The WAGE variables have positive sign and they are significant for three years period. Extending time period our results confirm that FDI has no significant influence on the employment changes. Note there is explanatory power of models increasing with growth of time intervals until five years period then it decreases. In short, similarly to year on year regressions, our results are sensitive for the length of time period and the choice of MIIT indices.

4.3. The lag structure

For the reasons mentioned in section 3, the sequencing problem also requires detailed scrutiny. Therefore we re-estimated the model with three different lag structures on the regressand with two-year lag, three-year lag and four-year lag. Table 3 reports our results for various MIIT indices. The coefficients of ΔPROD and ΔCONS variables are robust to those variations. The signs of TRADE variable have become negative and significant for the two years lag. The coefficients of MIIT indices are statistically insignificant when lags extend to two or three years. However, they are significant with expected signs for Aj and UMCIT indices extending lag to four years. The results confirm that control variables, like WAGE CONC and FDI have no significant effects on employment changes if lags are extended. In short, sensitivity analyses on various dynamic structures of the basic model suggests that MIIT indices lagged by four years relate most significantly to labour market reallocation in the sense of smooth adjustment hypothesis.

5. Conclusions

This paper focuses on some dynamic aspects of the smooth adjustment hypothesis associating to the intra-industry trade. More specifically, the paper investigated howpartial trade liberalisation due to the Association Agreement affects on employment changes in Hungarian food industry between 1995 and 2003. Our results suggest that the growth in domestic consumption have positive effect on employment changes, while the increase of productivity is negatively related to employment growth. However, we do not find significant relationships between good sectoral performance and employment changes. In some regression specifications, MIIT indices did appear with expected signs and significance. Furthermore, market concentration has strong positive and significant effects, while FDI has no influence on the employment changes.

In addition, two specific questions were investigated. First, we focused on the appropriate size of time intervals for MIIT and corresponding labour market adjustment. The data are rather favoured to the longer time period comparing to year-on-year intervals. Second, we investigated the relative timing of trade and labour market changes assuming different lag structures. The calculations suggest that labour market effects may follow changes in longer term. To summarise, we do not find clear evidence to support smooth adjustment hypothesis. However, our results should be interpreted only with care due to sensitivity on the choice of period and lag structure.

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Table 1 Employment Changes and Marginal IIT: Year on Year Fixed Effects Panel Estimates

	Aj	C	UMCIT	S
		ΔEMPL		
ΔPROD	-0.785***	-0.788***	-0.783***	-0.788***
ΔCONS	0.555***	0.551***	0.553***	0.550***
TRADE	0.202	0.180	0.206	0.198
MIIT	-0.037**	0.000**	-0.000	-0.004
WAGE	0.000	0.000	0.000*	0.000*
CONC	0.325***	0.327***	0.318**	0.304**
FDI	-0.027	-0.023	-0.028	-0.021
constant	-0.221***	-0.252***	-0.247***	-0.243***
N	144	144	144	144
R^2	0.6742	0.6689	0.6679	0.6749

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

Table 2 Fixed Effects Panel Estimates with Varying Time Intervals

	Aj			C			UMCIT			S		
	3 year	5 year	8 year	3 year	5 year	8 year	3 year	5 year	8 year	3 year	5 year	8 year
ΔPROD	-	-	-	-	-	-	-	-	-	-	-	-
	0.863***	0.902***	0.478***	0.870***	0.919***	0.544***	0.867***	0.907***	0.498***	0.883***	0.889***	0.542***
ΔCONS	0.514***	0.622***	-0.021	0.507***	0.612***	-0.022	0.518***	0.642***	0.039	0.518***	0.641***	0.022
TRADE	0.078**	0.177***	0.008	0.070*	0.172***	-0.027	0.082**	0.189***	-0.029	0.082**	0.163***	-0.026
MIIT	-0.022	-0.042**	-0.073**	0.000**	0.000**	0.000	0.000	0.000	0.000	-0.022	0.048**	-0.045
WAGE	0.000**	-0.000	0.143	0.000**	0.000	-0.195	0.000**	-0.000	-0.322	0.000**	0.000	-0.188
CONC	0.410*	0.329	0.001***	0.337	0.206	0.001***	0.420*	0.285	0.001***	0.498**	0.032	0.001***
FDI	-0.111	-0.173	-0.394	-0.062	-0.090	-0.135	-0.115	-0.183	-0.295	-0.127	-0.161	-0.363
constant	-0.251**	-0.063	0.024	-0.249**	-0.074	-0.003	-0.273**	-0.061	0.190	-0.316**	0.055	0.121
N	108	72	36	108	72	36	108	72	36	108	72	36
R^2	0.7220	0.8934	0.5669	0.7554	0.9111	0.6308	0.7205	0.8956	0.7907	0.6769	0.9309	0.7558

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

Table 3 Fixed Effects Panel Estimates with Varying Lags

	Aj			C			UMCIT			S		
	2 year	3 year	4 year	2 year	3 year	4 year	2 year	3 year	4 year	2 year	3 year	4 year
ΔPROD	-0.906***	-0.858***	-0.952***	-0.908***	-0.857***	-0.959***	-0.906***	-0.856***	-0.965***	-0.908***	-0.858***	-0.944***
ΔCONS	0.743***	0.603***	0.861***	0.741***	0.606***	0.875***	0.744***	0.602***	0.869***	0.740***	0.603***	0.859***
TRADE	-0.486***	-0.086	0.081	-0.483***	-0.095	0.088	-0.487***	-0.089	0.051	-0.506***	-0.094	0.060
MIIT	0.013	0.006	0.033*	-0.000	0.000	-0.000**	0.000	0.000	0.000*	0.014	0.003	0.010
WAGE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000*	0.000	0.000	0.000
CONC	0.128	-0.271	-0.120	0.136	-0.251	-0.090	0.124	-0.271	-0.139	0.118	-0.255	-0.153
FDI	0.039	0.008	-0.023	0.038	0.002	-0.013	0.034	0.010	-0.029	0.050	0.005	-0.013
constant	-0.051	0.176	0.035	-0.046	0.170	0.035	-0.043	0.177	0.064	-0.042	0.171	0.077
N	108	90	72	108	90	72	108	90	72	108	90	72
R^2	0.7017	0.7595	0.7850	0.6927	0.7758	0.8148	0.7280	0.7629	0.7880	0.6886	0.7758	0.7833

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