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Intra-industry trade and adjustment in Malaysia: puzzling evidence

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The structure of Malysia's trade expansion over the high-growth period 1970–1994 and its implications for labour-market adjustment is examined. An econometric analysis of trade and employment data suggests that intra-industry trade is related with relatively large inter-industry payroll changes. Results therefore cast doubt over the widely held smooth-adjustment hypothesis of intra-industry trade.

I. INTRODUCTION

Although economists accept that international specialization along comparative advantage is a positive-sum game it is acknowledged that changes in specialization will entail transitional adjustment costs. One empirical method to assess the adjustment implications of trade expansion is to analyse patterns of intra-industry trade (IIT).[1] The widely held 'smooth-adjustment hypothesis' states that a high share of IIT will be associated with relatively low labour-market disruption, since, with intra-industry adjustment, workers move within industries rather than between them. Hence, measures of IIT are frequently employed to estimate the intensity of structural adjustment pressures from trade expansion.[2]

The most rapid expansion of trade in recent decades has been achieved by East Asian countries. This development has given rise to a lively and ongoing intellectual debate about the adjustment implications of this development, and a large number of empirical studies have examined patterns of East Asian IIT.[3] In its influential Jobs Study, for instance, the OECD (1994) found that most East Asian economies exhibited relatively low shares of IIT, but that these IIT shares showed consistently increasing trends. The OECD therefore concluded that related adjustment costs in industrialized as well as East Asian countries were poised to decrease over time.

However, the existing literature on trade-induced labour market adjustment and on East Asian IIT has some serious limitations, which we address in this paper. First, the focus of most contributions on adjustment has been on OECD countries.[4] Second, researchers have so far used the conventional Grubel–Lloyd (GL) index in analysing East Asian trade patterns. However, Hamilton and Kniest (1991) have argued that such a static measure of IIT is not inherently related to changes in trade and specialization, and suggested the use of alternative measures of *marginal* IT (MIIT). Therefore GL indices are complemented with a measure of MIIT.[5] Third, the smooth-adjustment hypothesis, both in the GL and in the MIIT version, have rarely been subjected to explicit tests. Using data for Malaysia, an econometric analysis of the link between (M)IIT and employment changes is conducted.

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[1] See Greenaway and Milner (1986) for a comprehensive treatment.
[2] A survey of this vast literature can be found in Brülhart (1999).
[3] Recent studies of East Asian IIT patterns include Drysdale and Garnaut (1993), Grant *et al.* (1993), Khalifah (1995, 1996), Lincoln (1990), Menon (1996, 1997), Noland (1990, 1997), OECD (1994), Rajan (1996) and Thorpe (1997).
[4] A large body of research has been dedicated to analysing the link between the growth of East Asian trade and falling demand for low-skill workers in industrialized countries. For a survey, see Freeman (1995).
[5] We use the A index of Brülhart (1994). Alternative measures have been proposed by Greenaway *et al.* (1994), Menon and Dixon (1997) and Thom and McDowell (1998).

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The main results confirm conventional wisdom, but they also present some puzzles. Both IIT and MIIT exhibit continually increasing trends in Malaysia. However, the econometric test of the smooth-adjustment hypothesis does not confirm our priors. Hence, one has to be cautious in evaluating the adjustment implications of Malaysia (M)IIT.

II. METHOLDOLOGY AND EMPIRICAL RESULTS

Malaysian intra-industry trade

The steep and continuous increase in Malaysia's trade orientation is documented in Table 1. Combined imports and exports as a percentage of Malaysian GDP rose from 73.4% in 1970 to 160.7% in 1994. As is well known, Malaysian trade expansion has gone hand-in-hand with a steady increase in the share of IIT. The aggregate Grubel–Lloyd index rose from 0.19 to 0.54 between 1970 and 1994. In addition to this conventional static measure of IT, we have computed measures of MIIT, using the *A* index of Brülhart (1994). Again, a steady increase over the sample period is observed, from 0.31 to 0.51. The continuous rise in IIT and MIIT is also apparent when we look only at trade in manufactured goods (SITC 5–8). Conventional wisdom in the guise of the smooth-adjustment hypothesis would therefore suggest that the adjustment implications of Malaysian trade expansion became gradually less severe.

A model of employment change and IIT

It is imperative that the smooth-adjustment hypothesis be subjected to explicit empirical scrutiny. Some recent studies of European countries have done exactly that and found support for the hypothesis when applied to measures of MIIT (Brülhart *et al.*, 1998; Brülhart and Hine, 1999).

Table 1. *Malaysian intra-industry trade, 1970–1994*

	1970	1980	1985	1990	1994
Total trade as percentage of GDP					
Exports	40.1	53.7	48.9	68.7	81.2
Imports	33.3	44.5	39.2	64.9	79.5
IIT: GL index					
Total trade	0.19	0.30	0.37	0.46	0.54
Manufactures trade	0.13	0.38	0.52	0.57	0.59
MIIT: A index		(70–80)	(80–85)	(85–90)	(90–94)
Total trade		0.31	0.33	0.48	0.51
Manufactures trade		0.47	0.47	0.54	0.57

Source: International Economic Data Bank, Australian Natural University.

However, no study has yet been carried out to explore the link between IIT and adjustment in the East Asian context. Therefore a data set, with matched disaggregated industry and trade data based on the ISIC code for Malaysia over the period 1970–1995, has been compiled. All data were obtained through the International Economic Data Bank (IEDB) at the Australian National University.

The following basic equation has been estimated:

$$DEMPL_{it} = \beta_0 + \beta_1 DPROD_{it} + \beta_2 DCONS_{it} + \beta_3 TREX_{it} + \beta_4 IIT_{it} + \varepsilon_{it} \quad (1)$$

with $\varepsilon_{it} = \gamma_i + \eta_{it}$; $\eta_{it} \sim iid(0, \sigma^2)$; and γ_i correlated with regressors, where i denotes industries and t denotes years. *DEMPL*, the dependent variable, is the absolute value of employment change between t and $t-n$, which we use as a proxy for the costs of adjustment in the labour market. Underlying this proxy is the assumption that the total resource cost involved in moving labour across sectors is proportional to the size of net payroll changes, and that this proportion is similar across industries and over time.

The explanatory model is specified as follows. *DPROD* stands for the absolute value of the change in labour productivity (output per worker) between year's t and $t-n$. *A priori*, this variable is expected to relate positively to *DEMPL*. The second regressor, *DCONS*, is the absolute value of the change in apparent consumption, and is also expected to relate positively with *DEMPL*. *TREX* represents trade exposure, calculated as the ratio of imports plus exports over output. One could expect *TREX* also to correlate positively with our dependent variable, given that greater trade exposure will increase inter-industry specialization pressures and Schumpeterian processes through intensified competition. The crucial priors concern the *IIT* variable. According to the smooth-adjustment hypothesis, this should relate negatively to the level of inter-industry job changes, as measured by *DEMPL*. The literature on *MIIT* suggests that this relationship should be particularly pronounced when *IIT* is understood in the sense of a measure such as the *A* index rather than in the sense of the GL index. Both of these indices are investigated for comparison.

Given that unknown industry-specific effects undoubtedly play a role in the context of our model, a model that uses panel data has been chosen. A fixed-effects estimator was chosen, since the data set covers the entire manufacturing sector. All variables are in constant prices, and, with the exception of IIT measures, in natural logarithms.

Results

Before discussing results from the panel data analysis, it is useful to look at correlations between the variables in our data set. These are reported in Table 2 (a) for year-on-year

Table 2. *Correlations in the Malaysian data set*

	DEMPL	*DPROD*	*DCONS*	*TREX*	*GLINDEX*	*GLINDEX * TREX*	*AINDEX*	*AINDEX * TREX*
(a) One-year intervals (670 observations, 5% critical level = 0.08)								
DEMPL	1.00							
DPROD	−0.20	1.00						
DCONS	0.48	0.22	1.00					
TREX	−0.07	−0.07	0.11	1.00				
GLINDEX	0.21	−0.002	0.16	−0.19	1.00			
*GLINDEX *TREX*	*0.02*	−0.07	0.10	0.82	−0.19	1.00		
AINDEX	0.12	−0.07	0.13	0.06	0.41	0.10	1.00	
*AINDEX *TREX*	0.01	−0.07	0.07	0.67	−0.08	0.69	0.03	1.00
(b) Three-year intervals (139 observations, 5% critical level = 0.17)								
DEMPL	1.00							
DPROD	−0.09	1.00						
DCONS	0.52	0.42	1.00					
TREX	−0.04	−0.04	0.12	1.00				
GLINDEX	0.28	0.07	0.13	−0.21	1.00			
*GLINDEX *TREX*	0.04	0.02	0.13	0.83	−0.20	1.00		
AINDEX	0.14	0.04	0.17	0.07	0.40	0.09	1.00	
*AINDEX *TREX*	0.06	−0.05	0.01	0.78	−0.12	0.70	0.04	1.00

Table 3. *IIT and employment change in Malaysia: fixed-effect panel data estimates for year-on-year changes*

	(1) GL index, no interaction		(2) GL index, interaction term		(3) *A* index, no interaction		(4) *A* index, interaction term	
Variables	Coefficient (*t*-statistic)	Beta value	Coefficient (*t*-statistic)	Beta value	Coefficient (*t*-statistic)	Beta value	Coefficient (*t*-statistic)	Beta value
DPROD	0.0003 (0.01)	0.0003	0.002 (0.05)	0.002	0.003 (0.07)	0.003	0.01 (0.14)	0.01
DCONS	0.30 (9.27)	0.35	0.28 (8.76)	0.33	0.32 (9.53)	0.36	0.31 (9.32)	0.36
TREX	−0.20 (−2.55)	−0.14	−0.40 (−4.40)	−0.27	−0.23 (−2.99)	−0.16	−0.29 (−3.51)	−0.20
GLINDEX	0.45 (1.87)	0.08	0.50 (2.21)	0.08				
GLINDEX TREX*			0.67 (3.71)	0.24				
AINDEX					0.10 (0.76)	0.02	0.12 (0.92)	0.02
AINDEX TREX*							0.27 (2.14)	0.08
Adj. R^2	0.65		0.66		0.64		0.65	
F (*p*-value)	44.11 (0.00%)		44.08 (0.00%)		43.40 (0.00%)		42.24 (0.00%)	
RESET test (*p*-value)	2.75 (4.20%)		1.97 (11.66%)		2.74 (4.26%)		2.96 (3.15%)	

Note: Dependent variable = absolute employment changes, log-linear model with White-corrected standard errors, 670 observations.

changes and in Table 2(b) for three-year intervals. The correlationbs between both IIT measures and *DEMPL* are positive − against the priors derived from the smooth-adjustment hypothesis. This unexpected result is stronger in terms of the GL index than in terms of the *A* index. The negative signs on *TREX* and *DPROD* also run against expectations. Note that we do not find a perfect correlation between GL and *A* indices, due to the distinctness of the two measures.

Table 3 reports the results for the panel data analysis, carried out on yearly intervals. The same counterintuitive pattern emerges: both the GL index (column 1) and the *A* index (column 3) relate positively to our proxy for inter-industry labour adjustment, while greater trade exposure *per se* seems to lead to relatively lower inter-industry adjustment. However, statistical significance for this result is only found in the case of the GL index. Since IIT is likely to matter more in heavily traded sectors, we have interacted *TREX* with the IIT variables (columns 2 and 4). Introduction of such an interaction term strengthens the significance of the positive coefficients on both the GL and the *A* index.

As a second step, the time intervals, over which the variables are calculated from one year to three years, have been widened. This strips the data from some year-on-year volatility and retains 'medium-term' effects which are arguably a more plausible time horizon for the analysis of trade-related adjustment.[6] Table 4 reports the three-year results.

[6] There still exists no consensus on the most appropriate time horizon for the smooth-adjustment hypothesis. For discussions, see Oliveras and Terra (1997) and Brülhart (1999).

Table 4. *IIT and employment change in Malaysia: fixed-effect panel data estimates for three-year intervals*

Variables	(1) GL index, no interaction: Coefficient (*t*-statistic)	Beta value	(2) GL index, interaction term: Coefficient (*t*-statistic)	Beta value	(3) *A* index, no interaction: Coefficient (*t*-statistic)	Beta value	(4) *A* index, interaction term: Coefficient (*t*-statistic)	Beta value
DPROD	0.02 (0.27)	0.02	0.01 (0.07)	0.01	0.05 (0.57)	0.05	0.05 (0.53)	0.05
DCONS	0.29 (3.20)	0.33	0.24 (2.62)	0.28	0.33 (4.04)	0.38	0.37 (4.32)	0.43
TREX	−0.04 (−0.31)	−0.03	−0.27 (−0.16)	−0.18	−0.13 (−1.06)	−0.09	−0.43 (−2.77)	−0.29
GLINDEX	1.42 (2.16)	0.22	1.39 (2.32)	0.22				
GLINDEX TREX*			0.98 (2.28)	0.33				
AINDEX					−0.12 (−0.34)	−0.02	−0.09 (−0.31)	−0.02
AINDEX TREX*							0.74 (2.97)	0.27
Adj. R^2	0.75		0.76		0.73		0.75	
F (*p*-value)	23.41 (0.00%)		23.61 (0.00%)		22.56 (0.00%)		24.25 (0.00%)	
RESET test (*p*-value)	0.06 (97.91%)		0.08 (97.12)		0.45 (71.57%)		0.42 (74.01%)	

Note: Dependent variable = absolute employment changes, log-linear model with White-corrected standard errors, 139 observations.

Most findings are unchanged. Against theoretical priors, the GL index relates positively, and *TREX* relates negatively, to employment changes. The coefficient on the 'stand-alone' *A* index in column (3), has the expected negative sign, but it is neither significant nor does it preserve its sign when interacted with trade exposure in specification (4). Hence, our basic results are very similar in the year-on-year model and in the three-year model.

It could be argued that unobserved cyclical effects drive some of the findings. However, running the same model with inclusion of year dummies produces no significant impact on the results, in both the one-year and the three-year models. In addition, it is found in Brülhart *et al.* (1998) that changes in IIT and trade exposure tend to precede sectoral payroll changes. Hence, we experiment with lags in the trade variables. Again, the main results were unaffected.[7]

III. CONCLUSIONS

An explicit econometric test of the smooth-adjustment hypothesis on Malaysian data does not support the notion that high or growing (M)IIT relates negatively to gross employment changes. We therefore have to interpret the detected IIT trends with caution. Since a substantive literature has made the implicit inference that rising IIT levels will yield ever lower adjustment pressures both in the East Asian economies and in industrialized western countries, the puzzle which appears in the Malaysian data seems somewhat disconcerting. It will be very useful for future research to replicate this analysis on data for other countries, in order to establish whether the Malaysian results are representative. In addition, it would be helpful if more disaggregated employment data were available in the East Asian context. This would permit the computation of a more sophisticated measure of adjustment costs (see Brülhart *et al.*, 1998, on the use of plant-level data). Finally, the counterintuitive results for Malaysia might in time find an explanation through extended analysis of economic and policy features of that country.

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[7] The results with time fixed effects and lags are available from the authors.

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