Nature of Intra-industry Trade and Labour Adjustments: Is the SAH Relevant for Malaysia?

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ABSTRACT

This study examines the nature of intra-industry trade on labour market adjustments in the Malaysian manufacturing sector between 1983 and 2000. Contrary to previous findings for Malaysia, the results of this study on the nature of intra-industry trade support the notion of the smooth adjustment hypothesis (SAH). Horizontal intra-industry trade is found to yield less costly adjustments than vertical intra-industry trade between 1983 and 2000. Vertical intra-industry trade is found to significantly cause higher inter-industry adjustments in high skills between 1983 and 1990. However for the period 1993 to 2000, vertical intra-industry trade exerts higher inter-industry adjustments on semi skills instead. From the findings of this study on adjustment, it can be concluded that the time interval, the nature of IIT and the type of inter-industry adjustment proxy are all-important for one to accept or reject the SAH.

Introduction

The argument of adjustment costs related to intra-industry trade (IIT) is rooted in the smooth adjustment hypothesis (SAH). The SAH basically implies that if the change in trade patterns is of IIT, there should be less adjustment or displacement of existing factors of production as it is assumed theoretically that products of an industry are perfectly homogenous and factor mobility is greater within than between industries. Thus, industries with high intra-industry trade (IIT) face relatively low trade-induced adjustment costs. Brulhart (1999) emphasizes that even with some intra-industry factor heterogeneity, IIT may result in small adjustment costs, as the difference in factor requirements of two firms belonging to the same industry is generally smaller than the difference in factor requirements of two firms belonging to different industries.

In identifying the consequences of the IIT for the labour market, is the issue of quality. Development of IIT associated with specialization along quality lines, that

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is IIT in vertically differentiated products (VIIT), has different consequences for labour adjustments than IIT in horizontal (HIIT) products (specialization in varieties). Thus painful or more costly adjustments may not be confined to inter-industry trade alone, but may also be sizeable for VIIT. The latter involves costly displacement of resources since it may not be equivalent to specialize in high or low quality products in the same industry.

The existing empirical evidence on the negative relationship between IIT and trade-induced adjustment costs in Malaysia is however scarce. The study by Brulhart and Thorpe (2000) is the only existing research on the implications of IIT and labour adjustments in Malaysia for the period 1970 to 1994. The results of their study indicate a lack of support for the SAH. There could be several reasons for the "puzzling" evidence obtained in the case of Malaysia.

First, IIT gained considerable importance in Malaysian manufacturing only in the 1990s. The period of study considered by both authors does not cover the 1990s period adequately to gauge the adjustments resulting from IIT. Second, the measure of adjustment costs considered in their study is solely based on absolute employment change. It has been acknowledged that labour market adjustments for Malaysian manufacturing have not been confined to aggregate employment. In fact, skill intensity had started to rise since 1993, coinciding with the increase in IIT. The changes in the type of skills are also important in that the growth in semi skills has far outpaced the growth of high skills in manufacturing. Thus, labour market adjustments may more likely be reflected by skills than aggregate employment.

Finally, the lack of support for the SAH in Malaysia could be due to the nature of IIT. As Cristobal (2001) iterates, using total IIT to test the SAH can produce misleading results since the IIT encompasses two effects of IIT on adjustment costs that are of different signs. It has been expounded that VIIT dominates relative to HIIT for trade in Malaysian manufactures. Thus, the adjustments of intra-industry trade in general may still be costly in the Malaysian case due to the high activity of VIIT.

Data

The link between M(IIT) and labour adjustment can be explored by matching sectorally disaggregated non-trade data. Since the detailed non-trade data for Malaysian industries remains as unpublished, the analyses would have to be restricted to selected years for comparison. The years' chosen are 1983, 1990, 1993 and 2000. The considered years in the 1990s are characterized by an increase in IIT, while the remaining years in the 1980s represent the predominance of inter-industry trade (IT).

Labour data is drawn from manufacturing surveys conducted by the Department of Statistics, Malaysia. It comprises full-time paid employees by occupational

groupings for industries at the 5-digit levels of the Malaysia Industrial Classification (MIC). Based on occupations, skills are defined as those in the managerial, professional, technical and supervisory group. A finer disaggregation of skills into high skills and semi skills is also adopted for the study. High skills refer to those in the managerial and professional category whilst semi skills comprise the technical and supervisory group.

Due to the non-availability of a concordance table to match trade and labour data in Malaysia at disaggregated level beyond the two-digit sectors, a concordance table had to be established for the analyses. The trade data (based on the Standard International Trade Classification SITC), which identifies thousands of relevant products, cannot be mapped to one particular industry in the MIC. The industries thus have to be re-grouped after performing the concordance with the SITC classification.

Apart from establishing the concordance table, calculations are made on unit values of exports and imports to investigate the nature of IIT. Deriving unit values for exports and imports by disaggregated product categories is a rather complicated process, since the measurement unit varies across traded products in Malaysia. Thus, unit values can only be calculated for the finely disaggregated import and export groupings at the 9-digit SITC classification by dividing values by quantities.

The construction of industry-specific unit values, which is a by-product of the analysis, is probably the most careful to date, allowing to examine the effects of the nature of IIT on labour adjustments. The nature of IIT for the selected years is thus examined from the constructed data on values and unit values of trade flows. The unit values calculated from the detailed trade data is used to uncover the nature of IIT into its vertical (VIIT) and horizontal components (HIIT).

First the number of sub-industries within a particular industry engaged in IIT had to be identified. The Grubel-Lloyd (GL) index is used to identify the industries concerned since the GL comprises a combination of HIIT and VIIT (There is no measure to compute the marginal intra-industry trade index according to its nature and thus the focus is on the GL index). In what follows, the GL coefficients of more than 50 per cent is treated as a cut-off point to represent IIT products.

Second, since products differ in quality even at the most detailed level of disaggregation, it is assumed that differences in prices (unit values) at the 9-digit level reflect quality differences. Products whose unit values are close are considered to be differentiated horizontally. The criterion adopted is that if the export and import unit values differ by more than 15 per cent, products are considered to be differentiated vertically (see Greenaway *et al.* 1994).

Thus HIIT is defined as the simultaneous exports and imports of a 9-digit SITC product where the unit value of exports (UV^X) relative to the unit value of imports

(UV^M) is within a range of ± 15 per cent as follows: $0.85 \leq (UV^X/UV^M) \leq 1.15$, while VIIT refers to the relative unit value of exports and imports outside this range. This allows for trade flows to be separated into three trade types: one-way trade, two-way trade in horizontally differentiated goods (limited differences in unit values) and two-way trade in vertically differentiated goods (large differences in unit values).

Extent and Nature of Intra-industry Trade

Table 1 reports the recorded levels of IIT in manufacturing trade between Malaysia and the rest of the world. The picture is very mixed when IIT is calculated based on different levels of aggregation. The GL indicator at the 9-digit SITC level was around 19 per cent in 1983, and reached 41 per cent in 2000, while at the 3-digit SITC level, it surpassed the 50 per cent cut-off point in 1993 and increased to 58 per cent in 2000.

The finer level of commodity disaggregation of trade in Table 1 implies that the changes in the pattern of trade are largely driven by inter and not intra-industry trade, one has to bear in mind that the 9-digit level is too high a disaggregation. Even at the 7-digit level, IIT could be virtually eliminated and thus underestimated. Thus the doubling of GL index from 19 per cent in 1983 to 41 per cent in 2000 at the 9-digit level is a clear indication that a growing proportion of trade between Malaysia and the rest of the world involves the exchange of similar products.

Though IIT in manufactures has been growing over time, it is suspect that IIT is of vertical nature, owing to the large differences between Malaysia and some of her major trading partners in terms of factor endowments. In terms of the number of industries engaged in IIT, 8 per cent of the total number of products is that of IIT in 1983. It increased to 20 per cent of the total number in 2000. VIIT comprises 61 and 88 per cent of the total number of IIT products in 1983 and 2000 respectively. The trade patterns reveal that VIIT is obviously more important than HIIT, implying that trade in manufactures between Malaysia and the rest of the world is mainly that of two-way trade in varieties of product characterized by different qualities.

The above description of the nature of IIT has so far focused on the GL index. However, it has been argued in the literature that the GL index is inadequate to capture the dynamics of IIT, more so when the aim is to explore trade-induced adjustment costs. As such, the marginal intra-industry trade (MIIT, A) index of Brulhart (1994) is used to measure the change for the three intervals: 1983 and 2000; 1983 and 1990 to represent changes in the 1980s; and subsequently 1993 and 2000 to represent changes in the 1990s.

It is not possible to compute the MIIT index at the 9-digit SITC level for the interval 1983 to 1990 and 1983 to 2000 since the 1983 trade data is based on SITC

(Revision 2) while the trade data for 1990 and 2000 data is based on SITC (Revision 3). At such as fine disaggregation level, it is impossible to match the products. Thus, the MIIT index for the 3-digit and 9-digit SITC can only be compared for the 1993 to 2000 interval since the trade data for both years is based on SITC (Revision.3).

The A index for Malaysian manufacturing between 1993 and 2000 at the 9-digit level is 0.39 (not reported in Table 1), implying that trade in manufactures during this period is of inter-industry nature. However at the 3-digit SITC level, the MIIT index of 0.56 points to intra-industry trade for the same period. Again, one has to be cautious in interpreting the results since the highly disaggregated data would definitely underestimate the extent of trade overlap. Nevertheless, the increase of the MIIT index from 0.44 to 0.56 confirms that IIT has gained importance in the 1990s relative to the 1980s.

Table 1
Trade Patterns in Malaysian Manufacturing, 1983-2000

		1983	*1990*	*1993*	*2000*
No. of Industries		4211	5228	5382	7316
GL Index (%)	- 3-digit	32.54	42.85	50.93	58.40
	- 9-digit	18.67	23.45	27.03	40.68
IIT industries	- No.	563	798	1021	1649
	- % of total No.	13.37	15.26	18.97	22.54
VIIT Industries	- No.	346	526	654	1430
	- % of total IIT	61.46	65.91	64.05	86.72
HIIT Industries	- No.	217	272	367	219
	- % of total IIT	38.54	34.09	35.95	13.28

	MIIT
1983-2000	0.581
1983-1990	0.441
1993-2000	0.564

***Source*:** Calculated from Malaysia: External Trade Statistics, Malaysia.

Cross-sectional Estimates

Empirical Design

This study employs the basic equation as examined by Brulhart and Thorpe (2000) and only considers adjustments that are confined to labour market changes:

AEC = f (DLP, DCONS, TE, IIT, IIT*TE)

where

AEC = absolute employment change between year t and t-n

DLP = absolute value of change in labour productivity between year t and t-n

DCONS = absolute value of change in consumption (output plus imports less exports) between year t and t-n

TE = trade exposure (ratio of total trade to output, measured as $[(M + X)_{t-n} + (M+X)_t]/(Q_{t-n}+Q_t)$ where Q is output)

IIT = intra-industry trade index (GL index and MIIT)

IIT is interacted with TE since IIT is likely to matter in more heavily traded sectors. The above variables are in real terms, and, with the exception of IIT measures, in natural logarithms. The variables stated in the above specification are mainly that which are featured explicitly in the SAH due to a lack of a theoretical model on adjustments. This limitation is noted but since the aim is to test the relevance of the SAH, the above basic specification is generally used in the literature.

All variables in the above specification are expected to relate positively with the adjustment measure, with the exception of the IIT indices and the interaction effects. The expectations are that IIT indices should have a negative relationship with AEC since changes in industry employment should be lower with the changes in exports and imports within an industry. The IIT indices employed are the GL index of the current year t (GLt), GL index of the base year t-n (GLt-n) and the change in GL index between year t and t-n (GLc), the average of the GL indices of years t and t-n (GLa) and the MIIT(A). In addition to the GL index, another measure of intra-industry trade used is the change in the share of IIT products to total products (IITn) within an industry. All IIT measures are used interchangeably.

The above specification of Brulhart and Thorpe (2000) is modified for this study in the following manner. First the study will consider adjustments *via* skilled employment, besides aggregate employment (AEC). Absolute changes in skills (ASC), high skills (AHSC) and semi skills (AMSC), are also defined in a similar manner as that of the AEC.

Second, the nature of intra-industry trade on adjustments is explored by using VIIT and HIIT measures as explanatory variables. VIIT (HIIT) is measured as the change in the share of products that are vertically (horizontally) differentiated in total products within that industry between year t and t-n. A positive relationship with the adjustment measure is expected for VIIT since VIIT is likely to involve greater adjustment costs than HIIT.

Third, the adjustments are considered for across different time periods. Since the 1990s reflect the period of high IIT, the labour market adjustments in this period are expected to differ from that of the 1980s. To examine this possible asymmetry in labour market adjustments, the responses are examined for two

time intervals of similar duration. Adjustments in the 1980s in this study are reflected by changes between 1983 and 1990 while adjustments in the 1990s are represented by changes between 1993 and 2000. The changes in both time intervals are then compared with the results of the overall adjustment between 1983 and 2000.

Finally, cross-section data is utilized to explore the nature of IIT on adjustments, as it is impossible to calculate unit values for such a long period. The cross-section dataset comprises 66 observations for the 1983 and 1990 interval, 70 observations between 1993 and 2000 and 68 observations between 1983 and 2000. Cross-section estimates are considered to be more reliable for examining trade-related adjustment since it reflects medium to long-term effects (7 year intervals between 1983 and 1990 and between 1993 and 2000), as opposed to the year-on-year volatility of panel estimates.

Results

Table 2 presents correlations between trade measures and adjustment measures of the cross section data. Of the five variants of the GL index (GLt-n, GLt, GLa, GLc and IITn), the GLc has the expected negative signs with all adjustment measures. Similarly, the MIIT is also negatively correlated with adjustments for both the 1980 and 1990 intervals.

Table 2
Correlations of trade and adjustment measures

	GLt-n	*GLt*	*GLc*	*GLa*	*IIT*	*VIIT*	*HIIT*	*MIIT*	*TE*
					1983-2000				
AEC	0.103	-0.097	-0.172	0.004	-0.192	-0.072	-0.185	-0.023	-0.150
ASC	0.119	-0.037	-0.134	0.051	-0.195	-0.118	-0.132	0.052	-0.174
AHSC	0.085	-0.028	-0.097	0.035	-0.156	-0.107	-0.090	0.026	-0.213
AMSC	0.153	-0.038	-0.164	0.071	-0.208	-0.106	-0.166	0.078	-0.122
					1983-1990				
AEC	0.272	0.068	-0.162	0.203	-0.080	-0.033	-0.085	neg.	0.186
ASC	0.263	0.044	-0.176	0.182	-0.039	-0.011	-0.052	-0.020	0.065
AHSC	0.200	0.179	-0.003	0.232	0.102	0.157	-0.099	-0.010	0.079
AMSC	0.273	0.019	-0.207	0.172	-0.044	-0.039	-0.010	-0.057	0.037
					1993-2000				
AEC	-0.145	0.100	-0.246	-0.021	-0.130	-0.175	0.062	-0.097	-0.053
ASC	0.005	0.163	-0.167	0.100	-0.013	-0.133	0.138	-0.108	-0.097
AHSC	0.067	0.194	-0.138	0.152	-0.097	-0.245	0.160	-0.015	-0.039
AMSC	0.041	0.206	-0.176	0.146	-0.039	-0.113	0.085	-0.109	-0.057

Note: neg. - negligible.

More importantly are the expected negative signs on HIIT and the adjustment measures for the overall period and the 1980s interval. However, the positive correlations of HIIT and adjustment measure between 1993-2000 runs contrary to expectations. The negative correlations between VIIT and adjustments for all intervals also do not conform to expectations. Positive signs on TE are only evident in the 1980s, but runs against expectations for the 1990s and the overall period. (Brulhart and Thorpe, 2000 observe the same negative signs between TE and AEC for Malaysia).

Table 3 reports the results of the cross-section analysis for absolute employment changes as the proxy for inter-industry labour adjustment. The estimations are corrected for heteroskedasticity. Since the specification is not deduced from a complete theoretical model, the test on omitted variables is also conducted. The results show that omitted variable problem is not pervasive as the test is found to be insignificant in most regressions. Only the results of the GLc are reported in the cross-section estimations since the other IIT measures seem to be insignificant and generally produce the wrong signs.

Table 3
IIT and Employment Change: Cross Section Estimates

	(1a)		*(1b)*		*(1c)*		*(1d)*		*(1e)*	
Variables	*Coeffi-cient*	*Std. Err.*	*Coeffi-cient*	*Std. Err.*	*Coeffi-cient*	*Std. Err.*	*Coeffi cient*	*Std. Err.*	*Coeffi-cient*	*Std. Err.*
					1983-2000					
DLP	-0.260*	0.098	-0.272*	0.094	-0.204*	0.095	-0.279*	0.102	-0.269*	0.089
DCONS	0.541*	0.089	0.547*	0.089	0.568*	0.094	0.547*	0.091	0.547*	0.090
TE	-0.223**	0.132	-0.241**	0.138	-0.173	0.125	-0.137	0.145	-0.253	0.227
GLc	-0.001	0.005					-0.001	0.005		
MIIT			0.213	0.457					0.202	0.473
VIIT					0.002	0.013				
HIIT					-0.043*	0.018				
GLc*TE							-0.005	0.004		
MIIT*TE									0.025	0.400
R-Squared	0.488		0.490		0.536		0.502		0.490	
					1983-1990					
DLP	-0.373*	0.117	-0.384*	0.118	-0.362*	0.116	-0.374*	0.119	-0.401*	0.120
DCONS	0.488*	0.113	0.424*	0.113	0.433*	0.112	0.487*	0.114	0.420*	0.113
TE	0.042	0.162	0.064	0.169	0.063	0.176	0.049	0.169	-0.072	0.207
GLc	0.005	0.004					0.005	0.004		
MIIT			-0.319	0.630					-0.404	0.585
VIIT					0.001	0.015				
HIIT					-0.010	0.030				
GLc*TE							-0.001	0.004		
MIIT*TE									0.395	0.363
R-Squared	0.368		0.361		0.359		0.368		0.375	

	(1a)		*(1b)*		*(1c)*		*(1d)*		*(1e)*	
Variables	*Coeffi-cient*	*Std. Err.*	*Coeffi-cient*	*Std. Err.*	*Coeffi-cient*	*Std. Err.*	*Coeffi cient*	*Std. Err.*	*Coeffi-cient*	*Std. Err.*
					1993-2000					
DLP	0.013	0.129	-0.014	0.135	0.001	0.119	0.012	0.128	-0.010	0.138
DCONS	0.510*	0.155	0.536*	0.156	0.550*	0.169	0.511*	0.155	0.532*	0.158
TE	-0.107	0.099	-0.083	0.120	-0.119	0.096	-0.094	0.117	-0.163	0.177
GLc	-0.006	0.006					-0.006	0.006		
MIIT			-0.478	0.709					-0.503	0.715
VIIT					0.002	0.017				
HIIT					-0.010	0.018				
GLc*TE							-0.001	0.005		
MIIT*TE									0.149	0.262
R-Squared	0.345		0.343		0.340		0.345		0.345	

Note: 1. Dependent variable is absolute employment changes.
2. Robust standard errors are reported.
* significant at 5% and ** significant at 10%.

The coefficient of DLP is negative and significant for the 1983 to 1990 interval and for the overall period, contrary to expectations. This implies that absolute changes in labour productivity (DLP) lead to relatively lower inter-industry adjustment. Other studies that have found similar results on DLP are that of Tharakan and Calfat (1999) for Belgium and Erlat (2000) for Turkey. However the DLP coefficient is positive but insignificant between 1993 and 2000. Similarly increased competitiveness resulting from greater trade exposure appears to lead to relatively lower inter-industry adjustment between 1983 and 2000.

With regards to trade, the GL and the MIIT index have the expected negative signs (though insignificant) for the 1993 to 2000 period of high IIT. The interaction effects remain insignificant in all cases. Though IIT appears to have no impact on employment changes, interestingly the nature of IIT appears important. HIIT relates negatively (and significantly) to adjustments between 1983 and 2000 implying less costly adjustments. VIIT remains positive, but insignificant for all intervals.

The impact of the nature of IIT is thus explored further for adjustment measures based on skill changes. Table 4 summarizes the cross-section estimates for ASC, AHSC and AMSC, as proxies for labour adjustment. HIIT implies less costly adjustments for the overall period of 1983 and 2000, irrespective of the adjustment measures employed. There is evidence of VIIT causing higher inter-industry adjustment in high skilled employment between 1983 and 1990 and higher inter-industry adjustment in semi skills between 1993 and 2000. It thus can be gathered that the SAH is more likely to hold in the 1993 to 2000 interval of high IIT when absolute changes in semi skilled labour are used as adjustment measures.

Table 4
Nature of IIT and Skill Adjustments

Variables	*ASC*	*AHSC*	*AMSC*
		1983-2000	
VIIT	-0.002	neg.	neg.
HIIT	-0.040*	-0.028**	-0.047*
		1983-1990	
VIIT	neg.	0.034*	-0.003
HIIT	0.024	0.005	0.040
		1993-2000	
VIIT	0.015	-0.012	0.023*
HIIT	0.006	0.002	-0.003

Note: 1. The above is a summary of the cross-section estimates.
neg.-negligible
* significant at 5% and ** significant at 10%.

In total, the distinction between VIIT and HIIT in the cross-section estimates appears justified, as it seems to impact on the results of labour adjustments in the way that is anticipated.

Conclusion

The cross-section estimates in this study provide some support for the widely held SAH of IIT. From the findings of this study on adjustment, it can be concluded that the time interval, the nature of IIT and the type of inter-industry adjustment proxy are all-important for one to accept or reject the SAH.

The three factors deemed important in examining the relevance of the SAH is captured largely in the overall findings of the cross-section estimations on adjustments. First, the negative impact of HIIT is significant only between 1983 and 2000. Second, VIIT has the positive sign and is found to significantly cause higher inter-industry adjustments in high skilled employment between 1983 and 1990, and higher inter-industry adjustments in semi skills for the high IIT period of 1993 to 2000.

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