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Product Quality Changes and Skills' Demand: An Empirical Study of Malaysia's Trade in Manufactures[*]

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Abstract:

The competitiveness of the Malaysian manufacturing sector has become a major issue given recent arguments that she is being squeezed by low wage competitors and rich country innovators. Critical to competitiveness is product quality. The relatively high level of matched trade (though declining), implying greater product differentiation, brings to the fore the extent of product quality changes and the implications for skill upgrading. The findings of the study indicate a less than favourable position for Malaysia due to a slowdown in matched trade coupled with severe trade-induced adjustments in the highly driven traded sector. There is only limited evidence of product quality improvements since the 1990s, and low quality varieties continue to dominate Malaysian manufactures. Following that, the low quality varieties of Malaysian exports are not viable for skill upgrading, as they do not beckon a higher demand for skills'. The findings of the study thus do not reveal any significant progression of the Malaysian manufacturing sector, contrary to claims of the sector moving up the quality ladder *via* higher value-added products.

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1. INTRODUCTION

The importance of foreign trade in manufactures for the Malaysian economy cannot be disputed. The manufacturing sector contributes approximately 30 per cent to overall Gross Domestic Product (GDP) in 2007 (Central Bank of Malaysia, 2008). Manufactured goods also account for a large percentage of Malaysian exports, approximately 78 per cent in 2007. Similarly, manufactured imports command a high share of total imports, due to rising demand for capital, intermediate and consumer goods (Amir, 2000). Nevertheless, Malaysia remains a net exporter of manufactured goods.

Being a middle-income country, recent arguments state that Malaysia may be squeezed between the low wage competitors that dominate in mature industries such as China and rich country innovators that dominate in hi-tech industries such as the US and Japan (Gill and Kharas, 2007). The fact that manufactures have been leading in Malaysia's trade therefore warrants a closer examination of the performance of this sector. The basic idea on performance impinges on the fact that the scope for product differentiation is great in manufactures and therefore trade openness may induce quality upgrading. Product differentiation in turn, which represents technological progress in a country's product (Kang, 2007), is able to proxy the degree and quality of labour in a given economy. Prior estimates indicate that the level of intra-industry trade (IIT) or matched trade in manufactures is considerably high. In 2005, IIT as measured by the unadjusted aggregate Grubel-Lloyd (AGL) index was 45 per cent at the 3-digit level of SITC (Standard International Trade Classification) disaggregation. More importantly, IIT adjustment was found to be high since the 1990s, without rendering increased competitiveness of the manufacturing sector in general (Devadason, 2007).

With the expansion of matched trade, quality improvement in differentiated products becomes critical to Malaysia's performance as a net exporter. The key question is: Has the Malaysian manufacturing sector progressed adequately to face stiffer global competition *via* improvement in product quality and utilization of higher skills'? The objectives of the paper are thus twofold. First, to document the changes in product quality in Malaysia's trade flows. Second, to estimate the effects of trade on skills' (within industry) demand in the manufacturing sector.

2. THEORY, METHODOLOGY AND DATA

2.1 Trade-Induced Changes

There is renewed interest in trade between countries in products that belong to the same sector, IIT. Prior to the 1990s, product differentiation centered on different varieties of a specific product that are of similar quality, horizontal intra-industry trade (HIIT). The distinction between HIIT and vertical intra-industry trade (VIIT, quality[1] based varieties) has now become critical given that the latter has grown in importance. VIIT is basically driven by differences in skill content since high quality goods require higher content of skilled labour relative to low quality goods (Widell, 2005).

Trade expansion, alongside product differentiation in matched trade, is critical as it presents different implications for factor markets. The most accessible framework for a discussion of adjustment issues in the labour market is the specific factors model, expounded

[1] Product quality was first emphasized in international trade by Linder (1961) (cited from Hallak, 2006; Bernard *et al.,* 2007).

concisely by Neary (1985). It is hypothesized that industries with high levels of IIT undergo less structural change in response to trade than industries with low levels of IIT. The former involves a reallocation within industries while the latter implies a reallocation between industries. It is often argued that the adjustment costs are lower when new trade is of the IIT type because disruption is minimized when adjustment is internal to an industry. It is easier to transfer and adapt resources within firms or industries than to switch them from one industry to another. This proposition has become known in the literature as the "smooth adjustment hypothesis (SAH)."

Brulhart (1999) is the first to establish the SAH hypothesis that is firmly rooted in the neo-classical thinking. The SAH simply implies that if offsetting contemporaneous import and export shocks (expanding and contracting activities) occur within a sector, adjustment costs will be lower or smoother than if those shocks affect separate industries. In the context of the specific factors model, the SAH implicitly either assumes that the mobility of labour is greater within than between industries. According to Brulhart (1999), the plausibility of labour mobility being higher within than between industries is more conceivable if skills requirements (factor mixes) are similar within industries with IIT. Therefore trade shocks will result in an easier transferability of labour from contracting firms to expanding firms within an industry since the labour can be redeployed with minimal training to the latter. Several qualifications have been made by Greenaway and Hine (1991) to justify smoother adjustment of IIT. First since much of the IIT is in parts and components (rather than in final goods), traded components are produced presumably in the same industry and rely upon similar skills to ensure smoother adjustment. Second, the issue of retraining is not the sole issue to ensure transferability since there is also geographical mobility. With the latter, they argue that expanding and contracting activities are more likely to be based in a given area in a setting of IIT than inter-industry trade.

The nature of IIT further complicates the conceptualizing of adjustment costs since varieties of vertically differentiated products have inherently different factor intensities which link to the relative factor endowments of the trading countries. Within the context of the SAH, labour might be relatively less mobile within VIIT than HIIT industries. Greenaway and Hine (1991) posit that factor mixes may alter in the process of specialization, particularly for VIIT. This results in complete retraining before transferability ensues. Following this logic, VIIT implies more severe adjustments since the transferability of labour from the contracting sector to the expanding sector may not be with comparative ease.

Given the expansion of product differentiation and quality improvements in international trade, recent contributions link IIT with the demand for labour, particularly high skilled [Manasse and Turrini (1999), Duranton (1999), Grossman (1999) and Beaulieu *et al.* (2004)]. The reasons for the links between IIT and skills are as follows: Assuming skilled labour determines the quality of goods produced and that the opportunities for greater trade rests with industries that are basically producing high quality products, the demand for high skilled labour would increase much faster. Second, to employ advanced technology to produce high quality goods, the pool of high skilled labour will have to increase. Third, the very fact that specialization in a smaller variety of products leads to higher scale of operation in production of each variety, which links to skill intensity. In this context, trade can be perceived as a cause for adjustment pressures (Greenaway *et al.,* 1994a, 1994b; Brulhart, 1999). Adjustments occur because of the following - temporary inefficiencies when markets fail to clear instantaneously in response to changes in demand; changes in trade flows between different time periods; and changes in factors of production.

Another dimension of understanding trade and labour markets is the trade inducing technological change, as suggested by Acemoglu (1999). The developing country is assumed to rely on imported technology mainly through foreign direct investment (FDI) rather than directly creating technology. Acemoglu argues that if the imported production technology is skill-biased (Robbins, 1996), trade may increase the demand for skilled labour. An additional channel of trade-labour links is the outsourcing of production activities abroad, an idea mooted by Feenstra and Hanson (1995). Moving low skilled activities abroad reduce the relative demand for unskilled labour at home within each industry, which produces the same effect as skill-biased technological change. Outsourcing can also induce technological change if the success of outsourcing depends on new inventory methods and rapid and sophisticated communication techniques. Productivity gains associated with the new techniques may result in labour reallocation within industries rather than between industries. Therefore employment may well rise and not fall, after some time lags in import competing

In summary, trade may induce competitive and efficiency effects in product markets, resulting in product differentiation. These factors alluded to as "trade-induced changes," represent the indirect effects of trade. Trade-induced changes and adjustment pressures of trade on the labour market may therefore translate into changes in skills, with the precise magnitudes depending on conditions in the labour market.

2.2 Measure of Product Quality Changes

The data are sourced from the UN COMTRADE database that records imports and exports in quantities and values. Merchandise imports and exports recorded in millions USD are deflated by the US consumer price index (CPI) at 1990 constant prices. This study will be based on highly disaggregated data, compiled at the 5-digit SITC (Standard International Trade Classification), Revision 3, to minimize composition problems. The total number of products considered is 2,090 manufactured products (Sectors 5-8). Product quality changes in matched trade are tracked over three sub-periods: 1990-1995, 1995–2000 and 2000–2005.

The method adopted is that which has been recently proposed[2] by Azhar and Elliott (2007). It involves a two-stage approach. In Stage 1, the S index[3] (Azhar and Elliott, 2003) is used to measure dynamic IIT. This index, also labeled as an index of trade-induced adjustment, is used to measure products that may have experienced large increases or decreases in matched trade over the period of analysis. The S index is given as:

$S = 1/2L\ (\Delta X - \Delta M) = (\Delta X - \Delta M)/\ 2[\max \{ |\Delta X|_t, |\Delta M|_t \}]$

where

L = largest change in exports (X) and imports (M) over the period studied

For the study, to infer the adjustments posed by matched trade, products with little IIT change and those that represent inter-industry trade are removed. Therefore the S index values are taken to be $-0.4 < S < 0.4$. A S index of 0 means X and M are exactly matched. At the extremes, X and M move in exact opposite directions either beneficial for the home country or *vice versa,* with S indices of +0.4 and –0.4 respectively.

In Stage 2, each product identified in Stage 1 is split into vertical and horizontal components using the product quality value (PQV)[4] index (Azhar and Elliott, 2006a; Azhar *et*

[2] Previous estimates on IIT at large focused on the GL (Grubel-Lloyd, 1975) index and the dynamic MIIT (marginal intra-industry trade, Brulhart, 1994) index. The quality of products is further differentiated based on the criterion proposed by (see Abd-el-Rahman, 1991; Greenaway *et al.,* 1994a).

[3] The S index satisfies four criteria (see Azhar and Elliott, 2003): monotonicity (increasing function of the net change in trade); consistency (adjustment costs associated with an industry expansion equals that with an industry contraction); country specificity (adjustment costs association with expanding or contracting industries) and matched trade changes do not involve resource reallocation costs.

[4] The PQV index exhibits proportionate scaling which is country invariant and thus less prone to distortions in product quality measurement, unlike that of the GHM (Greenaway, Hine and Milner, 1994a) and FF (Fontagne and Freudenberg, 1997) approaches (see Azhar and Elliott, 2006a; Azhar *et al*., 2006b).

al., 2006b). The PQV index is a measure of the dispersion of product quality in IIT flows. The basis for the PQV index is the calculation of crude unit values (UV)[5] by dividing the monetary value of trade by the quantity. The PQV is given as:

$PQV = 1 + [(UVX - UVM)/ (UVX + UVM)]$ where $0 < PQV < 2$

Where

UVX = unit value of export

UVM = unit value of import

From the PQV index, the extent of quality differences at the product level associated with the various bilateral trade relationships are quantified. The products are considered as HIIT or of similar quality if the X and M share at least 85 per cent[6] of their costs (reflected in the price). Thus,

$0.85 < PQV < 1.15$, HIIT

When all two-way trade is equal in quality (VIIT = 0), the PQV index is equal to unity. When imports and exports of a product share only 50 per cent of their costs, they are classified as VIIT. Products that are VIIT are further decomposed into those that are high quality (VIITH) and those that are low quality (VIITL) as follows:

$PQV > 1.15$, VIITH

$PQV < 0.85$, VIITL

2.3 Estimation of Trade Effects

The empirical analysis is based on a specially constructed database, established by integrating trade, labour and industry statistics. The dataset involves consistent yearly and industry coverage of a panel of 19 major industrial groups (at the 3-digit aggregation level) spanning the period 1983 to 2004[7], to facilitate empirical enquiry. Thus the unit of observation in the data is industry. The dataset, a balanced panel of 418 observations, is informative in that it includes all manufacturing industries, excluding only the non-tradable.

Trade data for the panel analysis is compiled for industries at the 3-digit Standard International Trade Classification (SITC level, Revision 3). The data on imports (M) and exports (X) for the period 1983 to 2004 are derived from the *Malaysia: External Trade Statistics* publications. Exports do not include re-exports. Exports are valued f.o.b. while imports c.i.f. Exports and imports are in ringgit Malaysia at current prices. Manufacturing imports and exports is deflated with the import price and export price index (1980=100) for the entire economy respectively.

Labour data (employment and wages) is drawn from industrial surveys conducted annually by the Department of Statistics (DOS) Malaysia. The study only considers full-time paid employees (measured in terms of numbers employed, and not the total man-hours worked[8] due to data unavailability), which excludes working proprietors and active business partners, unpaid family workers and part-time paid employees. Similarly only annual salaries and wages of full-time paid employees are taken into account. Salaries and wages paid refer to cash payments, including bonuses, commissions, over-time wages and cost of living

[5] Price is considered an indicator (albeit imperfect) of quality, that is higher quality goods command higher prices (see Widell, 2005; Azhar, 2006a; Hallak, 2006). There are concerns that price (or rather UVs) may pick up other influences such as production costs, efficiency and compositional changes (Hallak, 2006; Silver, 2007; Fabrizio *et al.,* 2007).

[6] The cut-off point however does involve a certain degree of arbitrariness.

[7] The latest survey conducted at the time of study is 2004.

[8] Since part-time employees are excluded, variance in hours of work is expected to be small. (Full-time employees represent 98-99 per cent of the total number of persons engaged in the Malaysian manufacturing sector).

allowances[9]. The employees' contribution to the social security schemes or to other provident or superannuating funds is included but the employer's contribution is excluded. Salaries and wages are deflated by the consumer price index at 1980 constant price. The wage measures used for the study are real average annual wages, calculated as the real annual full-time wages divided by the number of full-time employees. The definition of skills used for the study is solely based on occupational groupings governed by the availability of data. The study defines skills to include categories of managerial, professional, technical and supervisory workers.

Other industry measures employed comprise real output (Q), real value-added (VA), capital intensity (K) and the share of foreign direct investment in total capital investment (FDI/CI). Output and value-added are deflated by the GDP deflator at 1980 constant prices. Capital intensity is measured as fixed assets deflated by the consumer price index at 1980 constant prices and then divided by real output[10].

The study will take the labour perspective in analyzing the skill upgrading implications of trade flows. Generally, demand for labour is taken as being a derived demand – derived from the demand for the products produced by firms and hence affected by the product market conditions under which products are sold. The relative effects (factor input shares) of trade on labour demand are estimated using skill share equations derived from a standard translog cost function that has been widely used in the literature, such as studies by Machin *et al.* (1996) and Anderton *et al.* (2001). The translog function is considered appealing in that it provides a second order approximation to any cost function and it does not impose any restrictions on the substitutability of imports. The variable cost function in translog form that assumes capital to be a fixed factor of production is as follows:

$$\ln C_i = \alpha_0 + \alpha_q \ln Q_i + ½\, \alpha_{QQ} \ln(Q_i)^2 + \beta_k \ln K_i + ½\, \beta_{KK} \ln(K_i)^2 + \Sigma_j \gamma_j \ln W_{ij} + ½\, \Sigma_j \Sigma_k \gamma_{jk} \ln W_{ij} \ln W_{ik} + \Sigma_j \delta_{Qj} \ln Q_i \ln W_{ij} + \Sigma_j \delta_{Kj} \ln K_i \ln W_{ij} + \rho \ln Q_i \ln K_i + \lambda_T T_i + ½\, \lambda_{TT} (T_i)^2 + \lambda_{QT} T_i \ln Q_i + \lambda_{KT} T_i \ln K_i + \Sigma_j \varphi_{TWj} T_i \ln W_{ij}$$

where

C_i = variable costs in industry i

Q_i = output in industry i

K_i = capital stock in industry i

W_{ij} = price of variable factor j

T_i = technology in industry i

Cost minimization of the above generates the following linear equations for the factor shares (L):

$$L_{ij} = \gamma_j + \delta_{Qj} \ln Q_i + \delta_{Kj} \ln K_i + \Sigma_k \gamma_{jk} \ln W_{ik} + \varphi_{TWj} T_i \tag{1}$$

Differencing (denoted by d) the above with respect to factor prices generates:

$$dL_{ij} = \varphi_{TWj} dT_i + \delta_{Qj} d\ln Q_i + \delta_{Kj} d\ln K_i + \Sigma_k \gamma_{jk} d\ln W_{ik} \tag{2}$$

Assuming homogeneity of degree one in prices imposes:

$$\Sigma_k \gamma_{jk} = \Sigma_j \gamma_{jk} = \Sigma_j \delta_{Kj} = \Sigma_j \delta_{Qj} = 0 \tag{3}$$

this generates

$$dL_{ij} = \varphi_{TWj} dT_i + \delta_{Qj} d\ln Q_i + \delta_{Kj} d\ln K_i + \gamma d\ln(W_j/W_k) \tag{4}$$

with two variable factors j and k.

[9] The determination of salary and allowances are quite structured in Malaysia. The amount of bonuses paid is decided upon an annual negotiation between firm management and labour union according to the profit of the firm and performance of individual workers. Thus bonuses are included to reflect differences in wages.

[10] Capital intensity does not only capture the concentration ratio, but also other factors such as profit rate, different level of substitution between capital and labour and bargaining power. It has been argued that capital intensity may proxy for bargaining power since it is more likely for workers to be better organized in capital intensive industries for a variety of reasons.

Machin *et al.* (1996) and Anderton *et al.* (2001) define the two variable factors of production as skilled (S) and unskilled (U). The skill share equation is thus defined in the above as the proportion of skilled employment to total employment.

Since there is no technology data available and given that technologies are mostly foreign sourced and embodied in imported capital, foreign direct investment is used as an indirect measure of technology. Theoretically, skill upgrading occurs when foreign direct investment causes technological spillovers that are skill-biased and when capital-skill complementarities exist. The other demand shifters considered for the study are the effects of foreign competition, captured by trade flows.

The skill share equation is differenced to transform out the industry specific fixed effects. The static equations estimated in the panel analyses are as follows:

$$d(S/N)_{it} = \Omega - \Sigma\varphi_0 d\ln(SW/USW)_{it} + \Sigma\varphi_1 d\ln(VA)_{it} + \Sigma\varphi_{2j} dK_{it} + \Sigma\mu_1 d(FDI/CI)_{it} + \Sigma\mu_1 d\ln M_{it} - \Sigma\mu_2 d\ln X_{it} + \varepsilon_{it} \quad (5)$$

$$d(S/N)_{it} = \Omega - \Sigma\varphi_0 d\ln(SW/USW)_{it} + \Sigma\varphi_1 d\ln(VA)_{it} + \Sigma\varphi_{2j} dK_{it} + \Sigma\mu_1 d(FDI/CI)_{it} + \Sigma\mu_1 d\ln M_{it}{*}d(US/N)_{it} - \Sigma\mu_2 d\ln X_{it}{*}d(US/N)_{it} + \varepsilon_{it} \quad (6)$$

where
i = industry
t = time
Ω = constant
(S/N) = ratio of skilled employment to total employment
(SW/USW) = ratio of skilled wages to unskilled wages
VA = real value-added
K = real capital intensity
(FDI/CI) = share of foreign direct investment in total capital investment
M = real imports
X = real exports
(US/N) = ratio of unskilled employment to total employment
ε represents the error term that picks up random measurement errors in skill share and the effects of labour demand shocks on relative employment, which are not picked up by the included independent variables.

3. ADJUSTMENTS AND PRODUCT QUALITY CHANGES

The manufacturing sector had already undergone substantial and rapid structural changes in the commodity mix of exports and imports by the 1990s. The commodity mix of trade as shown in Table 1 broadly conforms to *a priori* expectations of a shift towards a higher level of industrial sophistication, that is industries that exhibit high growth in world markets.

The largest sector contributing to total manufacturing exports is SITC 7. The exports of electronics, electrical machinery and appliances represent the largest share (66 per cent in 2005) in total manufacturing exports. This does not imply that Malaysia has moved into industries requiring skill- and capital-intensive production processes and thus no longer specializes in exporting unsophisticated, labour-intensive manufactures. In fact, within the skill- and capital-intensive industries, Malaysia is still involved in relatively labour intensive segments of component production and assembly activities. The high concentration in the exports of electronics, electrical machinery and appliances (SITC 7) indicate that the composition of manufactured exports is narrowly based. Similarly, the SITC 7 group again constitutes the largest share of total imports. The electrical and electronic products and machinery manufacturing remained as the dominant sub-sector within manufacturing imports since 1990. The other remaining industries do not reflect significant changes in their export and import composition shares.

Table 1: Composition of Malaysia's Trade, 1990 - 2005

	SITC 5	SITC 6	SITC 7	SITC 8	SITC 5	SITC 6	SITC 7	SITC 8
Year	**Exports**				**Imports**			
1990	2.96	14.38	64.59	18.07	10.59	19.70	62.63	7.09
1995	4.02	11.66	72.80	11.51	8.29	16.21	69.81	5.69
2000	4.71	8.50	76.93	9.86	8.40	12.24	72.77	6.59
2005	7.18	9.75	72.03	11.05	9.66	13.62	70.29	6.43

Note: SITC 5 – chemicals and related products; SITC 6 – manufactured goods classified chiefly by material; SITC 7 – machinery and transport equipment and SITC 8 – miscellaneous manufactured articles.

Source: Calculated from the UN COMTRADE.

It is obvious that sectors that are enjoying high and growing export shares have also high import shares. It is claimed that the modern and growing sectors of manufacturing in particular are highly dependent on imported components. This is either a reflection of the low level of linkages to other industries or that component production and assembly within vertically integrated production systems are typically more import intensive (Athukorala and Yamashita, 2005). In the latter case, Athukorala and Rajapatirana (2000) assert that there is difficulty in influencing procurement practices of firms in component production and assembly since the import structure is determined as part of the overall process of international production. Therefore any dynamic changes in the import structure of these industries can be identified with changes in their export structure and *vice versa*. For example when exports decrease, imports contract even faster (Amir, 2000; Mahani, 2002).

The high concentration of trade in SITC 7 in particular therefore implies a plausibility of high levels of matched trade. The following therefore adopts a more recent method to assess the dynamic changes in matched trade, adjustments and quality changes over three sub-periods. Table 2 reports the number of products with significant changes in matched trade.

Table 2: Number of Products with Positive S Index

	1990-1995		**1995-2000**		**2000-2005**	
Sector	TOTAL*	S > 0	TOTAL*	S > 0	TOTAL*	S > 0
	(39.98-43.88)		***(33.17 – 34.99)***		***(20.88 – 25.54)***	
SITC 5	89	33	80	43	118	56
SITC 6	198	89	176	103	185	95
SITC 7	188	60	152	96	206	95
SITC 8	148	78	125	59	146	67
TOTAL	623	260	533	301	655	313

Note: 1. *Total number of products that have experienced significant changes in matched trade for the period based on the S index (-0.4 < S < 0.4). The S index is calculated at the 5-digit level and reported at the 1-digit level.
2. Figures in parenthesis refer to the percentage value of two-way trade in total trade for the various bilateral relationships based on the start and end-year for the period.

Source: Calculated from the UN COMTRADE.

From Table 2, though the number of products identified as having significant changes in matched trade has increased between 1990 and 2005, the export value shares of these products in total exports has indeed decreased. Further, the percentage of products with a positive S index at the 5-digit level at 42 per cent between 1990-1995 increased to 56 per cent between 1995-2000 and thereafter recorded a decline to 47 per cent in the most recent period. By sectors, generally the majority of products traded had a negative S index. This implies a less than favourable position for the Malaysian manufacturing sector in terms of international exchanges. To further assess the adjustment implications, the S index for Malaysian manufactures from 1990-2005 is aggregated from the 5-digit level. Table 3 presents the results.

Table 3: S index for Malaysian Manufactures

Sector	1990-1995	1995-2000	2000-2005
SITC 5	-0.005	0.190	0.057
SITC 6	-0.100	0.190	-0.161
SITC 7	0.094	0.068	-0.010
SITC 8	0.082	-0.388	0.213
TOTAL	**0.078**	**0.057**	**0.010**

Note: The S index in the above table is aggregated from the 5-digit SITC level.

Source: Calculated from the UN COMTRADE.

On aggregate, the S index suggests benign trade-induced adjustment implications, which has indeed reduced succinctly over the three sub-periods. By sector, trade in SITC 6 and 7 impose severe (contracting) adjustment pressures for the period 2000-2005. The negative adjustments in SITC 7 are worth noting given that it is the largest contributing sector to Malaysia's trade. Amir's (2000) study using the RCA (Revealed Comparative Advantage) index reveals a decline for the entire telecommunication and sound equipment division (SITC 76) between 1994 and 1998, attributing the disadvantage to rising global competition that affects price and non-price determinants. Recent trends indicate that within the SITC 7, the performance of the electrical and electronics products in particular was affected by the transition from old products like cathode-ray tube televisions and VCD players to higher value-added products like high definition LCD televisions, DVD recorders and Blu-ray players (Central Bank of Malaysia, 2008).

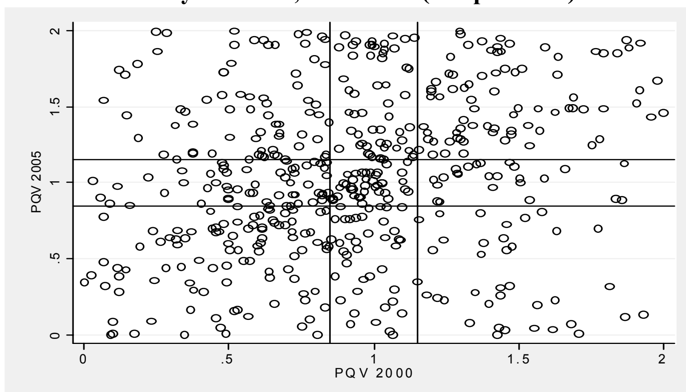
The competitive position of the manufacturing sector is further analyzed *via* shifts in product quality. Previous work using the GL and MIIT indices indicate that product differentiation, particularly VIIT rather than HIIT, has increasingly dominated trade patterns in Malaysian manufacturing. Furthermore, it was ascertained that Malaysia specializes in VIITL vis-à-vis VIITH (Devadason, 2007). Figure 3 caricatures the PQV index for three sub-periods to track dynamic shifts in product quality.

Figure 3 shows that there has been an increase the export value shares of VIITH from 13 per cent to 39 per cent in the latest period, unlike the earlier two sub-periods. With the exception for 2005, the total number of products classified as VIITH is consistently less than VIITL (see Appendix 2). There is thus no clear indication of quality improvements in matched trade between sub-periods and even for the period 2000-2005, the export share values of VIITH are not high enough to justify significant progress in manufacturing.

By sector (Figure 4), most products traded under SITC 6 are classified as HIIT. Conversely, exports of miscellaneous manufactured articles (SITC 8) are generally VIITH. As for SITC 7, the number of products classified as VIITH does not differ substantially from

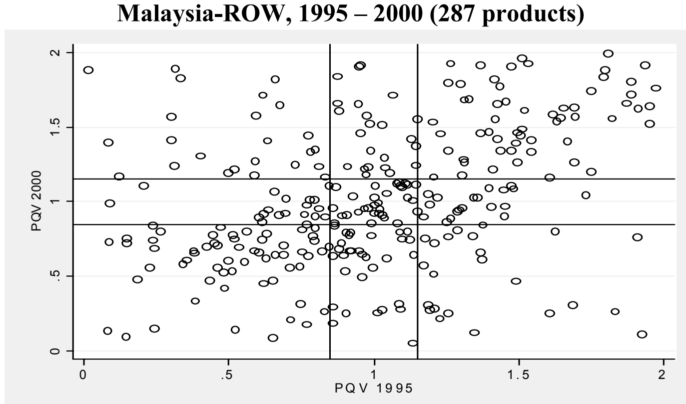
Figure 1: PQV Index for Malaysian Manufactures, 1990-2005

Malaysia-ROW, 2000-2005 (528 products)



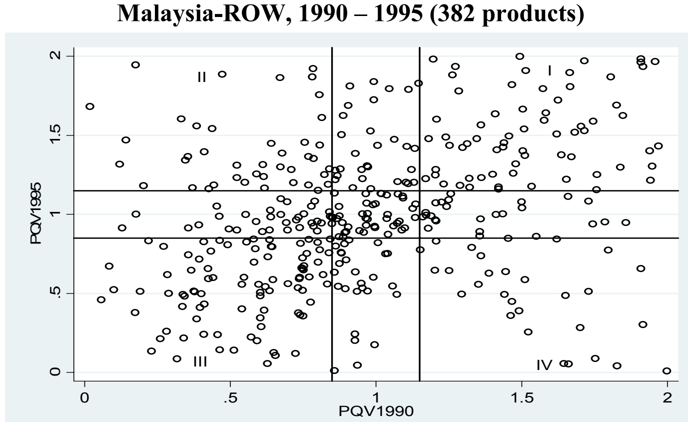
VIITH (2000 – 2005) – 12.80% to 39.23%

Malaysia-ROW, 1995 – 2000 (287 products)



VIITH (1995 – 2000) – 14.34% to 11.22%

Malaysia-ROW, 1990 – 1995 (382 products)



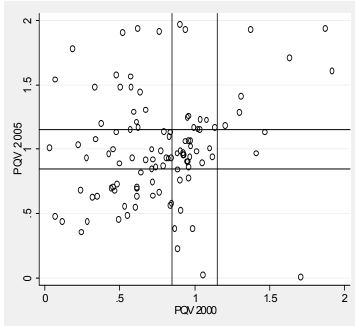
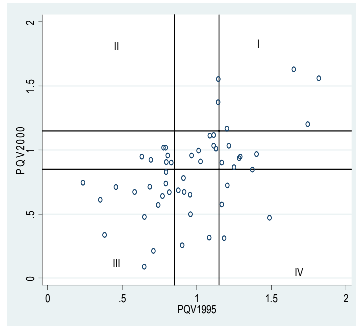
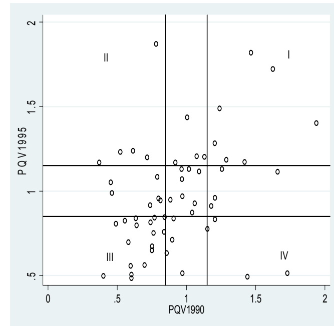
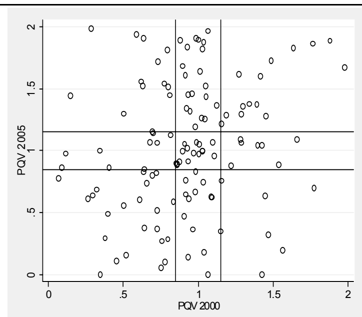
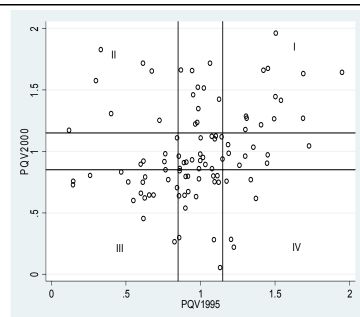
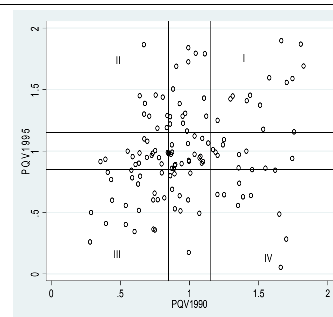
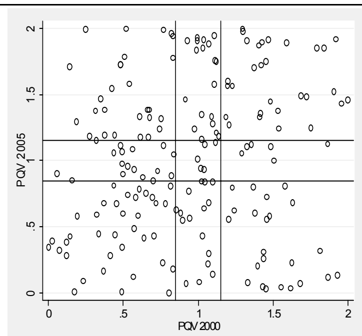
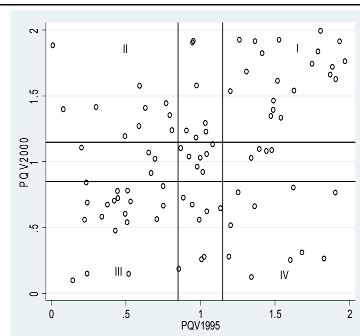
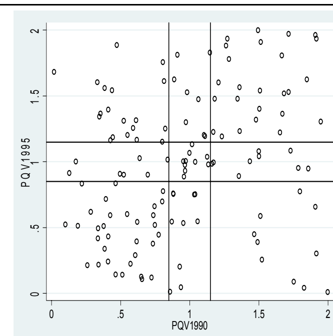
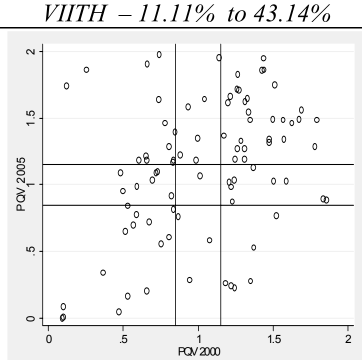
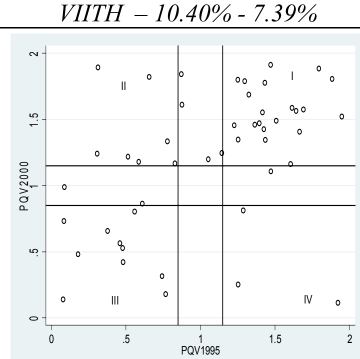
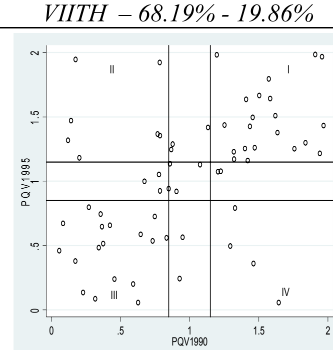
VIITH (1990 – 1995) – 62.14% to 23.19%

Note: 1. Data below the respective diagrams indicate the share of export value within matched trade that is VIITH for the start and end-period.

2. Products that fall within the t-zone represent horizontally differentiated goods (HIIT). Quadrant I represents products that have remained as high quality vertically differentiated goods (VIITH), quadrant II refers to products that shifted from low quality vertically differentiated goods (VIITL) to VIITH, quadrant III are products that have remained as VIITL and quadrant IV represents products that has shifted from VIITH to VIITL.

Source: Calculated from the UN COMTRADE.

Figure 2: PQV Index by Sectors 5-8, 1990-2005

SITC	2000-2005	1995-2000	1990-1995
5			
	VIITH – 1.52% to 17.56%	*VIITH – 6.62% - 2.94%*	*VIITH – 6.05% - 5.97%*
6			
	VIITH – 15.26% to 31.88%	*VIITH – 4.44% - 7.83%*	*VIITH – 7.74% - 34.03%*
7			
	VIITH – 11.11% to 43.14%	*VIITH – 10.40% - 7.39%*	*VIITH – 68.19% - 19.86%*
8			
	VIITH – 38.29% to 45.87%	*VIITH – 73.34% - 73.28%*	*VIITH – 40.80% - 66.81%*

Note: The explanation of Figure 2 holds.

Source: Calculated from the UN COMTRADE.

that of VIITL. This concurs with previous findings of a dualistic structure for the electronics and electrical industry in particular; a relative strength in capital-intensive automated operations but a structural weakness in labour intensive assembly line operations (see Amir, 2000).

The above findings point to a slowdown of the manufacturing sector in terms of less product differentiation, severe adjustment pressures and low levels of product quality improvement, particularly in key sectors. The extent to which Malaysia can sustain and expand her share in global trade very much depends on her capacity to sustain her export competitiveness in the key sectors of manufacturing on the basis of quality.

4. EMPIRICAL FINDINGS

One implication of trade-induced adjustments is the ensuing changes in factor shares. The skill share in Malaysian manufacturing though considerably low at 19 per cent in 2004 (latest data available based on the 2004 industrial survey), rose from 13 per cent in 1983. Despite the low level of skills in manufacturing, the skill shares vary considerably across industries, ranging from 6 per cent to 64 per cent.

Table 3 reports the results of the links between trade and skills using the GMM[11] estimator of Arellano and Bond (1991) for equations (5) and (6). The results of the one-step model are reported though the null hypothesis of no first-order correlation in the difference residuals is rejected for all specifications, since Arellano and Bond (1991) recommend the one-step results instead of the two-step standard errors for inference on coefficients. The one step results are found to be free of second order autocorrelation for all specifications. For ease of exposition, the resulting estimates of other explanatory variables are not discussed below.

The results indicate that the growth of imports reduce the growth of skill shares in manufacturing. This is not surprising given that previous studies indicate that Malaysia's aggregate imports comprise higher skill content than that of exports. Similarly, export growth has a negative but statistically insignificant coefficient. This concurs largely with the results displayed in Figure 2, which shows that despite an improvement in product quality between sub periods, the percentage value of VIITH remains low.

The above results are not statistically different when unskilled labour shares in each industry are used as an additional instrument [see equation 5(b)]. However, since a lack of skill upgrading is evident with trade expansion, the export and imports variables are interacted with unskilled labour shares in each industry (see equation 6) to assess the impact on unskilled intensive industries. On aggregate, imports significantly cause larger declines in the growth of skill shares in unskilled intensive industries.

[11] As relative labour demand is likely to show inertia leading to first-order correlation in the errors, the lagged dependent variable is included as an explanatory variable. Further, the potential endogeneity of relative wages and capital intensity are addressed by using the first, second and third lagged values of an additional instrument, unskilled labour shares in each industry.

Table 3: GMM Estimates of Skill Share Equations (one step results)

Independent Variables	(5a)		(5b)		(6)	
	coefficient	Std. Err.	coefficient	Std. Err.	coefficient	Std. Err.
constant	0.676**	0.179	0.680**	0.179	0.663**	0.193
$d(S/N)_{t-1}$	-0.304**	0.023	-0.303**	0.023	-0.310**	0.043
$d(S/N)_{t-2}$	-0.174**	0.021	-0.173**	0.021	-0.195**	0.044
$d(SW/USW)_t$	-0.016**	0.002	-0.016**	0.002	-0.012**	0.002
$dln(VA)_t$	-0.854	0.467	-0.862	0.471	-0.248	0.26
dK_t	0.128*	0.062	0.128*	0.062	0.073*	0.034
$d(FDI/CI)_t$	-0.002	0.002	-0.002	0.002	-0.005	0.003
$dlnM_t$	-0.758*	0.222	-0.770*	0.363		
$dlnX_t$	-0.041	0.362	-0.060	0.216		
$dlnM_t*d(US/N)_t$					-0.762**	0.126
$dlnX_t*d(US/N)_t$					-0.048	0.085
2nd order serial correlation	-0.124		-0.137		1.232	
Wald test	695.53 (8)		723.25 (8)		1365.57 (8)	
No. of observations	342		342		342	

Note: 1. The standard errors reported are the robust standard errors.
2. The Wald test is a test of the joint significance of the independent variables asymptotically distributed as a chi-square under the null of no relationship. The figure in parenthesis represents the number of coefficients estimated (excluding time dummies).
3. The additional instrumental variable used in Equation 5(b) is the shares of unskilled labour in each industry.
** significant at 1% and *significant at 5%.

In summary, trade expansion over the past two decades cannot explain the rise in skill shares in manufacturing. Given that product quality is related to skills, the low quality varieties that continue to dominate Malaysian exports do not beckon for a higher demand for skills. The empirical findings of the study negate any significant impact of exports on skill upgrading contrary to claims that industries have moved up the quality ladder to produce higher value-added goods.

5. CONCLUSION

The study has shown that the prominence of IIT does not conform to *a priori* expectations. Previous work on IIT using traditional measures may have grossly overstated the increase in two-way trade between Malaysia and the rest of the world. The low levels of IIT (at least in the period 2000-2005) appear to suggest that Malaysia may be losing an edge in terms of product variety or product differentiation.

The type of IIT during the period was due, fundamentally to two-way trade of vertically differentiated products. Further the disaggregation of the VIIT into ranges of quality shows that Malaysia specializes in low quality products. The low quality varieties, in turn, proxy for low skill levels, thereby hindering any form of skill upgrading. This contributes to the severe adjustment pressures for manufacturing particularly in high-driven traded products that need to be addressed.

The study contends that competitiveness of the manufacturing sector is necessary, *via* product quality. This requires adding more value than competitors. Critical to these value-added process, hence quality improvements, is the pool of talent workers. The right human capital to maximize assets such as machinery and equipment is essential for improving competitiveness (The Star, 21 April 2008). The heavy reliance on unskilled foreign workers will derail the move up the value chain, resulting in a continuous trap of producing low quality varieties.

Appendix 1: Product Quality (Number of Products)

	1990 - 1995						**1995 – 2000**						**2000 - 2005**					
	1990			1995			1995			2000			2000			2005		
Sector	VIITL	VIITH	HIIT	VIITL	VIITH	HIIT	VIITL	VIITH	HIIT	VIITL	VIITH	HIIT	VIITL	VIITH	HIIT	VIITL	VIITH	HIIT
SITC 5	30	15	16	25	16	20	22	15	17	26	6	21	63	11	37	36	34	42
SITC 6	48	36	46	50	46	51	40	30	52	40	31	32	52	36	50	44	56	37
SITC 7	59	45	28	53	55	27	37	36	22	39	37	16	81	58	41	79	81	27
SITC 8	29	27	8	26	32	9	20	28	7	16	36	5	36	46	10	25	48	18
TOTAL	166	123	98	154	149	107	119	109	98	121	110	74	232	151	138	184	219	124

Note: The total number of products in the above table does not match that which is indicated in Table 2 given that for some products, the unit values could not be calculated either due to missing data on quantity or different units of quantity measurement for exports and imports.

Source: Calculated from the UN COMTRADE.

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