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EMERGING TRADE PATTERNS OF MALAYSIA WITH CHINA, US AND JAPAN: A COMPARATIVE ANALYSIS*

ABSTRACT:

The US, Japan and recently China are all important markets for Malaysia's manufactures. Trade ties with China in particular have grown faster than that with the rest of the world. Being a middle-income country, there are arguments that Malaysia may be squeezed between low wage competitors such as China and rich country innovators such as the US and Japan. The paper compares the shifts in trade pattern, namely quantity flows and trade structure, between Malaysia and the three global players. Specifically, implications of trade for product quality and skill upgrading effects in Malaysia are examined from aggregate trade and component trade flows.

Keywords: Quantity Flows, Trade Overlap, Component Trade, Product Quality, Skill Upgrading.

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1. INTRODUCTION

The United States (US), Japan and recently China are not just global players in merchandise trade but are also important markets for Malaysia's manufactures[1]. The US maintained its position as Malaysia's main trading partner in manufactures over the past two decades, commanding a share of 16.6 per cent of total trade in 2005. Japan, Malaysia's third most important trading partner (11.7 per cent of total trade in 2005) seems to be losing ground in terms of both export and import market shares of Malaysia in the recent past due to the economic recession in Japan. In fact, Japan has declined from its position as the top-trading partner of Malaysia in 1996. In contrast, the most dynamic trading position is registered by China[2]. Malaysia's trade with China has grown tremendously to account for 8.8 per cent of total trade in 2005, thus emerging as the fourth largest trading partner of Malaysia since 2001.

Apart from greater trade levels between Malaysia and the three countries, there has been a rapid internationalization of production (Ng and Yeats, 2001; Jones *et al*., 2005; Gaulier *et al.,* 2004; Athukorala and Yamashita, 2006; Gill and Kharas, 2007; Gaulier *et al.,* 2007), which translates into the expansion of component trade. In fact, all four countries (including Malaysia) are at the "core" of trade in intermediate inputs and capital goods (Srholec, 2006). The combined market shares of the three trading partners for Malaysian exports and imports of components in 2005 were 30 per cent and 46 per cent respectively. The internationalization of the US and Japanese semiconductor and electronics industries in the 80s had not only established production networks but also created division of labour based on vertical specialization[3] (Ernst, 2003). As such, it is not surprising that network trade of Malaysia is quite established in bilateral trade with the US and Japan. Of interest is China's recent integration into the region's production networks (Chin, 2007), thus emerging as a conduit of exports (assembly and processing of imported inputs for re-exports) from the region to the industrialized world (Huang, 2007; see also Gaulier *et al.*, 2007).

Being a middle-income country, there are arguments 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). Are the current winds of change in trade working against Malaysia?

It is thus important to compare the shifts in trade pattern (quantity flows and trade overlap) between Malaysia and the three global players both from the aggregate trade and component trade perspectives. Subsequently the effects of trade on local upgrading of Malaysian manufactures are explored in terms of product quality and skills.

2. TRADE, SKILLS AND PRODUCT QUALITY

The Hecksher-Ohlin (HO) model, based on differing factor endowments across countries, provides one of the most important theories of international trade for understanding the links between trade and labour. The typical model based on the HO theory assumes that the industrialized country is relatively rich in skilled labour and the developing country is relatively rich in unskilled labour. According to this theory, the developing country will thus export unskilled intensive goods and import skill intensive goods. The elemental theory however assumes that countries trade in final goods and thus fails to account for current trade flows that witness greater shipment of parts and components of manufactures between countries.

The recent changing structure and composition of trade results in the unskilled abundant country abandoning the production of the final good, and instead assembling the imported skilled segment with domestic production (This reasoning follows the HO lines for the basis for trade, see Jones *et al.,* 2005) or even manufacturing certain components (segments) of the product. This can arise due to large factor price differentials between countries, which allow for some of the production segments to be produced more cheaply in another country. Put simply, industries across the globe are now characterized by segments with varying skill requirements. From the perspective of an unskilled abundant country, the more skilled intensive segment will be moved abroad. Hence unskilled labour intensive countries may not only gain a comparative advantage in low-end industries but also low-end production stages of high industries. However, if the segment produced locally is relatively skilled intensive compared to the entire economy and its output increases, the relative demand for skilled labour in the economy may well increase (Helg and Tajoli, 2004; Feenstra and Hanson, 2001). The change in relative demand for skilled labour ultimately depends on how factor proportions of segments compare to the average factor intensities within the country.

Other contributions that link trade structure with the demand for high skilled and low skilled labour are traced by studies of Manasse and Turrini (1999) and Duranton (1999). Manasse and Turrini (1999) assume that goods are differentiated in a horizontal and vertical way. The quality of goods in turn is determined by skills. They assume that only high quality goods will be traded since there is a fixed cost that needs to be paid by exporters. Duranton however (1999) looks merely into horizontal intra-industry trade, whereby the skill levels determine the quality of intermediate goods. Final good producers who desire for advanced production technology will resort to trade to acquire the high quality intermediates abroad due to the scarcity of skilled labour locally and hence the limited high quality local intermediates. Trade therefore indirectly increases the demand for high skilled workers.

A multitude of explanations co-exist on how trade may create pressures for product- and labour upgrading. The product life cycle hypothesis for example explains that the type of labour skills needed is linked to the phases of the product life. High skills are needed for the initial and growth phases of the product relative to the mature phase (letto-Gillies, 2005). Upgrading of workers' skills through training and education may thus follow from the continuous improvement of products and processes. There is also a possibility for skill upgrading with increases in imports of capital and intermediate goods. Imports of components for assembly may become the easiest way to acquire high technology and benefit from technological spillovers (Gaulier *et al*., 2004; Feenstra and Hanson, 2001). The knowledge diffused through trade which also includes tacit forms of 'organizational knowledge,' requires skilled workers (both technical and managerial skills).

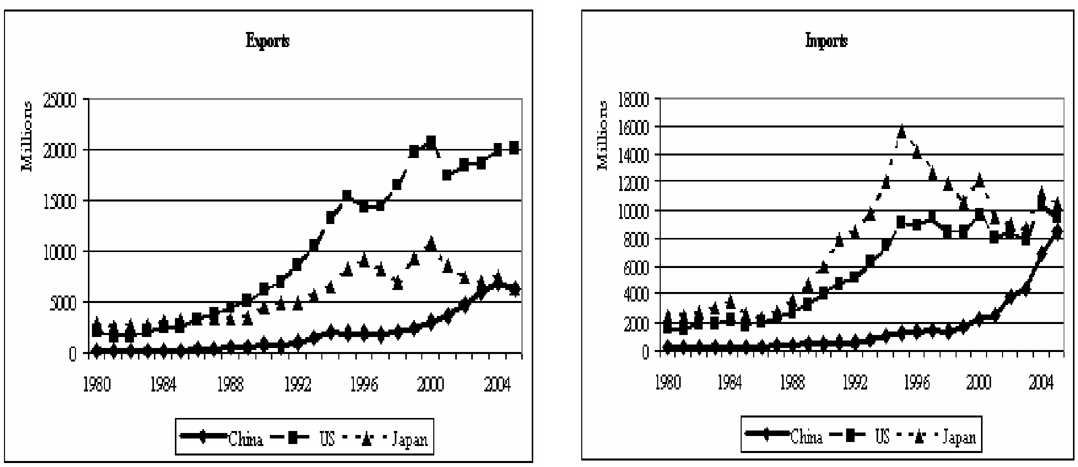
In short, the implications of the structure of the trade for local upgrading, industrial- and skill upgrading, may be viewed as a two-edged sword. First, it shapes the capacity to upgrade production activities as the export role shifts. Globalization of production contributes to the development of new comparative advantages ("recycling comparative advantages"), which is said to be at the core of East Asian industrialization (Gaulier *et al.,* 2004). This may involve either product shifts, changes in economic functions, intrasectoral progression or intersectoral shifts. Second, it provides for a finer division of labour (Lemoine and Unal-Kesenci, 2001; see also letto-Gillies, 2005, for explanation on the new international division of labour in the electronic age). The sector, which is moving abroad the skilled intensive segment of production and maintaining the unskilled intensive segments, may not necessarily experience a decrease in the relative demand for skilled labour.

3. BILATERAL TRADE PATTERNS: CHANGING LANDSCAPE

3.1 Aggregate Trade

Figure 1 displays the quantity flows between Malaysia and the three global players. Generally, exports to and imports from all three trading partners have been on an upward trend. However since the entry of China into the World Trade Organization (WTO) in 2001, quantity flows with Japan and the US appear to be on the decline. Kwek and Tham (2005) also assert that Malaysia's trade ties with China have grown faster than that with the rest of the world, particularly since the aftermath of the financial crisis in 1998.

FIGURE 1. TRADE FLOWS WITH CHINA, US AND JAPAN (IN USD MILLION)



Note: 1. Exports and imports are in real terms, deflated with the export price and import price indices (1980=100) respectively.
2. Data is converted from RM to USD based on the average yearly exchange rate.

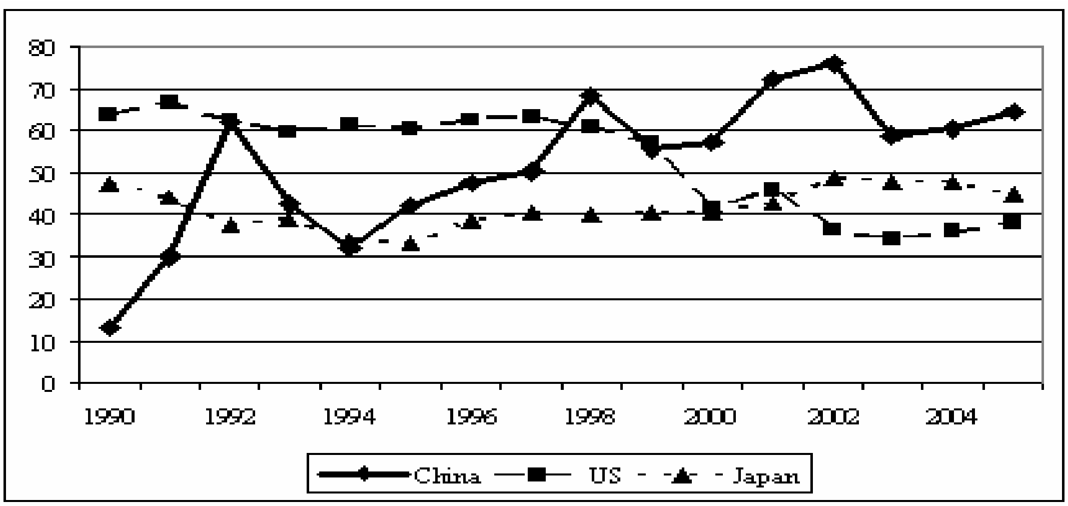
Source: Calculated from the *Malaysia: External Trade Statistics*, various issues.

Though trade flows to China still lag behind that with the US and Japan, the average annual growth rate of exports to China was highest at 21 per cent vis-à-vis that with the US (13 per cent) and Japan (6 per cent). Similarly, the average annual growth rate of imports from China at 19 per cent for the entire period was double that of the US and Japan. In terms of trade balances, generally surpluses are observed with China since the mid-1980s. Whilst surpluses remain in trade with the US, persistent deficits prevail in Malaysia's trade with Japan.

To examine further bilateral trade ties with China, US and Japan, the extent of trade overlap is examined. Figure 2 presents the extent of two-way trade (trade overlap), as measured by the aggregate Grubel-Lloyd (AGL) index (see Grubel and Lloyd, 1975), in bilateral flows.

The AGL indices are below 50 per cent for trade with Japan, indicating that one-way trade (inter-industry trade) very much prevails in total trade flows in manufactures with Japan. Whilst the AGL indices with the US indicate swings between intra- and inter industry trade, the extent of trade overlap has been on the decline since the mid-1980s. The opposite prevails for Japan and China where the AGL indices are trending upwards. The AGL index for trade with China increased from less than 1 per cent in 1980 to 64 per cent in 2005. Two-way trade thus characterizes trade flows with China since 2001.

FIGURE 2. AGL INDICES WITH CHINA, US AND JAPAN IN MANUFACTURES (IN PER CENT)



Note: The Grubel-Lloyd indices are calculated at the 3-digit SITC (210 products) prior to aggregation.

Source: Calculated from the *Malaysia: External Trade Statistics*, various issues.

3.2 Component Trade

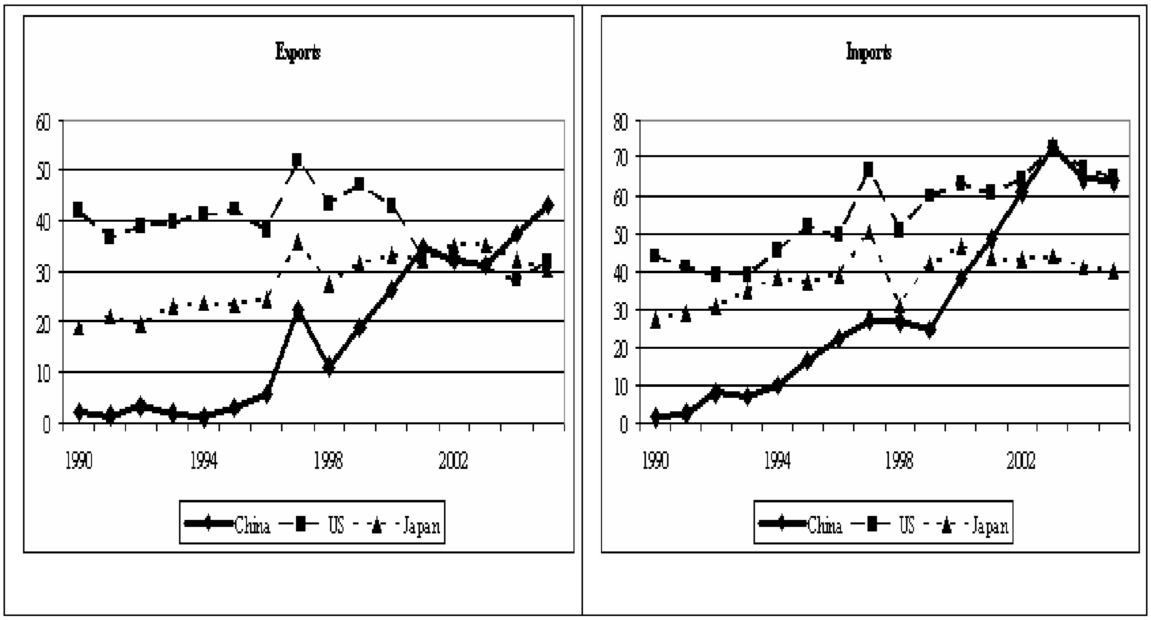
The previous section dealt with total trade in manufactures, which comprises both final goods and components. However, Malaysia is said to have built up her industrial capacities largely through integration in regional and global production networks (Gaulier, *et al.,* 2007). In this respect the trends in component trade with China, the US and Japan deserves attention to capture the extent and proliferation of the networks.

The strengths and links of the three trading partners to Malaysia as import sources and market destinations for components differ considerably. Between both the established markets of the US and Japan, the former market is relatively a more important destination for parts and components from Malaysia. Exports of components to the US are consistently more than triple the share of that which is destined to Japan. Though the market shares of China in Malaysia's components is the lowest relative to the other two trading partners, trade ties with the former have grown tremendously since 2000. This is hardly surprising given that China, though a new player in the region is currently ranked as one of the "core" economies in network trade. The increase in production sharing between Malaysia and China is much larger from the import relative to the export side. In 2005, China remained as Malaysia's fourth major source of imports, which mainly comprised parts and accessories for office machines, transistors and valves and automatic data processing equipment (Ministry of Finance, 2005).

Figure 3 presents the extent of component trade in bilateral trade with China, US and Japan. (It is claimed that modern and growing sectors of manufacturing, particularly electrical and electronics, machinery manufacturing and transport equipment, are highly dependent on imported components. See Data Appendix for components of other industries that considered in Figure 3).

A large proportion of Malaysia's total trade in manufactures with the US comprised components even in 1990. The component shares of exports to and imports from the US were 42 per cent and 44 per cent respectively in 1990. The main products exported to the US were office and automatic data processing machines as well as electrical machinery, apparatus, appliances and parts while imports include parts for electronic integrated circuits and micro assemblies, electrical machinery and parts as well as optical and scientific equipment (Ministry of Finance, 2006). Though component export shares to the US have declined, component imports have increased by 47 per cent over the period of study to represent 65 per cent of total imports from the US in 2005.

FIGURE 3. COMPONENT TRADE SHARES WITH CHINA, US AND JAPAN (IN PER CENT)



Note: 1. Data is compiled for components at the 5-digit SITC (Rev.3) level for 212 products.
2. Component trade shares refer to the share of component exports in total exports and the share of component imports in total imports for the bilateral flows.

Source: Calculated from UN COMTRADE database.

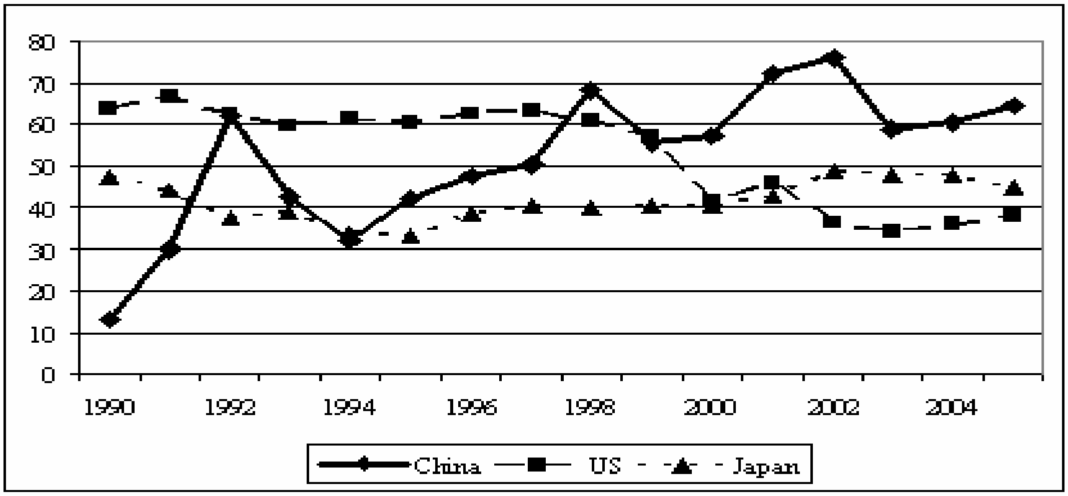
Figure 3 also shows that component trade (both exports and imports) with Japan has generally increased with time, but the extent of production sharing remains small compared to that with the US. Nevertheless, Japan remains a net supplier of components to Malaysia relative to the US. Differences in production sharing with the US and Japan also prevail in the types of components traded with both countries. Exports to Japan consist mainly of electrical machinery, apparatus appliances and parts, telecommunication and sound equipment as well as LNG whilst imports include digital monolithic integrated units, machinery, appliances and parts as well as transport equipment (Ministry of Finance, 2006).

In the case of trade with China, there was hardly any production sharing between both countries in 1990. Component exports only represented 2 per cent of total exports to China in 1990. However in 2005, the component export share to China increased tremendously to 49 per cent, higher than that to the US and Japan. Gill and Kharas (2007) also note that component exports from Malaysia to China had increased by 19 times over the last decade. This implies that Malaysia has taken advantage of China's rising dependence on foreign inputs. The trends also indicate a possible reorientation of component exports taking place from the established industrial countries to China. Component imports from China have also increased and have reached the import share levels of component trade with the US since 2002.

The trends above indicate that production sharing with China may be largely driven by both market expansion strategies and cost considerations. The findings also concur with the belief that China complements Asian exports in intermediates, thus any exogenous increase in its exports will result in an associated increase in the partner countries exports of the same product (Eichengreen and Hui, 2005[4]). This is particularly true given that China's foreign trade heavily relies on processing operations; imports of goods into China are assembled or transformed and re-exported within international assembly and subcontracting operations. The extensive production sharing with China relative to Japan reflects the recent arguments that 'China may be the next Japan' (see also Gaulier *et al.,* 2007).

The extent of networks between Malaysia and the three global players is also gauged from the extent of trade overlap in components, as shown in Figure 4. The AGL index for component trade with China has more than doubled between 1990 and 2005, implying that production sharing is becoming increasingly centered on China.

FIGURE 4. AGL INDICES WITH CHINA, US AND JAPAN IN COMPONENT TRADE (IN PER CENT)



Note: The Grubel-Lloyd indices for component trade are calculated at the 3-digit SITC (42 products) prior to aggregation for comparison purposes with trade overlap of total manufactures captured in Figure 2.

Source: Calculated from UN COMTRADE database.

Though trade overlap with the US was predominantly high in the 1990s, the extent of two-way trade in components fell below 50 per cent since 2000. The extent of two-way trade in components with Japan remains below 50 per cent for the entire period. The decline in two-way trade in components with the established industrial countries is a result of the shifts in imports of the US and Japan to lower cost suppliers in the region, particularly to China. China accounts for more than 25 per cent of Japan's electronic capital goods imports in 2003 (Gaulier *et al.,* 2007).

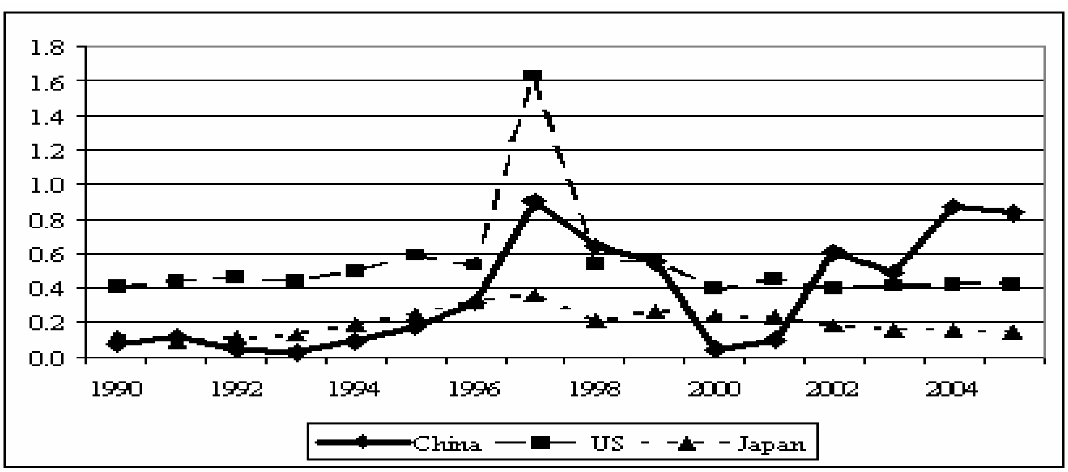
4. PRODUCT QUALITY: THE CASE OF ELECTRONICS COMPONENTS

Given that a lot of product diversification occurs in components/ intermediates (Gill and Kharas, 2007), components belonging to the same category may be characterized by different qualities. To capture the shifts from a low quality (cheap) to a high quality (expensive) product of the same type, the unit values of exports and imports are calculated to reflect the respective prices/ quality in components traded with the three global players.

The quality of components is first gleaned from the comparison of export prices of the same product across different bilateral trade flows to gauge quality differences in exports to different key players. The focus is on electronics since it is the fastest growing commodity (see also Gaulier *et al.*, 2007) in world trade due to the scope for scale economies and vertical specialization (Gill and Kharas, 2007). In the Malaysian context, the electronics industry has also remained the key sector in manufacturing, and thus if improvements in product quality were to take place, this sector is the most highly candidate given its high levels of export orientation dominated by multinational corporations (MNCs). There is prior evidence of a steady progression in the electronics industry of Malaysia, involving the production of complex and higher value products since 2000. This involves a move from assembly of electronic and semiconductor devices to sub-assembly and component assembly of more complex devices. (see Norlela and Figueiredo, 2004).

Under the electronics category, unit values of exports are calculated for thermionic valves, tubes, photocells and parts thereof (SITC 776) in particular as it commands the largest share in trade in electronics with all three trading partners vis-à-vis other components. Figure 5 present the unit values of exports of these products with the three trading partners.

FIGURE 5. UNIT VALUES OF EXPORTS FOR COMPONENTS OF SITC 776



Note: 1. The 20 products that represent components under the SITC 776 at the 5-digit SITC level are aggregate prior to the calculation of unit values.
2. The unit of measurement is USD per item.

Source: Calculated from UN COMTRADE database.

Generally, components within SITC 776 destined to the US recorded the highest prices prior to 2001. Since 2002, export prices of the same components to China were highest relative to export prices of components to the US and Japan. The findings therefore no longer support the theoretical prediction that rich countries tend to import relatively more from countries that produce higher price/ quality goods.

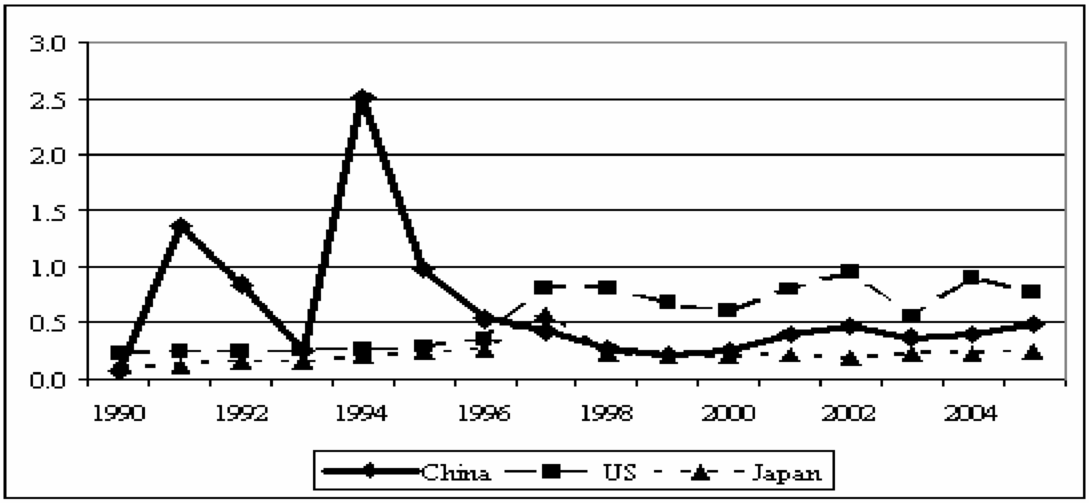
Though Rodrik (2006) claims that there is some truth to the above argument that Chinese exports of electronic products tend to be low cost without much technological sophistication, Lall and Albaladejo (2003) stress that Malaysia already faces direct threat of medium technology and high technology exports from China. Huang (2007) further adds that China has made substantial gains in hi-tech exports such as automated data processing equipment. Best (2007) therefore alerts that the Malaysian electronics industry has reached a critical impasse, caught between lower-wage rivals imitating its present production capabilities and higher performance rivals with superior production and innovation capabilities. In this context, the scope for greater trade with China and hence the US and Japan depends on how fast Malaysia goes through the middle-income status relative to China.

China's influence on price competition is also depicted through the import price of components compared with that of the US and Japan as shown in Figure 6. Import prices of components within the SITC 776 from China have fallen below that of the US since the mid-1980s; yet remain higher than component imports from Japan. However, it is found that the low prices of components imports from China also reflect the low quality of products whilst Japan's exports display the largest hi-tech content within countries in the region. The findings concur at large with that of Azhar *et al.* (2006) and Rodrik (2006). The former study indicates that China tends to export low quality versions of its manufactured products to Malaysia in 2002 whilst the latter shows that the export unit values for most of China's electronic products in 2003 were lower than those of Malaysia.

More important than the comparison of unit values of exports and imports across different trading partners is the extent of product upgrading that takes place in the various bilateral trade flows. Product upgrading is assessed *via* the relative prices of exports to imports of the same product within each bilateral trade flow. Figure 7 displays the extent of product upgrading to the US, Japan and China for electronic components (SITC 776).

If the export unit value is generally higher than the import unit value (UVX/UVM > 1, depicting higher quality exports relative to imports), this implies that Malaysia exports costlier varieties of a product to a particular destination, from which it imports cheaper varieties of the same product.

FIGURE 6. UNIT VALUES OF IMPORTS FOR COMPONENTS OF SITC 776



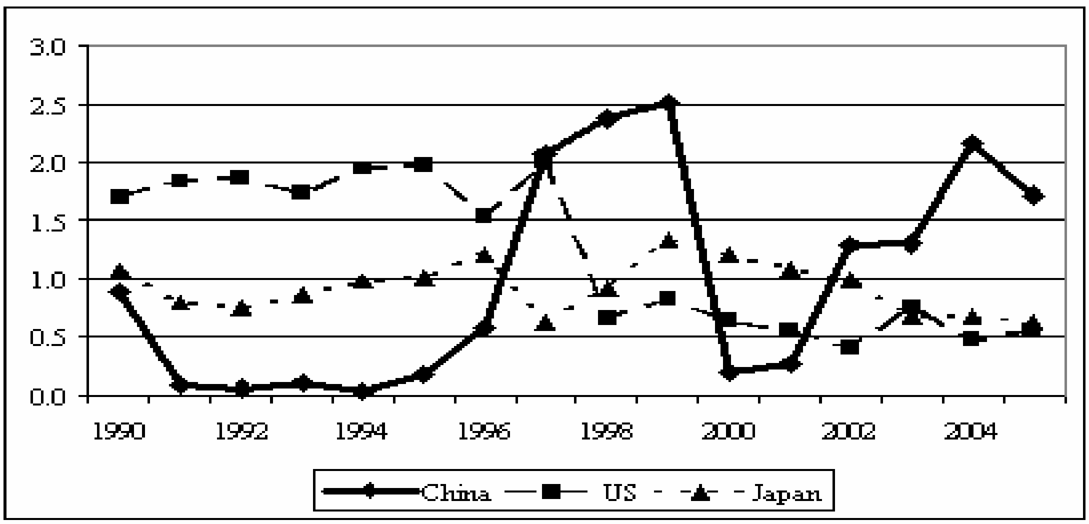
Note: 1. The 20 products that represent components under the SITC 764 at the 5-digit SITC level are aggregated prior to the calculation of unit values.
2. The unit of measurement is USD per item.

Source: Calculated from UN COMTRADE database.

The trends in the relative unit values in the case of China do not depict a clear trend over the period of study, though the values are higher than unity since 2002. For further confirmation of the recent trends in trade with China, the proportion of products with relative unit values greater than unity is calculated at a finer disaggregated level[5] for all components traded with China. The proportion of components with relative unit values (UVX/UVM) greater than unity in bilateral trade with China in 2000 and 2005 are 63 per cent and 72 per cent respectively. This is a positive indication that products exported to China have a higher value-added content than their corresponding imports. It may also be taken to reflect an improvement in quality of products exported to China vis-à-vis the quality of imports of the same product between 2000 and 2005.

The opposite holds true in the case of components traded with the US and Japan. Prior to 1997, Figure 7 indicates that exports to the US had higher value content than their corresponding imports. This seems to have changed and the decline in relative unit values is also noted in trade with Japan more recently. As in the case of China, the unit values are further calculated at a finer disaggregated level for all components within the SITC 7-8 for 2000 and 2005. The results again reaffirm that products exported to the US and Japan have little value added content than their corresponding imports (results not reported here). The only exception is that component exports of electrical and electronic products to Japan are consistently of higher quality than the corresponding imports for both years.

FIGURE 7. RELATIVE UNIT VALUES FOR COMPONENTS OF SITC 776



Source: Derived from Figures 5 and 6.

Overall, the unit values of components traded with Japan underwent more limited changes than that with the US and China over the period of study.

4. TRADE AND SKILL UPGRADING

4.1 Method of Estimation

The preceding section points out that China is growing in its importance as a market for Malaysia's manufactures. Given the distinct shifts in trade patterns observed with China vis-à-vis the other two trading partners, it is expected that the former may have important ramifications for the domestic labour market . Of interest is the effects of these key bilateral trade flows on skill upgrading (relative labour demand) in Malaysian manufacturing. The study will take the labour perspective in analyzing the skill upgrading implications of *trade flows* and *trade structure* in aggregate trade and component trade with the global players.

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. Downes *et al.* (2004) state that the process works in the opposite direction in the case of brand name MNCs. The demand for the product is in part derived from the demand for labour and hence affected by the labour market conditions under which the product is produced.

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:

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

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):

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

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

$$dL_{ij} = \varphi_{TWj}dT_i + \delta_{Qj}dlnQ_i + \delta_{Kj}dlnK_i + \Sigma_k\gamma_{jk}dlnW_{ik} \quad (2)$$

Assuming homogeneity of degree one in prices imposes:

$$\Sigma_k\gamma_{jk} = \Sigma_j\gamma_{jk} = \Sigma_j\delta_{Kj} = \Sigma_j\delta_{Qj} = 0 \quad (3)$$

this generates

$$dL_{ij} = \varphi_{TWj}dT_i + \delta_{Qj}dlnQ_i + \delta_{Kj}dlnK_i + \gamma dln(W_j/W_k) \quad (4)$$

with two variable factors j and k.

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 (S/N = L).

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 quantity flows and structure of trade with the trading partners concerned. The impact of quantity flows and trade structure on skill upgrading are examined independently[6].

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:

$$d(S/N)_{it} = \Omega - \Sigma\varphi_0 dln(SW/USW)_{it} + \Sigma\varphi_1 dln(VA)_{it} + \Sigma\varphi_{2j}dlnK_{it} + \Sigma\mu_1 dln(FDI/CI)_{it} + \Sigma\mu_1 dlnM^{China}_{it} - \Sigma\mu_2 dlnM^{US}_{it} - \Sigma\mu_3 dlnM^{Japan}_{it} - \Sigma\mu_4 dlnX^{China}_{it} - \Sigma\mu_5 dlnX^{US}_{it} - \Sigma\mu_6 dlnX^{Japan}_{it} + \varepsilon_{it} \quad (5)$$

$$d(S/N)_{it} = \Omega - \Sigma\varphi_0 dln(SW/USW)_{it} + \Sigma\varphi_1 dln(VA)_{it} + \Sigma\varphi_{2j}dlnK_{it} + \Sigma\mu_1 dln(FDI/CI)_{it} + \Sigma\mu_2 d(AGL^{China})_{it} - \Sigma\mu_3 d(AGL^{US}) - \Sigma\mu_4 d(AGL^{Japan}) + \varepsilon_{it} \quad (6)$$

$$d(S/N)_{it} = \Omega - \Sigma\varphi_0 dln(SW/USW)_{it} + \Sigma\varphi_1 dln(VA)_{it} + \Sigma\varphi_{2j}dlnK_{it} + \Sigma\mu_1 dln(FDI/CI)_{it} + \Sigma\mu_1 dlnMPC^{China}_{it} - \Sigma\mu_2 dlnMPC^{US}_{it} - \Sigma\mu_3 dlnMPC^{Japan}_{it} - \Sigma\mu_4 dlnXPC^{China}_{it} - \Sigma\mu_5 dlnXPC^{US}_{it} - \Sigma\mu_6 dlnXPC^{Japan}_{it} + \varepsilon_{it} \quad (7)$$

$$d(S/N)_{it} = \Omega - \Sigma\varphi_0 d\ln(SW/USW)_{it} + \Sigma\varphi_1 d\ln(VA)_{it} + \Sigma\varphi_{2j} d\ln K_{it} + \Sigma\mu_1 d\ln(FDI/CI)_{it} + \Sigma\mu_2 d(AGL_{pc}^{China})_{it} - \Sigma\mu_3 d(AGL_{pc}^{US}) - \Sigma\mu_4 d(AGL_{pc}^{Japan}) + \varepsilon_{it} \quad (8)$$

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^{China} = real imports from China

M^{US} = real imports from the US

M^{Japan} = real imports from Japan

X^{China} = real exports to China

X^{US} = real exports to the US

X^{Japan} = real exports to Japan

AGL^{China} = AGL index with China

AGL^{US} = AGL index with the US

AGL^{Japan} = AGL index with Japan

MPC^{China} = real share of imports of components from China

MPC^{US} = real share of imports of components from the US

MPC^{Japan} = real share of imports of components from Japan

XPC^{China} = real share of exports of components to China

XPC^{US} = real share of exports of components to the US

XPC^{Japan} = real share of exports of components to Japan

AGL_{pc}^{China} = AGL index for component trade with China

AGL_{pc}^{US} = AGL index for component trade with the US

AGL_{pc}^{Japan} = AGL index for component trade with Japan

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.

4.2 Results: Skill Upgrading Effects of Trade

The empirical analyses are based on two databases, established by integrating trade, labour and industry statistics. The first dataset involves a panel of 19 industries spanning the period 1983 to 2003 for the estimation of equations (5) and (6), whilst the equations (7) and (8) are estimated based panel dataset of 6 industries for the period 1988 to 2003 (see Data Appendix for further explanation on data sources and definitions).

Table 1 presents the impact of trade flows and trade structure for aggregate manufactures and component trade. The fixed effects (FE) and the random effects (RE) models are employed and the choice of the model is determined by efficiency unbiasedness and consistency properties. The Hausman (1978) specification test is performed to check if the coefficients estimated by the FE estimator and the same coefficients estimated by the RE estimator does not differ statistically. The Hausman test suggests that there are no significant differences between the FE and RE estimates for all equations. Therefore, only the results of the FE model are presented in Table 1. The following discussion focuses on the coefficient estimates of trade variables, which are of specific interest for the study.

From the perspective of trade flows, only aggregate imports from Japan render a significant negative impact on skill upgrading whilst imports of components from Japan do not significantly displace skilled labour. A plausible reason is that component imports from Japan do not fall into the category of competing goods, which in the case of Japan is generally that which has high technology content. It has been pointed out that trade with Japan is typically that of one-way trade (see Figures 2 and 4). Malaysia is a net importer of components from Japan as a substantial portion of imports from Japan is related to Japanese MNCs in Malaysia sourcing their machinery and intermediate inputs from their parent/associate companies in Japan (Belderbos *et al.*, 2001). About 33 per cent of Malaysia's regional imports of components originated in Japan (see Ng and Yeats, 2003). The panel results highlights the fact that though the US and Japan are relatively more skill endowed than Malaysia, both trading partners do not incur similar impact on skills.

Though imports from China and exports to China have positive and negative effects on skill upgrading, the evidence remains weak. Furthermore, the lack of evidence of significant positive effects of component trade on skills even in the case of trade with China implies that the recent improvements in products traded has yet to trigger a higher demand for skills (assuming that there is a direct link between quality and skills) in Malaysia.

From the perspective of trade structure, there is no significant bearing of two-way trade (on an aggregate basis and in components) on skills. However, caution should be given in the interpretation of the results for equations (7) and (8) in particular due to the small sample size.

TABLE 1. SKILL SHARE EQUATIONS BY FIXED EFFECTS

Dependent Variable: d(S/N)

Equation	dln(SW/USW)	dlnVA	dK	d(FDI/CI)	$dlnX^{China}$	$dln\ X^{US}$	$dlnX^{Japan}$	$dlnM^{China}$	$dlnM^{US}$	$dlnM^{Japan}$	Constant	R^2	DW
(5)	-0.020***	-0.919***	0.129***	-0.005	-0.062*	0.120	-0.034	0.334*	0.259	-0.772***	0.248**	0.517	2.173
	(0.003)	(0.274)	(0.010)	(0.003)	(0.037)	(0.175)	(0.165)	(0.189)	(0.261)	(0.209)	(0.110)		

Equation	dln(SW/USW)	dlnVA	dK	d(FDI/CI)	$dAGL^{China}$	$dAGL^{US}$	$dAGL^{Japan}$	Constant	R^2	DW
(6)	-0.020***	-1.131***	0.142***	-0.004	-0.007	0.004	0.003	0.246**	0.410	2.426
	(0.003)	(0.299)	(0.016)	(0.004)	(0.006)	(0.010)	(0.010)	0.117		

Equation	dln(SW/USW)	dlnVA	dK	d(FDI/CI)	$dlnXPC^{China}$	$dlnXPC^{US}$	$dlnXPC^{Japan}$	$dlnMPC^{China}$	$dlnMPC^{US}$	$dlnMPC^{Japan}$	Constant	R^2	DW
(7)	-0.013***	-0.416	0.030	-0.004	0.010	0.006	-0.006	-0.014	-0.015	-0.011	0.523***	0.218	-
	(0.005)	(0.344)	(0.032)	(0.006)	(0.008)	(0.011)	(0.013)	(0.012)	(0.014)	(0.017)	(0.133)		

Equation	dln(SW/USW)	dlnVA	dK	d(FDI/CI)	$dAGL_{pc}^{China}$	$dAGL_{pc}^{US}$	$dAGL_{pc}^{Japan}$	Constant	R^2	DW
(8)	-0.012***	-0.503	0.035	-0.007	-0.001	0.006	-0.0003	0.506***	0.153	-
	(0.004)	(0.357)	(0.034)	(0.006)	(0.006)	(0.008)	(0.013)	(0.134)		

Note: 1. DW refers to the Bhargava *et al.* (1982) Durbin-Watson statistics.
2. Figures in the first row are the coefficient estimates and figures in the parenthesis are the standard errors.
1. Total number of observations is 361 for equations (5) and (6). Equations (5) and (6) are with AR1 disturbances.
2. Total number of observations for equations (7) and (8) are 90.
***, **, * significant at 1%, 5% and 10% respectively.

5. CONCLUSION

The analysis from the trade data suggests the following. First, the declining role of major industrial countries is evident since China's entry into the WTO. Stronger trade ties are evident between Malaysia and China vis-à-vis that with the US and Japan. Second, distinct shifts are apparent namely in likely reorientation of component exports away from the US and Japan to China. In many respects, China has caught up with Japan as a major component market for Malaysia. The big increase in production sharing with China relative to Japan indirectly shows the strengths of China at the core of network trade in East Asia. Third, quality upgrading (or the 'moving up of the value chain') in electronics is clearly not evident, except for components destined to China in the recent past.

Given the lack of evidence of quality upgrading of components traded, it is not surprising to find that component trade with China in particular has yet to increase the relative demand for skills in manufacturing. The current lack of local upgrading (both in terms of product quality and skills) in manufacturing even in the context of trade with an unskilled abundant country like China is a serious concern for Malaysia.

Given that integration within the region is expected to further become more China centered particularly in the production chain, the health of Malaysia's trade with major industrial countries such as the US and Japan will also indirectly hinge on China's exports to the latter (Huang, 2007). It is thus crucial for Malaysia to capitalize on China's booming demand for high-end parts and components that feed into its assembly plants, to maintain China as its big customer. To reap benefits from mutual trade dependence, Malaysia needs to enhance its technological capacity (see also Tham, 2001, 2005), which is to innovate indigenously, particularly to upgrade exports. According to McKibbin and Woo (2003), much needs to be done given that China at present ranks almost as high as Malaysia (Gill and Kharas, 2007) in the indigenous innovation index. Furthermore, Lemoine and Unal-Kesenci (2002) note that the specialization pattern of China is becoming almost similar to that of Malaysia, given the rapid rate of imitation[7] in the latter which has shortened the product cycle tremendously (Tham, 2005). The intensity of competition for further market share in China, hence the US and Japan, will be based on goods exported on the quality ladder.

DATA APPENDIX

Trade Data

(1) Data on exports (X) and imports (M) are derived from the *Malaysia: External Trade Statistics* publications. The aggregate trade and bilateral trade data is compiled at the 3-digit Standard International Trade Classification (SITC) level, for the period 1980 to 2005. A total of 210 products are identified for the 19 major industrial groups within manufacturing. The trade data in Malaysia is based on the SITC (Rev.2) for the period 1980 to 1987 and on SITC (Rev.3) for the period 1988 to 2005. Exports are valued f.o.b. while imports c.i.f. Total manufacturing exports and imports are deflated with the export price and import price index (1980 =100) for the entire economy respectively.

(2) Data on component exports and component imports are derived from the United Nations COMTRADE database. Since industries based on the SITC scheme do not separate component trade from final goods, the study adopts Athukorala's (2003) classification of intermediate goods inferred from trade statistics (of the SITC, Revision 3) for the industries in sections SITC 7 and 8 at the 5-digit level for the period 1990 to 2005. These include items termed as "parts and accessories" for six industries, (machinery manufacturing, electrical and electronics, transport equipment and scientific and measuring equipment, furniture and fixtures and miscellaneous). There are 212 components identified in the six industries.

(3) Unit values of exports (UVX) and imports (UVM) are calculated by dividing trade values with quantities obtained from the United Nations (UN) COMTRADE database. The limitations in the data that are worth mentioning include: (a) A large proportion of bilateral country export-import pairs with zero trade. The pairs with zero-trade are not considered for quality comparison; and (b) Quantity measures that differ across products and also years. The measure chosen is that which captures the largest trade volume.

Labour Data

(4) Labour data (employment and wages) are drawn from manufacturing surveys, conducted annually by the Department of Statistics (DOS) Malaysia for the period 1983 to 2003 (the latest data available at the time of the study). The survey data is collected based on a national classification of manufacturing industries under major Division 3 of the *Malaysia Industrial Classification* (MIC), 1972 (updated 1979) changed in the year 2000 to Category D of the *Malaysia Standard Industrial Classification* (MSIC) 2000. Only full-time paid employees (N) are considered for the study, which excludes working proprietors, active business partners, unpaid family workers and part-time paid employees. The wage variable (W) refers to the average yearly earnings per full-time employee in each industry. All wage variables are deflated by the Malaysian consumer price index (at constant 1980 prices).

(5) The definition of skills used is solely based on occupational groupings governed by the availability of data. Skilled workers (S) refer to the number of employees in the managerial, professional, technical and supervisory categories. Unskilled workers (U) comprise production/operative workers. The real average wages for skilled (SW) and unskilled workers (USW) are constructed based on their average yearly earnings.

Industry Data

(6) Value-added (VA) is derived as the difference between the gross value of output and the cost of input. Capital intensity (K) refers to the share of fixed assets in total output. While VA is deflated by the Gross Domestic Product deflator, K is deflated by the Malaysian consumer price index (at constant 1980 prices). The proxy for technology is the share of foreign direct investment in total capital investment (FDI/CI).

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Notes

[1] Japan and China are considered the twin engines for the East Asian region.

[2] China is now the world's largest trader (Gaulier *et al.,* 2007) and the largest trader n East Asia, overtaking Japan in 2004 (Gill and Kharas, 2007).

[3] Specialization along the production chain, which implies specific gains since it involves products of different qualities.

[4] The study by Eichengreen and Hui (2005) indicate overall positive effects for Malaysia due to trade with China, reflecting the specialization of Malaysia in exports of components and other capital goods that are much demanded by the latter.

[5] Unit values are calculated at the 9-digit SITC based on trade data. (Unit values measured at the finest level of aggregation of which data are available minimize the incidence of composition problems, see Hallak, 2006).

[6] It is argued that trade structure variables cannot be meaningfully included in the same regression with trade measures since they are non-linear transformations of others (Lovely and Richardson, 1998).

[7] Imitation becomes easier as the product reaches a higher level of standardization (letto-Gillies, 2005).

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