ADB Institute Discussion Paper No. 2

People's Republic of China's export threat to ASEAN: Competition in the US and Japanese markets

John Weiss and Gao Shanwen

Asian Development Bank Institute

January 2003

John Weiss is Director of Research at the ADBI. Gao Shanwen was then Research Associate at the ADBI. The authors acknowledge the comments of Iwan Azis and David Roland Holst.

Introduction

The issue of People's Republic of China's (henceforth PRC) competitive threat to ASEAN and other regional exporters has received considerable attention in the aftermath of PRC's WTO accession. Most modeling exercises available at present tend to suggest that welfare losses in the region will be relatively slight since all exporters will gain from the expansion of world trade and the rise in imports into the Chinese market (Ianchovina and Martin, 2001). However this does not mean that there will be no market disruption in the short-term to exporters in some sectors and some countries as a result of increased Chinese competition. This paper considers the issue of competition by looking at trends in imports into the two of the main markets of the world economy – United State and Japan. It addresses the question - in what sectors was ASEAN losing competitiveness to PRC prior to the WTO accession and explores the economic characteristics of these sectors. The period of study is the second half of the 1990's when competition from PRC intensified in a range of products. The analysis is conducted both for the main ASEAN exporters as a group and then moves to consider individual economies. We focus on the larger ASEAN economies – Singapore, Malaysia, Thailand, Indonesia and the Philippines and exclude the smaller exporters such as Viet nam and Cambodia. The importance of the US and Japanese markets for these economies and PRC can be seen in table 1. The paper is in four main sections. Section 1 sets out a methodology for assessing the competitiveness effect for ASEAN from PRC based on changing relative market shares. It also gives the descriptive results from the application of this approach. Section 2 sets out a regression model, which attempts to explain this competitiveness effect by characteristics of different export categories. Section 3 gives the results of this regression analysis. We conclude with some final observations.

Table 1 Share of US and Japan in total exports (1995-2000) for selected ASEAN economies and PRC.

	Share of US (%)	Share of Japan (%)
PRC	19.5	17.6
Singapore	18.5	7.5
Malaysia	20.3	12.3
Thailand	20.3	15.2
Indonesia	13.9	23.2
Philippines	32.7	15.1
ASEAN (total for six economies)	19.7	13.0

Source: unless otherwise stated all data are calculated from United Nations trade database (COMTRADE).

1. Measure of competitiveness effect

To establish the degree of loss of market share to Chinese exports we apply a version of constant market share analysis.[1] Export growth for a given commodity i to a particular market (e.g. US or Japan) can be decomposed into a share effect (assuming country j keeps a constant share of the market) and competitiveness effect (allowing for its changing market share). Hence we have

[1] For a discussion and application of constant market share analysis see ADBI (2002). For a conceptual discussion, see Richardson (1971). The approach here uses a version of equation (6) from Richardson (1971). The analysis differs from a conventional constant market share approach as it looks separately at two markets (the US and Japan) and at different export categories. Hence the commodity composition and export composition effects, which are relevant when total exports to the world are the focus of attention, are not required here.

$$\Delta Xij = \Delta Xi^1j + \Delta Xi^2j \quad (1)$$

where X is exports and Δ is the absolute change in.

$$\Delta Xi^1 = \Delta Qi.sij \quad (2)$$

where Qi is total imports of i in the market concerned (at the end of the period) and sij is the initial market share of country j in imports of i

and

$$\Delta Xi^2j = sij.Qi^* (\Delta sij/sij - \Delta sik/sik) + \Delta sik/sik. sij.Qi \quad (3)$$

where now competitor country k has been introduced, so sik is k's market share for product i.

Equation (3) reduces to the identity $\Delta Xi^2j = Qi. \Delta sij$, that is competitiveness equals initial imports times the change in market share.

However expressing the competitiveness effect in (3) allows the introduction of a comparator competitor economy (in this case PRC). The two different terms in (3) give different information. The first term gives the absolute change in exports from j due to the change in its market share viz-a-viz PRC (that is the due to the change in its competitiveness relative to PRC). The second term gives the absolute change in exports from j due to the change in PRC's market share relative to the rest of the world (including j). The sum of these two effects is the total competitiveness effect for j.

Adding equations (2) and (3) in (4) allows a decomposition of the change in exports of i for country j, so that

$$\Delta Xij = \Delta Qi.sij + sij.Qi^* (\Delta sij/sij - \Delta sik/sik) + \Delta sik/sik. sij.Qi \quad (4)$$

A negative sign for the second term indicates a loss of competitiveness viz-a-viz PRC ($\Delta sij/sij - \Delta sik/sik)<0$; however this may be compensated by the movement of PRC's competitive position viz-a-viz the rest of the world, $\Delta sik/sik$. Countries for which the sum of these two effects is negative will be losing competitiveness. Whether overall exports fall will then depend on the strength of the general demand effect, which is the first term ($\Delta Qi.sij$).

Application to ASEAN

Here we apply this approach to the exports of five main ASEAN economies to the US and Japan. We take as our period of analysis 1995-2000 as disaggregate data are available for this period from the UN trade database. We proceed in stages commencing initially with an analysis at the 2-digit SITC level, before moving to a more disaggregate analysis at the four-digit level.

Table 2 shows the decomposition, for ASEAN as a whole, for the five 2-digit SITC categories in which the loss to PRC is greatest.

Table 2 ASEAN Export competitiveness decomposition US market: key SITC categories 1995-2000 US$ thousand

SITC 75 Exports 1995	Export increase to US 1995-	Constant Market share	Overall competitiveness	Competitiveness viz PRC	Export increase as % of

	00	effect			1995 exports
17592030	7399271	8314541	-915270	-16271732	42.1
% of export increase	100	112	-12	-220	
SITC 77 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 total exports
13272500	7305644	5968343	1337301	-9199265	55.0
% of export increase	100	82	18	-126	
SITC 76 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 exports
7788920	1378780	8179066	-6800286	-7881440	17.7
% of export increase	100	593	-493	-572	
SITC 89 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 exports
2591387	253818	1458162	-1204344	-1711339	9.8
% of export increase	100	574	-474	-674	
SITC 82 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 exports
1049617	819541	1383717	-564176	-1612576	78.1
% of export increase	100	169	-69	-197	

In each case there has been a strong effect from the loss of market share relative to PRC. For SITC 77 this was compensated by a gain in market share relative to other exporters. For the others the impact of the overall growth of import demand was large enough for there to be a big rise in exports in SITC 75, 77 and 82 and a more modest increase for SITC 76 and 89. In none of these major SITC was there an absolute decline in sales to the US, although there was a relatively rapid erosion of market share to PRC.

Table 3 shows a similar decomposition for the Japanese market. There given the greater importance of primary and resource-based products, SITC 34 (Natural Gas), 03 (Raw Fish) and 63 (Cork and Wood) are included in the five 2 digit categories in which loss relative to

PRC is greatest. As for the US, SITC 75 and 76 are in this group. In the Japanese market for these five main SITC categories there is no gain relative to other exporters, and in relation to SITC 03 and 63 there was an absolute decline, with 76 having only a relatively modest increase.

Table 3 ASEAN Export competitiveness decomposition Japanese market: key SITC categories1995-00 US$ thousand

SITC 34 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 exports
5152097	2619529	3235001	-615472	-8387098	51
% of export increase	100	123	-23	-320	
SITC 75 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 total exports
5045146	2755550	3496213	-740663	-5297193	55
% of export increase	100	127	-27	-192	
SITC 76 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 exports
3197657	780951	1512703	-731752	-1938566	24
% of export increase	100	194	-94	-248	
SITC 03 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 exports
3304474	-860107	-394603	-465504	-1093572	-26
% of export increase	-100	-46	-54	-127	
SITC 63 Exports 1995	Export increase to US 1995-00	Constant Market share effect	Overall competitiveness	Competitiveness viz PRC	Export increase as % of 1995 exports
2256959	-236495	-97559	-138936	-985936	-10
% of export increase	-100	-41	-59	-417	

2. Regression analysis and methodology

Here we report the results of our disaggregate analysis that aims to establish in more detail the type of products in which ASEAN competitiveness viz-a-viz PRC is being eroded in the US and Japanese markets. In terms analyzing the change in competitiveness we use as our measure of competitiveness, change in competitiveness relative to PRC, which is the second term in equation (4), scaled by division by total exports in 1995 in the same category. We calculate this measure for both markets, separately. Using the notation in equation (4) competitiveness (COMP) is measured as

$$COMP_{ij} = [\, s_{ij}.Q_i^* (\Delta s_{ij}/s_{ij} - \Delta s_{ik}/s_{ik}) \,] / X_{ij}$$

where Qi is total imports of i in the market concerned (at the end of the period) and sij is the initial market share of country j in imports of i; sik is the market share of the competitor economy k (in this case PRC), Δ denotes change in and Xij is initial exports of i from j to the market concerned. Where there is a gain in market share relative to PRC COMP will be positive and where there is a loss it will be negative.

This variable is related directly to the more conventional measure of competitiveness - the change in the revealed comparative advantage ratio (RCA). When the latter is defined (as below) as the relative ratio for a country in a particular market with PRC as a comparator, then ranking by our competitiveness measure will be identical to ranking by the change in RCA.

In the analysis we test the hypotheses that

- loss of competitiveness is systematically related to the characteristics of trade categories, whether in terms of technological characteristics, or patterns of specialization;
- loss of competitiveness differs systematically between countries in the ASEAN group;
- loss of competitiveness trends are similar between the US and Japanese markets.

By the logic of constant market share analysis we would expect common trends between different markets, as exporters will be exposed to common supply-side shocks in producing for different markets.

To test these hypotheses we utilize a simple model that makes competitiveness (defined as above as the export gain viz PRC as a proportion of initial exports) a function of the characteristics of products, general shifts in competitiveness and changes in tastes as a demand factor. We use a measure of specialization (RCA) at the start of a period to explain changing competitiveness over this period. We use the initial RCA as one of the explanatory variables for change in competitiveness, on the grounds that the initial RCA can be taken as a proxy for the relative output level and factor intensity of different products.[2]

In principle RCA can be related to the change in competitiveness through two possible routes:

[2] Because we work at the disaggregate 4 digit level the model is very constrained by data availability, and because of our highly disaggregate focus we do not have access to conventional measures that can explain changes in export market shares, such as unit labor cost or R and D activity. Hence the use of the initial RCA variable to capture the individual characteristics of products. Analyses that utilize such variables must normally work at much higher levels of aggregation; for example Carlin et al (2001) for OECD countries focus on changes in market share at the level of 12 divisions of manufacturing.

a) though shocks that affect relative factor prices and their impact on different commodities differently in line with their factor intensity – in this route the sign on the RCA term will be ambiguous varying with the nature of the price shock;
b) through a catch-up effect, so that where a competitor has low initial market shares it will be easier for them to gain in activities in which an economy is highly specialized – in this route the expectation is that the RCA term will always be negatively related to change in competitiveness. This will be most relevant for very large and very small observations for RCA since, if catch-up is a universal pattern across all observations, ultimately it will result in homogeneity in export structure across countries, which is implausible.

Our theoretical model focuses on the first of these two routes, although it must be acknowledged that empirically, whenever a negative relation between the competitiveness and RCA variables is found, we will be unable to distinguish between which of these two mechanisms is at work.

Formally for product i and a given country j we have

$Comp_{ij} = f (MC_{ij}, D_{ij})$

where $dComp_{ij} / dMC_{ij} < 0$,

MC_{ij} is marginal cost for i in country j relative to its cost in competitor economy k, and D_{ij} is a demand factor for j's exports, such that a change in D_{ij} reflects a shift in taste relative to exports of i from k.

In turn
$MC_{ij} = f (Q_i, FP, T_i, Z)$,

where Qi is the relative output of i and FP is the relative factor price ratio (capital rental/wage) for countries j and k. T_i refers to a unique technology parameter specific to an individual product and Z is a general relative competitiveness term for the two economies reflecting supply factors that are independent of factor intensities. FP is the ratio ($r_{k/} r_l$), where r_k is the opportunity cost of a unit of capital and r_l is the wage.[3]

We make the assumption that due diminishing returns to fixed factors marginal costs rise with output, so that $dMC_i / dQ_i > 0$. We do not have product specific data on Q hence we apply as a proxy measure, relative revealed comparative advantage (RCA), which can be calculated readily from the trade database

Relative revealed comparative advantage is defined as

$RCA = (X_{ij} /X_{tj})/(X_{ik}/X_{tk})$

where X refers to export value, t stands for total exports and k is the comparator economy. Since a rise in RCA indicates that the commodity concerned is a growing share of trade (and output), by assumption MC will rise with RCA. RCA will be directly related to the relative factor intensity of individual products. Hence products intensive in an economy's relatively abundant factor will have a high RCA; ie if ASEAN is capital- abundant relative to PRC, capital-intensive products can be assumed to have a high RCA in ASEAN. A formal proof of the derivation of our basic estimation equation is given in Appendix 1. We show in Appendix

[3] In principle the model can be based on any two factors of production. We choose the conventional measures of capital and labor, but other combinations such as skilled and unskilled labor or skilled labor and land could also be used. The critical assumption is that the relative prices of the two factors selected determine specialization on the basis of the factor-intensity of products; see Wood (1997) for a discussion of the underlying theory.

1 that in our simple model the sign on the RCA term is determined by the relative change in the capital-rental to wage ratio in an economy and its comparator and capital and labor endowments in the two economies at the start of the period of study. For an economy in which there is both a fall in the capital rental to wage ratio relative to a comparator and a lower initial endowment of capital relative to labor the sign on the RCA term must always be negative.

In this simple model in the long-run in an equilibrium situation there can be no systematic relationship between RCA and competitiveness, since RCA cannot grow or shrink indefinitely. At any point in time an economy can be at a transition from one equilibrium to another, hence a relationship may be found. The empirical analysis focuses on this transitional situation. In the model by assumption there will be a positive relation between the relative marginal cost line for countries j and k (MC) and RCA (for a given technology parameter and given tastes). However the MC line can shift due to changes in competitiveness as a result of either product–specific or country factors. The pattern of these changes will determine the relationship between the initial RCA and changes in competitiveness over a given period.

For an individual commodity figure 1 illustrates the logic involved. As we assume differentiation of products between suppliers, for product i there will be different prices between exporting countries j and k. The horizontal axis of figure 1 shows both the relative price ratio (Pij/Pik) and the relative marginal cost ratio (MCij/MCik). Shifts in MC reflect a gain in competitiveness for one country. In figure 1 starting from point A a shift from MC to MC* creates a competitiveness gain for country j (since at point A MCij/MCik<Pij/Pik exports from j will rise relative to competitor k) and this allows country j to capture market share at the expense of its competitor over the transition from A to B. Starting from point B an unfavorable shift for j is the move from MC* to MC and this leads to a competitiveness loss and thus a transition to A. The new equilibrium is where there is equality between the relative world market price ratio (P) and the relative MC line. As our analysis focuses on the transition we do not incorporate feedback to the initial RCA from the competitiveness change over the period.

For a favorable shock for j, there will be fall in MC. If this fall is proportionately greater the higher is the RCA this will lead to a positive relationship between RCA and competitiveness. This the case illustrated in the shift from MC to MC* in figure 1. If the change in MC is proportionately greater at a lower level of RCA then the reverse holds and there will be negative relationship between change in competitiveness and the RCA. An unfavorable shock implies an upward shift in MC. Where this rise in cost is proportionately greater the higher is the RCA (as in the move from MC* to MC in figure1) loss in competitiveness will be greater the higher the RCA and the relationship will be negative. Similarly if the rise in MC is proportionately lower at higher levels of specialization losses will be less the higher is the RCA and the relationship will be positive.

Changes in MC can be related to changing relative factor prices by the factor intensity of different products. A favorable factor price shock for ASEAN implies a fall in the price of either capital or labor, relative to that in PRC. Conversely an unfavorable price shock implies a rise in one of these prices relative to PRC. Where there is a favorable capital price shock that lowers the capital rental to wage ratio in an economy that is abundant in capital, this will lead to a fall in MC that is proportionately greater for products with a high RCA, which by assumption will be relatively capital –intensive. A similar effect will occur for a favorable wage price shock that raises the capital-rental to wage ratio in economies that are labor-abundant. In the model because of the focus on the relative position these changes in factor price ratios must be relative to the comparator economy. Where MC lines move in parallel they will be unrelated to RCA and change will be determined by a general shift in competitiveness that is neutral as regards factor intensity.

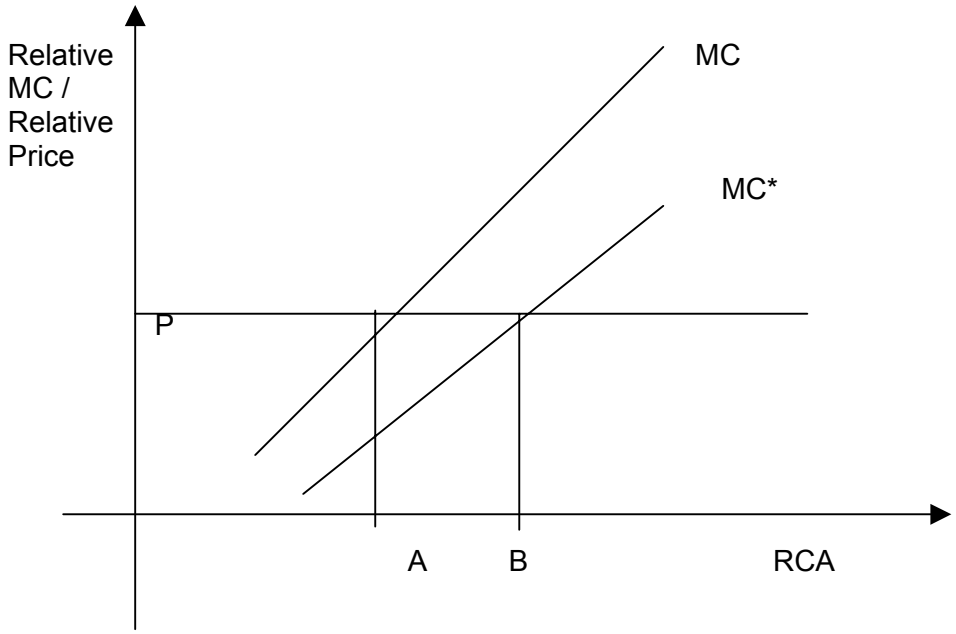

Figure 1: RCA and Competitiveness.

The position of ASEAN countries and PRC in this model is exactly the reverse, as competitiveness is in relation to PRC and MC and RCA are relative to PRC. Hence an unfavorable change for an ASEAN country is a favorable change for PRC. If this change for an ASEAN country is greater the higher the RCA, this also means the reverse for PRC; that is the change is greater the lower the RCA for PRC. In general we expect ASEAN economies to be relatively abundant in capital relative to PRC. This proposition is supported by the fact that in 1995, at the start of our period, income per capita in all of the ASEAN economies covered here was higher than in PRC both in calculations in current prices at actual exchange rates and in purchasing power parity estimates. Hence on the basis of this assumption in ASEAN, products with a high relative RCA are likely to be relatively capital intensive, whilst in PRC those with a high RCA are likely to be more labor-intensive. How shifts in relative factor prices will be related to RCA will thus depend on whether the capital-rental-wage ratio rises or falls. For example, a favorable capital price shock for PRC means a cheapening of the relative cost of capital for PRC and this will convert into an unfavorable shock for ASEAN and a rise in its MC, which is greater in its more specialized products (as the move from MC* to MC in figure 1). The implied negative relationship between competitiveness change and RCA for ASEAN is what is observed in our subsequent analysis.[4] In terms of the expression for FP above a favorable price shock for PRC can be interpreted as a fall in the opportunity cost of capital in PRC relative to that in ASEAN, for example due to relatively higher domestic savings or FDI inflows. As a test of the basic model we also check the results for India, an economy with a lower income per capita than PRC in 1995 by any measure, and by implication an economy with a lower capital-labor endowment. If some extreme outlier observations for the RCA term are excluded, on the grounds that catch up effects are likely to be stronger for these (we include the RCA terms from 0.1 to 10), we find that for the US market the sign on the RCA term for India is significant and the opposite of that for ASEAN as a group and all individual ASEAN countries; it is positive for India as compared with negative for ASEAN. This is what is

[4] A cheapening of capital in PRC relative to competitor economies will be expected to increase capital intensity, which will in turn raise labor productivity. For the period 1990-97 (more recent years are not available) at the three digit level of manufacturing, real labor productivity growth in PRC exceeded that in all ASEAN countries covered here in 90% of the cases, which is consistent with this hypothesis. Productivity figures are calculated from the World Bank Trade and Production database (see Nicita and Olarreaga, 2001).

predicted by our simple model, if improved competitiveness is due to a fall in the relative cost of capital viz-a viz labor in PRC. This will mean that in relation to India the latter's loss of market share will be lower in its more specialized, that is its labor-intensive, products (for a further discussion see Appendix 1).

Competitiveness behavior may also be influenced by the speed of growth of the market, so we also try as an independent variable the growth of the US market for the category concerned. It should be easier to maintain a market share against a new entrant in a fast growing market, as both a country and this new entrant can grow at the expense of third party competitors, so a positive sign is expected. However this variable is never significant and is not reported. In addition we also experiment with other possible variables. We calculated unit value indices for PRC and ASEAN and attempted to use differences between these as proxies for changes in relative prices. However unit values are only available for a limited number of trade categories and hence we are unable to apply this price variable consistently. We also tested for the impact of the ratio of exports from ASEAN in particular trade categories to exports from PRC in that category at the beginning of the period. However this variable is closely correlated with the RCA measure and was dropped due to multi-collinearity.

Mathematically the change in competitiveness will be related to RCA by a concave line; CC in figure 2 illustrates the case where the coefficient on RCA is negative. This means that there will be a crossover point for the RCA at which a product moves from competitive to uncompetitive. We only report these points where the independent variables in the model are all significant and the RCA value at the crossover point is above a minimum figure of 0.10. There are a small number of cases where these conditions are met.

Although it complicates the model we are forced to introduce changing demand conditions into the analysis. Conventional constant market share analyses omit any demand term and assume that supply changes that affect competitiveness determine changes in a country's share in a given market. However, our empirical observations of behavior in the US and Japanese markets find that for a significant number of trade categories the sign on the competitiveness term is the opposite; in other words a good may be gaining in relation to PRC in one market and losing in the other. Assuming, as we do, that there is no significant change in relative transport costs or in relative trade barriers facing exporters, this implies that products are differentiated and non-homogeneous and that, provided the changes are not random, they must be caused by demand shifts. We try to capture this effect by including a dummy for products subject to demand shifts due to differential taste change in the two markets. In figure 1 this implies that for such products the horizontal price line will move up (for a favorable demand shift) or down (for an unfavorable one).[5]

[5] The general constant term (a1DVS explained below) picks up both neutral shifts in competitiveness unrelated to factor intensity and any additional taste changes that occur that are in the same direction in the two markets.

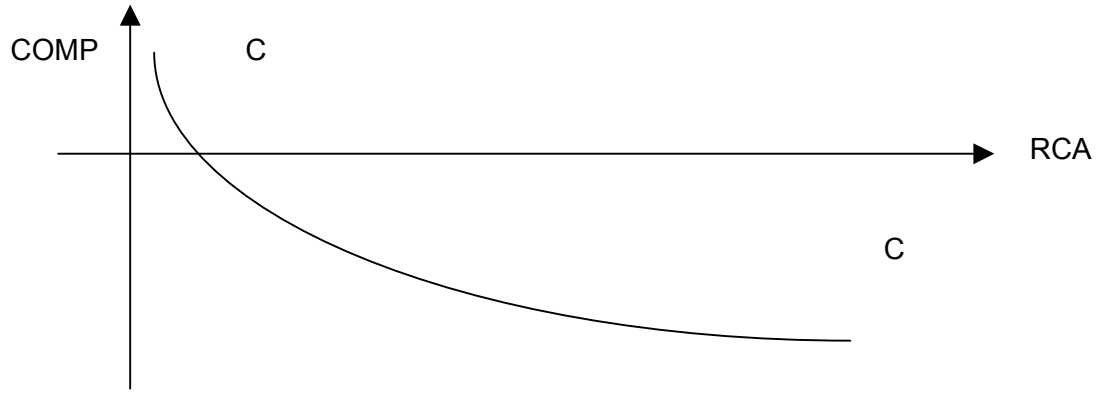

Fig 2. Illustration of RCA and competitiveness change

As total trade covers a wide variety of product types to impose some pattern on the data we classify these by the nine product categories of Lall (2000).[6] These can be interpreted as descriptive classifications of relatively homogeneous product categories. Our use of dummy variables reflecting these nine categories implies that there is broad homogeneity within each in terms of the response of different products to the explanatory variables. However, within these classifications we also attempt to capture the degree of technological sophistication by applying the sophistication index of Kwan (2002). The Kwan index is calculated at the 4-digit level to capture the technological sophistication of a trade category. It is based on the assumption that the sophistication of a commodity can be approximated by the weighted average income per capita of its exporters with the weights determined by the share of each exporter in the US market. This index gives a unique value for each trade category. The expectation is that products based on assembly –type production will have a relatively low value of the index (as they are assembled in low wage economies) and that products with higher local value-added will have a higher value of the index. If it is the case that ASEAN's market position is protected by a technological advantage within a broad trade category, we expect that the sign on the Kwan index would be positive.[7]

Summary of the regression model

To summarize the regression analysis takes the form

$$Comp_{it} = (\alpha_1 + ... + \alpha_9)DVS_{it} + (\beta_1 + ... + \beta_9)DVD_{it} + \varphi AD_t$$
$$+ (\gamma_1 + ... + \gamma_9 + \eta AD_t)Log(RCA_i) + (\delta_1 + ... + \delta_9)TECH_i + \varepsilon_{it}$$

where COMP is the competitiveness term relative to PRC as a proportion of exports,

TECH is a measure of technological characteristics of individual products (at the SITC four digit level), RCA is the relative revealed comparative advantage measure for the same

[6] The Lall classification is a widely cited approach, which utilizes earlier classifications and data on R and D expenditure, to classify trade categories by factor and technology characteristics. Like any such broad approach it is subject to reservations concerning the homogeneity of the categories. It groups products at the 3 –digit SITC level into the following nine main classifications – primary products, resource-based manufactures, low technology manufactures (split between textiles, garments and footwear, and others), medium technology manufactures (split between engineering, automotive products and process products) and high technology (split between electronics and electricals and others).

[7] This expected sign is also confirmed by the prediction of our simple model as discussed in Appendix A.1, although there the role of the Kwan index is rationalized in a slightly different way as a proxy for relative productivity levels between competitors.

product at the 4-digit SITC level, which is defined as a country's conventional revealed comparative advantage divided by that of PRC for the same product. Since we expect that the change in competitiveness is a structural adjustment process in response to some external shocks as explored in the appendix and that the adjustment will not be completed in the short sample period, we use the RCA calculated at the starting point of the period to capture the structural characteristics of products, which we assume will not change fundamentally over our sample period. The same can be said for the Kwan technology index that is a continuous variable used for TECH. In addition to allow for other similar characteristics of the trade categories, products are grouped into the nine categories used in the Lall classification – to reflect 'non-technological' similarities, which in the above equation is represented by the nine coefficients for the same explanatory variable.

These are reflected in nine product category dummies. The assumption is that within each category all trade observations will behave in the same way in response to both demand side shocks (that is taste change) and supply side shocks (general competitiveness shifts unrelated to specialization and technological sophistication). However, to distinguish products where there have been demand side shocks, defined as those where the sign on the competitiveness change differs between the US and Japanese markets, we introduce two further dummies. A demand shock dummy (DVD) takes a value of unity when the sign on the competitiveness term between the two markets differs and zero when the sign on the competitiveness term is the same. The supply shock dummy (DVS) takes a value of unity when the sign in the two markets is the same and zero when it is opposite. The constant αDVS refers to the interaction term between a dummy for each of these nine groupings and DVS. It can be interpreted as picking up the impact of general supply shocks, unrelated to either factor intensity or technological sophistication, plus generally favorable demand factors that are uniform between the two markets.[8] The constant βDVD refers to the interaction term between a dummy for each of these nine groupings and DVD. It should pick up the impact of changes in taste that vary between the two markets. In addition the terms γTECH and δRCA are interaction terms between the TECH and RCA variables and the dummies for the nine product groupings. We use a log form for δRCA on the grounds that any relation between competitiveness change and RCA is unlikely to be linear and this gives us the concave relation in figure 2. In this way we attempt to test for the impact of specialization and technological sophistication on competitiveness, whilst controlling for changes in tastes as between the two markets.

In addition, to allow for the possible disruptions brought about by the Asian financial crisis and its aftermath, we introduce further annual dummies (AD) that take a value of 1 for 1997-1998, 1998-1999 and 1999-2000, separately. We specify the equation so that the Crisis may affect the constant term as well as the coefficients for RCA simultaneously, but not the technological variables.

3. Regression Results

We conduct the initial analysis across 690 four-digit SITC categories first for the ASEAN countries as a group and then for each individually. We use a weighted least squares approach, because from the nature of the dependent variable we know there will be heterogeneity in the error terms. In examining the period 1995-2000 we apply three alternative approaches; we take the averages of all variables over the period, we take three year moving averages and (as explained above) we take annual observations with dummies for the years 1997-98, 1998-99 and 1999-2000 to pick up the effect of the Financial Crisis and its aftermath. The results are consistent between these three approaches, however as

[8] Any changes in relative trade barriers common to both markets would be picked up here, whilst changes that vary between the two markets would be picked up by DVD.

the latter using annual data gives both the maximum number of observations and the largest number of significant coefficients, we report this version of the analysis.

US Market

Table 4. US Market: Regression results for ASEAN and individual countries (annual data 1995-2000)

Country		ASEAN	Indonesia	Philippines	Malaysia	Thailand	Singapore
Constant	I	0.2 (0.4)	1.8* (0.6)	0.8 (1.2)	1.1 (1.0)	0.3 (0.5)	0.5 (1.0)
	II	-0.4 (0.3)	0.1 (0.5)	-0.7 (0.8)	-0.6 (0.9)	-0.2 (0.4)	-2.3** (1.1)
	III	0.2 (0.2)	-0.4*** (0.2)	-0.2 (0.4)	-0.3 (0.6)	0.2 (0.3)	-0.2 (0.5)
	IV	-0.4 (1.6)	2.4 (5.4)	-4.1 (14.2)	-4.7 (7.8)	-1.0 (3.1)	3.5 (3.6)
	V	-0.9* (0.2)	-0.6*** (0.3)	-1.1** (0.5)	-1.7* (0.3)	-0.4 (0.3)	-1.0* (0.3)
	VI	0.2 (0.3)	-3.4* (0.6)	-3.2* (0.5)	0.4 (0.4)	0.06 (0.3)	0.2 (0.5)
	VII	-0.7* (0.2)	-0.3 (0.3)	-0.4 (0.4)	-1.5* (0.4)	-0.8* (0.2)	-4.2* (0.9)
	VIII	0.3 (0.8)	0.09 (1.2)	6.4 (4.5)	-1.6 (1.3)	0.6 (0.9)	-2.3 (4.1)
	IX	-0.7 (0.5)	-4.7 (4.2)	-0.9 (1.4)	-2.1*** (1.1)	-0.7 (0.9)	-1.8 (1.6)
1997-1998		-0.002 (0.01)	-0.06** (0.02)	-0.05*** (0.03)	0.07* (0.03)	-0.02 (0.02)	-0.1* (0.03)
1998-1999		-0.005 (0.01)	-0.1* (0.02)	-0.2* (0.03)	-0.003 (0.03)	-0.001 (0.02)	0.003 (0.03)
1999-2000		0.005 (0.01)	-0.1* (0.02)	-0.2* (0.03)	0.02 (0.02)	0.02 (0.02)	-0.02 (0.03)
RCA term	I	-0.01 (0.03)	-0.2* (0.04)	-0.09*** (0.05)	-0.08*** (0.04)	0.004 (0.02)	-0.09* (0.03)
	II	-0.04* (0.01)	-0.07* (0.02)	-0.09* (0.03)	-0.08* (0.03)	-0.04** (0.02)	-0.06* (0.02)
	III	0.01 (0.01)	-0.03*** (0.02)	-0.04*** (0.02)	-0.05* (0.02)	0.005 (0.01)	-0.08* (0.03)
	IV	-0.02 (0.09)	-0.07 (0.1)	-0.1 (0.2)	-0.2 (0.3)	-0.04 (0.08)	-0.2 (0.2)
	V	-0.03* (0.01)	-0.07* (0.02)	-0.09* (0.02)	-0.05* (0.02)	-0.05* (0.01)	-0.01 (0.02)
	VI	-0.03* (0.009)	-0.08* (0.01)	-0.08* (0.01)	-0.05* (0.01)	0.01 (0.01)	-0.04* (0.01)
	VII	-0.05* (0.01)	-0.04*** (0.02)	-0.05*** (0.03)	-0.1* (0.02)	-0.04* (0.01)	-0.09* (0.03)
	VIII	-0.04 (0.03)	-0.07** (0.03)	-0.1 (0.08)	-0.05 (0.04)	-0.04 (0.04)	-0.1** (0.05)
	IX	-0.05** (0.03)	0.04 (0.2)	-0.2* (0.06)	-0.06 (0.07)	-0.1** (0.06)	-0.08* (0.03)

	Annual dummy 1997-1998	-0.01 (0.009)	0.03*** (0.02)	0.01 (0.02)	-0.02 (0.02)	-0.02*** (0.01)	0.005 (0.01)
	Annual dummy 1998-1999	-0.01 (0.009)	-0.001 (0.02)	0.05* (0.01)	0.03** (0.01)	-0.01 (0.01)	0.002 (0.01)
	Annual dummy 1999-2000	-0.01 (0.008)	0.009 (0.01)	0.07* (0.01)	0.07* (0.01)	-0.006 (0.01)	0.05* (0.01)
Demand dummy	I	0.5 (0.4)	1.9* (0.6)	1.2 (1.2)	1.0 (1.0)	0.7 (0.5)	0.4 (1.0)
	II	-0.3 (0.3)	0.3 (0.5)	-0.5 (0.8)	-0.2 (0.9)	-0.03 (0.4)	-2.2** (1.1)
	III	0.4** (0.2)	-0.2 (0.2)	-0.04 (0.4)	-0.1 (0.6)	0.5*** (0.3)	-0.2 (0.5)
	IV	-0.2 (1.6)	2.4 (5.3)	-4.2 (14.2)	-4.4 (7.8)	-1.0 (3.1)	3.2 (3.6)
	V	-0.8* (0.2)	-0.5*** (0.3)	-0.9*** (0.5)	-1.5* (0.3)	-0.3 (0.3)	-0.4 (0.3)
	VI	0.3 (0.3)	-3.3* (0.6)	-3.2* (0.5)	0.5 (0.4)	0.2 (0.3)	0.2 (0.5)
	VII	-0.7* (0.2)	-0.2 (0.3)	-0.4 (0.4)	-1.4* (0.4)	-0.7* (0.2)	-4.1* (1.0)
	VIII	0.2 (0.8)	0.06 (1.1)	6.6 (4.5)	-1.6 (1.3)	0.6 (1.0)	-2.4 (4.1)
	IX	-0.5 (0.5)	-4.2 (4.2)	-1.0 (1.5)	-2.1*** (1.1)	-0.3 (0.9)	-1.6 (1.6)
Kwan Index	I	-0.06 (0.05)	-0.2* (0.07)	-0.1 (0.1)	-0.1 (0.1)	-0.08 (0.06)	-0.07 (0.1)
	II	0.03 (0.03)	-0.02 (0.05)	0.08 (0.09)	0.03 (0.1)	0.01 (0.04)	0.2** (0.1)
	III	-0.04*** (0.02)	0.05 (0.03)	0.03 (0.05)	0.02 (0.08)	-0.04 (0.03)	0.008 (0.06)
	IV	0.2 (0.2)	-0.2 (0.6)	0.4 (1.4)	0.4 (0.8)	0.09 (0.3)	-0.4 (0.4)
	V	0.08* (0.02)	0.06*** (0.04)	0.1** (0.05)	0.2* (0.03)	0.02 (0.04)	0.07** (0.03)
	VI	-0.04 (0.03)	0.4* (0.06)	0.4* (0.06)	-0.05 (0.04)	-0.03 (0.04)	-0.04 (0.05)
	VII	0.06* (0.02)	0.03 (0.03)	0.04 (0.05)	0.1* (0.05)	0.07* (0.02)	0.4* (0.1)
	VIII	-0.04 (0.08)	0.008 (0.1)	-0.7 (0.5)	0.2 (0.1)	-0.07 (0.1)	0.2 (0.4)
	IX	0.05 (0.05)	0.5 (0.5)	0.1 (0.2)	0.2*** (0.1)	0.05 (0.1)	0.2 (0.2)
Observations		2851	1705	1488	1815	2128	1661
GLS/OLS		WLS	WLS	WLS	WLS	WLS	WLS
Adjusted R-squared		27.2/2.0	18.4/-1.1	12.0/-4.7	17.3/-4.6	22.6/4.2	34.1/-0.9

Notes: 1. *, ** and *** denote significance level of 1%, 5% and 10% respectively.

2. In the last row the first number is the Adjusted R-square for weighted statistics and the second one is for un-weighted statistics. Coefficients and standard errors (in parenthesis) are rounded to the first non-zero number.

3. To exclude data exceptions, instead of employing data dummies we introduce a filter condition for the dependent variable whilst the cutoff is set at 2 (or 5 in some cases). At this level the degree of freedom is not reduced very much, but the heterogeneity of observation fluctuation has been substantially reduced. An increase of this cutoff to 20 does not alter our results above.

4. Notably for most equations here the error terms do not follow a normal distribution.

5. The regression equation takes the form of

$$CG = C(1) + C(2)\log(RCA + 0.00001) + C(3)kwan + C(4)demand - dummy + C(5)data - dummy$$

We have also tried the linear form of the RCA term where the results are broadly the consistent. The addition of 0.00001 here is to allow for the observations where RCA is zero. This semi-log version is slightly superior in term of adjusted R-squared and number of significant cases.

Sector classification and number of observations: (according to the classification in Lall (2000), revised to version 3 of SITC)

Type	Maximum size	Sector
I	170	Primary product
II	254	Resource-based manufactures
III	122	Textile, garment and footwear
IV	34	Automotive
V	166	Engineering
VI	50	Electronic and electrical
VII	110	Other low tech
VIII	87	Process
IX	32	Other high tech

In analyzing the results from table 4 the following main points emerge.

1. For ASEAN as a whole there is evidence of a statistically significant loss of competitiveness in five of the nine product categories. These are the categories of resource-based manufactures, engineering products, electronics and electricals, the other low technology category and other high technology goods. For all of these the loss is significantly greater the higher is the degree of specialization as measured by the RCA, so that for these good losses of market share relative to PRC are found consistently in the more specialized areas. This appears to be a general pattern since for ASEAN as a whole the sign on the RCA term is always negative except for the case of textiles and garments, where it is positive but insignificant. Technological sophistication, as measured by the Kwan index, is significant with a positive sign for the categories engineering and other low technology goods, implying that losses are less in the more technologically advanced products. For textiles and garments the sign on the Kwan index is negative and weakly significant implying the reverse, although this category appears to be influenced by some favorable demand shifts. There is no systematic tendency for gain of competitiveness for ASEAN as a whole in any of the product categories, although as we discuss below there is some limited evidence for individual countries. It thus appears that although there is a strong tendency to loss of market share relative to PRC, this is not across the board and the general hypothesis of differential competitive effects by product category is

supported. Losses are found across a wide spectrum of activities; in both high technology (electronics and electricals and other high technology products), medium technology (engineering) goods, relatively simple products (other low technology), as well as in resource-based manufactures. There is no evidence of systematic loss of market share for ASEAN as whole for primary products, automotive products and process products and only very weak evidence for textiles and garments.

2. In terms of the impact of the Crisis as captured by the various annual dummies there is a negative sign on the general dummies for ASEAN for 1997-98 and 1998-99, although they are not significant. The impact of the Crisis of 1997 on performance in 1997-98 and 1998-99 relative to PRC is in principle ambiguous since whilst supply-side disruptions will reduce competitiveness the exchange rate depreciations will increase it. Significant negative annual dummies for 1997-98 are found for Indonesia, the Philippines and Singapore, and for Indonesia and the Philippines in 1998-99 and 1999-200. The apparently unusual case is Malaysia where the dummy for 1997-98 is positive and significant, implying that ceteris paribus there are special characteristics of 1997-98, which raise the competitiveness of the economy relative to PRC in the US. However, this result is consistent with the facts, since for total exports to the US the gap between Chinese export growth and Malaysian export growth for 1997-98 (at 8.7%) is lower than that for the period 1995-97 (at 14.5%).

3. Some differential patterns in terms of loss of competitiveness are found between countries (see table 5 for a summary). Singapore has significant losses that are greater in its more specialized activities in eight out of the nine categories, with the only exception being the small category for automotive products. The Philippines, Malaysia and Thailand have significant losses that are greater in more specialized activities in seven out of the nine categories. Indonesia has significant losses in five out of the nine categories and Thailand in four out of nine. No country shows significant losses in the small category of automotive products. All countries show significant losses in resource-based manufactures, engineering, and other low technology goods. Thailand is the main exception by failing to show significant losses for primary products, textiles and garments, and electronics and electricals. Indonesia is the exception in the case of other high technology products. In all but one case, whenever the Kwan index of technological sophistication is significant it has a positive sign, implying that within a given product category losses are lower ceteris paribus the more technologically sophisticated is the product. The exception is the case of primary products from Indonesia, however it is unclear whether this particular index is meaningful for such goods. No individual country has a significant tendency for an unambiguous gain of competitiveness viz-a viz PRC in any category. However in a small number of cases there is evidence of a non-zero crossover rate for the RCA at which competitiveness moves from positive to negative. This occurs in the case of primary products and engineering in Indonesia. The crossover RCAs above which there is a loss of competitiveness and below which a gain are 1.24 and 0.76, respectively. The other case is for engineering in the Philippines where below a relatively low crossover rate of 0.23 there is a tendency to a gain in competitiveness.[9] The hypothesis that there is a different pattern in trends of competitiveness between individual ASEAN countries and PRC can be said to be supported, although only weakly given the broad similarity in table 11.

4. The most consistent pattern in our results is the finding that loss of market share is systematically and negatively related to the degree of specialization in ASEAN and in individual economies relative to PRC. This follows since whenever the RCA term is significant (and it is significant in 36 out of 54 possible cases) it has a negative sign. This means that in terms of figure 1 the relative MC curve for ASEAN relative to PRC

[9] These crossover RCAs require all three terms – the constant for each product category, the RCA and the Kwan index - to be significant. Relatively few products are likely to be below the crossover rate of 0.23.

behaves as in the shift from MC* to MC, with the largest relative rise in the higher RCA products. In explaining this shift we can of this as a favorable relative shift for PRC, which converts into an unfavorable relative shift for ASEAN competitors. FDI-induced rising capital productivity is a simple explanation. If ASEAN economies have specialized relative to PRC in capital –intensive goods any favorable shock for PRC that affects its capital rental-wage ratio can be expected to shift the relative MC curve upwards in this way, creating a loss of competitiveness for ASEAN that is greater in its more specialized markets. This, together we some catch up effect in favor of PRC principally for commodities with high RCAs for ASEAN, appears to be what we have identified.

Table 5 summarizes the situation by country in the different product categories, where we find statistically significant results.

Table 5 US market: summary.

Sector/country	ASEAN	Indonesia	Philippines	Malaysia	Thailand	Singapore
Primary product		*, K-	*	*		*
Resource-based manufactures	*	*	*	*	*	*, K+
Textile, garment and footwear	K-	*	*	*		*
Automotive						
Engineering	*, K+	*, K+	*, K+	*, K+	*	*, K+
Electronic and electrical	*	*, K+	*, K+	*		*
Other low tech	*, K+	*	*	*, K+	*, K+	*, K+
Process		*				*
Other high tech	*		*	*	*	*
Number of categories with significant loss[a]	5	7	7	7	4	8

Notes: * indicates competitiveness significantly related to RCA with negative sign
K+ indicates Kwan index significant with positive sign,
K- indicates Kwan index significant with negative sign.
a) significant loss refers to categories where competitiveness significantly related to RCA with negative sign.

Japanese market

When the same analysis is repeated for the Japanese market (see tables 6 and 7) a few differences from the US market can be noted, however in general there is a broad similarity. With only a very few exceptions when a variable is significant in one market, its sign is the same in the other market, even if it is insignificant.

The main results from the analysis of competitiveness trends in the Japanese market can be summarized as follows;

1. For ASEAN as a whole there is evidence of a statistically significant loss of competitiveness in seven of the nine product categories, as compared with five in the US. These are the categories of primary products, resource-based manufactures, engineering products, electronics and electricals, the other low technology category, process products and other high technology goods. The only categories where there is no significant loss of competitiveness are textiles and garments and automotive products. As in the US the loss is significantly greater the higher is the degree of specialization as measured by the RCA, so that for these seven categories losses of market share relative to PRC are found consistently in the more specialized areas. This appears to be a general pattern since for ASEAN as a whole the sign on the RCA term is normally negative, even when it is insignificant. The only exception is the case of textiles and garments, where it is positive but insignificant. Technological sophistication, as measured by the Kwan index, is significant with a positive sign for the categories resource-based manufactures and other low technology goods, implying that losses are less in the more technologically advanced products. As in the US there is no systematic tendency for gain of competitiveness for ASEAN as a whole in any of the product categories. In Japan, as compared with the US, there is an even stronger tendency to loss of market share relative to PRC, that is widely spread across most products categories, the most important exception being textiles and garments, but here whilst ASEAN as whole shows no significant tendency to loss of market share three countries (Indonesia, the Philippines and Thailand) do.
2. In terms of the impact of the Crisis as captured by the various annual dummies there does appear to be evidence of differences between trends in the Japanese and US markets. In Japan for ASEAN as a whole the dummy for 1997-98 is positive although insignificant, whilst that for 1998-99 is positive and significant. Further and unexpectedly significant positive annual dummies are found for Indonesia and Thailand in both 1997-98 and 1998-99. The explanation for Indonesia's better performance in these years relative to what would otherwise be expected appears to be due to the behavior of primary exports, which may have been diverted from the US to the Japanese market in these years. When primary exports are excluded from the analysis the sign on the coefficient for 1997-98 changes to negative although it is insignificant, and the significance of the remaining positive coefficient for 1998-99 disappears. Thailand's positive term for the annual dummy in 1997-98 reflects the fact that the gap between the growth of Chinese exports to Japan and those of Thai exports in 1997-98 (at 3.1%) narrowed compared with the average for 1995-97 (at 11.4%). Similarly the positive dummy for 1998-99 again reflects a narrowing of the gap (at 7.2 % for 1998-99 compared with 11.4%).
3. Some differences in terms of loss of competitiveness are found between countries (see table 7 for a summary). Indonesia and Thailand have significant losses that are greater in more specialized activities in eight out of the nine categories, with as in the US the only exception being the small category for automotive products. Singapore has significant losses that are greater in more specialized activities in seven out of the nine categories, the Philippines has significant losses in six out of the nine categories, and in Japan, Malaysia is the economy with the lowest number with four out of nine. As in the US, no country shows significant losses in the small category of automotive products. All countries show significant losses in engineering, electronics and electricals and other high technology goods. The Philippines is the exception in failing to show significant losses for primary products, the Philippines and Malaysia do not show significant losses for resource base manufactures and Malaysia and Singapore are the exceptions for textiles and garments. Malaysia is the only exception in the case of process products. and electronics and electricals. Indonesia is the exception in the case of other high technology products. As in the US whenever the RCA term is significant its sign is always negative implying that losses are greater in more specialized activities. In the Japanese market the RCA term is

negative and significant in an even higher proportion of the possible cases (40 out of 54, as opposed to 36 out of 54 in the US).

4. No individual country has a significant an unambiguous tendency for a gain of competitiveness viz-a viz PRC in any category. However, in Japan we find a few more plausible cases of a significant non-zero crossover RCA. For ASEAN as a whole the crossover RCAs, below which there is a gain of competitiveness are 0.33 for resource-based manufactures and 0.94 for other high technology products. For individual countries there are crossover rates of 0.65 for resource-based manufactures and 2.0 for other low technology products in Indonesia, and of 0.32 and 0.58 for engineering and other low technology products, respectively for the Philippines. These are exceptions however and for the bulk of categories and countries the predominant result is a loss of competitiveness. The impact of the Kwan index is the main factor in explaining these non-zero crossover rates. In all cases, whenever the Kwan index of technological sophistication is significant, it has a positive sign, implying that within a given product category losses are lower ceteris paribus the more technologically sophisticated is the product. Similar results for the Kwan index between the US and Japanese markets are found for engineering (where it is positive and significant for the Philippines and Singapore in both markets) and other low technology products (where it is positive and significant for ASEAN as a whole and for Thailand and Singapore in both markets.

Table 6 Japanese Market: Results for ASEAN and individual countries.

Country		ASEAN	Indonesia	Philippines	Malaysia	Thailand	Singapore
Constant	I	-0.08 (0.2)	-0.008 (0.2)	-0.4 (0.6)	0.3 (0.4)	-0.4*** (0.2)	-1.1*** (0.7)
	II	-0.6* (0.2)	-0.6** (0.2)	-0.2 (0.6)	-0.5 (0.5)	-0.1 (0.2)	-1.2 (1.1)
	III	0.04 (0.2)	-0.1 (0.2)	-0.9*** (0.5)	-0.07 (0.5)	-0.5** (0.3)	-1.0 (1.2)
	IV	-1.4 (1.4)	-2.8 (1.9)	-9.8 (14.4)	-5.7 (5.4)	2.6 (2.9)	0.4 (4.8)
	V	-0.2 (0.2)	-0.2 (0.4)	-1.2** (0.5)	0.01 (0.3)	-0.01 (0.3)	-1.3* (0.4)
	VI	-0.2 (0.2)	0.6 (0.5)	-0.4 (0.5)	-0.8** (0.4)	-0.6*** (0.3)	-0.2 (0.4)
	VII	-0.6** (0.2)	-1.1* (0.4)	-0.7 (0.5)	-0.5 (0.6)	-0.7* (0.2)	-4.1* (1.4)
	VIII	-0.2 (0.5)	0.01 (0.6)	0.2 (1.2)	-1.5 (1.5)	-0.3 (0.6)	-2.3 (2.3)
	IX	-2.3* (0.6)	-1.3 (2.4)	-1.2 (1.7)	-2.1*** (1.2)	0.4 (0.8)	-0.7 (1.6)
1997-1998		0.02 (0.01)	0.08* (0.02)	-0.1* (0.03)	0.002 (0.03)	0.07* (0.02)	-0.005 (0.04)
1998-1999		0.1* (0.01)	0.05** (0.02)	-0.03 (0.03)	0.2* (0.03)	0.09* (0.02)	0.02 (0.04)
1999-2000		-0.02 (0.01)	-0.08* (0.02)	-0.1* (0.03)	-0.07** (0.03)	0.06 (0.02)	-0.03 (0.04)
RCA term	I	-0.04* (0.01)	-0.04* (0.02)	-0.03 (0.04)	-0.09** (0.04)	-0.06* (0.01)	-0.1* (0.04)
	II	-0.08* (0.009)	-0.09* (0.01)	-0.02 (0.03)	-0.02 (0.02)	-0.07* (0.01)	-0.09* (0.02)
	III	-0.005 (0.01)	-0.02 (0.01)	-0.1* (0.03)	-0.02 (0.02)	-0.03*** (0.02)	-0.06 (0.04)
	IV	-0.04 (0.06)	-0.2 (0.1)	-0.1 (0.1)	-0.2 (0.2)	0.05 (0.08)	-0.06 (0.1)
	V	-0.09* (0.01)	-0.1* (0.02)	-0.07* (0.02)	-0.06* (0.02)	-0.08* (0.01)	-0.08* (0.02)
	VI	-0.04* (0.008)	-0.08* (0.01)	-0.07* (0.009)	-0.02*** (0.01)	-0.07* (0.01)	-0.08* (0.01)
	VII	-0.06* (0.01)	-0.09* (0.02)	-0.1* (0.02)	-0.01 (0.03)	-0.05* (0.01)	-0.1* (0.04)
	VIII	-0.09* (0.02)	-0.1* (0.02)	-0.1* (0.05)	-0.01 (0.03)	-0.09* (0.03)	-0.1* (0.03)
	IX	-0.1* (0.03)	-0.2* (0.06)	-0.1** (0.06)	-0.2* (0.06)	-0.1*** (0.07)	-0.09** (0.04)
	Annual dummy 1997-1998	0.03* (0.009)	0.08* (0.01)	0.04* (0.01)	-0.02 (0.02)	0.005 (0.01)	0.04** (0.02)
	Annual dummy 1998-1999	0.05* (0.009)	0.09* (0.01)	0.05* (0.01)	-0.02 (0.02)	0.01 (0.01)	0.07* (0.01)

	Annual dummy 1999-2000	0.03* (0.008)	0.05* (0.009)	0.04* (0.01)	0.05* (0.01)	0.008 (0.009)	0.01 (0.01)
Demand dummy	I	-0.2 (0.2)	-0.04 (0.2)	-0.4 (0.6)	0.2 (0.4)	-0.4*** (0.2)	-1.0 (0.7)
	II	-0.5** (0.2)	-0.5** (0.3)	-0.1 (0.6)	-0.6 (0.5)	-0.04 (0.2)	-1.2 (1.0)
	III	0.08 (0.2)	-0.1 (0.2)	-1.0*** (0.5)	-0.06 (0.5)	-0.6** (0.3)	-0.6 (1.2)
	IV	-1.2 (1.4)	-2.7 (1.9)	-9.9 (14.3)	-5.8 (5.4)	2.7 (2.9)	1.1 (4.9)
	V	-0.02 (0.2)	-0.04 (0.4)	-1.2** (0.5)	0.2 (0.3)	0.2 (0.3)	-1.0* (0.4)
	VI	0.01 (0.2)	0.5 (0.6)	-0.3 (0.5)	-0.4 (0.4)	-0.3 (0.3)	0.2 (0.4)
	VII	-0.5*** (0.3)	-1.0** (0.4)	-0.5 (0.5)	-0.4 (0.6)	-0.6* (0.2)	-4.4* (1.5)
	VIII	-0.05 (0.5)	0.07 (0.6)	0.1 (1.2)	-1.1 (1.5)	-0.2 (0.6)	-2.2 (2.3)
	IX	-2.2* (0.6)	-1.2 (2.5)	-1.1 (1.8)	-1.9*** (1.2)	0.6 (0.8)	-0.5 (1.6)
Kwan Index	I	0.004 (0.02)	-0.001 (0.02)	0.04 (0.07)	-0.04 (0.05)	0.03 (0.03)	0.1*** (0.07)
	II	0.05** (0.02)	0.06** (0.03)	0.01 (0.07)	0.04 (0.05)	0.003 (0.03)	0.1 (0.1)
	III	-0.02 (0.02)	0.004 (0.03)	0.1 (0.07)	-0.007 (0.06)	0.04 (0.03)	0.08 (0.1)
	IV	0.1 (0.1)	0.3 (0.2)	1.0 (1.5)	0.6 (0.6)	-0.3 (0.3)	-0.08 (0.5)
	V	-0.002 (0.02)	0.005 (0.04)	0.1** (0.05)	-0.03 (0.03)	-0.02 (0.03)	0.1** (0.04)
	VI	0.004 (0.03)	-0.06 (0.06)	0.04 (0.06)	0.06 (0.04)	0.04 (0.03)	-0.0005 (0.05)
	VII	0.04 (0.03)	0.1** (0.04)	0.07 (0.06)	0.03 (0.07)	0.06** (0.03)	0.4* (0.2)
	VIII	0.02 (0.05)	0.003 (0.06)	-0.007 (0.1)	0.1 (0.2)	0.03 (0.07)	0.2 (0.2)
	IX	0.2* (0.07)	0.1 (0.3)	0.1 (0.2)	0.2*** (0.1)	-0.07 (0.09)	0.06 (0.2)
Observations		2969	1770	1509	1845	2202	1636
GLS/OLS		WLS	WLS	WLS	WLS	WLS	WLS
Adjusted R-squared		23.3/2.7	16.4/0.5	10.8/-1.1	18.8/-6.5	25.9/3.6	28.9/-3.8

Notes: 1. *, ** and *** denote significance level of 1%, 5% and 10% respectively.

2. In the last row the first number is the Adjusted R-square for weighted statistics and the second one is for un-weighted statistics. Coefficients and standard errors (in parenthesis) are rounded to the first non-zero number.
3. To exclude data exceptions, instead of employing data dummies we introduce a filter condition for the dependant variable whilst the cutoff is set at 2 (or 5 in some cases). At this level the degree of freedom is not reduced very much, but the heterogeneity of observation fluctuation has been substantially reduced. An increase of this cutoff to 20 does not alter our results above.

4. Notably for most equations here the error terms do not follow a normal distribution.

5. The regression equation takes the form of

$$CG = C(1) + C(2)\log(RCA + 0.00001) + C(3)kwan + C(4)demand - dummy + C(5)data - dummy$$

We have also tried the linear form of the RCA term where the results are broadly the consistent. The addition of 0.00001 here is to allow for the observations where RCA is zero. This semi-log version is slightly superior in term of adjusted R-squared and number of significant cases.

Table 7 Japanese market: summary

Sector/country	ASEAN	Indonesia	Philippines	Malaysia	Thailand	Singapore
Primary product	*	*		*	*	*
Resource-based manufactures	*, K+	*, K+			*	*
Textile, garment and footwear		*	*		*	
Automotive						
Engineering	*	*	*, K+	*	*	*, K+
Electronic and electrical	*	*	*	*, K+	*	*
Other low tech	*, K+	*, K+	*		*, K+	*, K+
Process	*	*	*		*	*
Other high tech	*, K+	*	*	*, K+	*	*
Number of categories with significant loss[a]	7	8	6	4	8	7

Notes: * indicates competitiveness significantly related to RCA with negative sign
K+ indicates Kwan index significant with positive sign,
K- indicates Kwan index significant with negative sign.
a) significant loss refers to categories where competitiveness significantly related to RCA with negative sign.

Conclusions

Our analysis strongly supports the view that the main ASEAN economies have been exposed to increasing competition from PRC in both the US and Japanese markets. Further the reduced competitiveness in terms of changes in market share viz-a-viz PRC appears to be related systematically to particular product categories with losses greater in the areas within these categories, where the ASEAN economies are most highly specialized relative to PRC. The pattern of loss of competitiveness also shows a broad similarity for both the US and Japanese markets.

There is evidence of increased competition from PRC at both the relatively labor-intensive and the relatively high technology end of the product scale, although within a given trade category technological sophistication appears generally to offer some protection for ASEAN exporters. The only product category for which there is no evidence of systematic loss of

competitiveness is automobile products, which is both small in value terms and for which we have the smallest number of observations in our analysis. In no product category is there any evidence of systematic gains relative to PRC, although for a few countries and categories we find a significant cross-over rate which implies that at lower levels of specialization there is a gain of competitiveness viz-a viz PRC, whilst there are losses at higher levels.

For the large categories of electronics and electricals and engineering (which combined are two-thirds of ASEAN exports in the US and 40% in Japan) there is a consistent pattern of loss of competitiveness which is stronger in more specialized products, which holds for all countries in both markets. For the other important categories of primary products, resource based manufactures and textiles and garments, all countries show significant losses in either the US or Japan and in a majority of cases for these categories countries show a significant loss in both markets. Again this is always significantly related to the degree of specialization. From our simple model we hypothesize that the link between greater specialization in ASEAN relative to PRC and loss of market share is due to shifts in the relative capital rental-wage ratios that are favorable to PRC and hence unfavorable to ASEAN. Increased domestic savings or rising FDI inflows to PRC, which increase the supply of capital and lower the capital rental-wage ratio are simple candidates for a general explanation. Naturally, more detailed industry-specific effects as well as general catch-up trends noted earlier may also be at work, but our analysis does not allow us to capture these.

It must be stressed that loss of competitiveness as defined here refers to loss of market share relative to PRC. This does not necessarily convert into an absolute decline in exports. Absolute export declines for ASEAN are found for primary products and engineering in the US and for primary products, resource-based manufactures, and textiles, garments and footwear in Japan. Hence much of the erosion of market share is in categories whose sales from ASEAN are continuing to expand, principally the very large category of electronics and electricals. Here losses of market share are in the product lines where ASEAN is most specialized eroding established market positions. This implies the need to consider some future restructuring, but it is not an immediate crisis in terms of declining absolute values of export sales. Also some of the gains by PRC in this category are misleading in that they relate to the export of assembled parts and components, some of which will have been exported to PRC by ASEAN producers. This emerging regional division of labor as yet has had only a modest impact in compensating ASEAN economies loss of export market share, with on aggregate a net export gain in sales to PRC of less than 20% of the combined value of the loss of market share in the US and Japan over the period of study. In terms of parts and components exports to PRC it appears that Malaysia and Thailand are the economies where the strongest signs of this compensating effect have begun to emerge.

Bibliography

ADBI (2002) 'Did East Asian Developing Countries lose Export Competitiveness in the pre-Crisis 1990's?' ADBI Research Paper 34, Tokyo.

W.Carlin, A.Glyn and J.van Reenen (2001) "Export Market Performance of OECD Countries: an empirical assessment of competitiveness" Economic Journal 111, 128-162.

E.Ianchovina and W.Martin (2001) Trade Liberalization and PRC's Accession to the World Trade Organization, mimeo World Bank, June.

C. Kwan (2002) Powerpoint presentation at ADB Institute, Jan.

S.Lall (2000) The Technology Structure and Performance of Developing Country Manufactured Exports, 1985-98, Oxford Development Studies, vol 28, no 3.

A.Nicita and M.Olarreaga (2001) Trade and Production 1976-99, mimeo World Bank, August.

J.Richardson (1971) 'Constant –Market-Shares Analysis of Export Growth', Journal of International Economics, pp 227-239.

A.Wood (1997) North-South Trade, Employment and Inequality, Clarendon Press, Oxford.

Appendix 1 Regression model

To formalize the analysis we use a simple model that assumes perfect factor mobility. We assume the production function for a representative producer of an individual commodity category takes a conventional Cobb-Douglas form as follows:

$$Q = \alpha K^{\beta} L^{1-\beta}, \beta < 1 \qquad (1)$$

Where Q is output, L is labor input, K is capital input, α is a constant; and α and β differ between commodities, whilst α also differs between countries.

Let superscript * denote a comparator and g represents the total export ratio of a comparator over the country concerned, then by the definition of RCA we have:

$$RCA = g\frac{\alpha}{\alpha^*}(\frac{K}{K^*})^{\beta}(\frac{L}{L^*})^{1-\beta}$$

Taking the logarithm of RCA and rearranging the above equation we have:

$$\beta = \frac{\log RCA - \log g - \log\frac{\alpha L}{\alpha^* L^*}}{\log(K/L) - \log(K^*/L^*)} \qquad (2)$$

Taking the logarithm of (1) and differentiating the result with respect to time we have:

$$\dot{Q} = \dot{\alpha} + \beta(\dot{K} - \dot{L}) + \dot{L} \qquad (3)$$

Output Q is either exported or absorbed domestically. We assume that for exportables the price ratio of the international and home market is stable, so that provided there are no systematic shifts in taste the ratio of export to domestic sales is determined only by the relative income level of the export and the home market. We denote the relative national income of the export to the home market as y and assume the export ratio is ky, where k is a constant coefficient. By our definition of competitiveness gain of a country viz-a viz a comparator (CG) we have:

$$CG = (\dot{y} - \dot{y}^*) + (\dot{\alpha} - \dot{\alpha}^*) + (\dot{L} - \dot{L}^*) + \beta[(\dot{K} - \dot{L}) - (\dot{K}^* - \dot{L}^*)] \qquad (4)$$

We distinguish the individual characteristics of products by subscript i and by plugging (2) into (4) we have as competitiveness gain for product i.

$$\begin{aligned} CG_i &= (\dot{y} - \dot{y}^*) + (\dot{\alpha}_i - \dot{\alpha}_i^*) + (\dot{L}_i - \dot{L}_i^*) \\ &+ \frac{[(\dot{K} - \dot{L}) - (\dot{K}^* - \dot{L}^*)]}{\log(K/L) - \log(K^*/L^*)}(\log RCA_i - \log g - \log\frac{\alpha_i L_i}{\alpha_i^* L_i^*}) \\ &= \{(\dot{y} - \dot{y}^*) + (\dot{L}_i - \dot{L}_i^*) - \frac{[(\dot{K} - \dot{L}) - (\dot{K}^* - \dot{L}^*)]}{\log(K/L) - \log(K^*/L^*)}(\log g + \log L_i - \log L_i^*)\} \\ &+ \{\frac{[(\dot{K} - \dot{L}) - (\dot{K}^* - \dot{L}^*)]}{\log(K/L) - \log(K^*/L^*)}\log RCA_i\} + \{(\dot{\alpha}_i - \dot{\alpha}_i^*) - \frac{[(\dot{K} - \dot{L}) - (\dot{K}^* - \dot{L}^*)]}{\log(K/L) - \log(K^*/L^*)}\log\frac{\alpha_i}{\alpha_i^*}\} \end{aligned} \qquad (5)$$

If r denotes a factor price, so r_L and r_K are the prices of labor and capital respectively, we know from the first order condition of profit maximization that the ratio of marginal factor

products is equal to the factor price ratio. When this is applied to our production function we derive an equation as follows:

$$\frac{K}{L} = \frac{\beta}{1-\beta}\frac{r_L}{r_K} \tag{6}$$

Taking the logarithm of (6) and differentiating with respect to time we have:

$$\dot{K} - \dot{L} = -(\dot{r}_K - \dot{r}_L) \tag{7}$$

Because of factor mobility, the factor price ratio and its change shall be the same for all products, thus we can omit the subscripts in equation (5).

Plugging (6) and (7) into (5) and rearranging the terms we have:

$$CG_i = \{(\dot{y} - \dot{y}^*) - \frac{(\frac{\dot{r}_K}{r_L^*}) - (\frac{\dot{r}_K}{r_L})}{\log[\frac{(r_K^*/r_L^*)}{(r_K/r_L)}]}\log g\} + \{\frac{(\frac{\dot{r}_K}{r_L^*}) - (\frac{\dot{r}_K}{r_L})}{\log[\frac{(r_K^*/r_L^*)}{(r_K/r_L)}]}\log RCA_i\}$$

$$+ \{(\dot{\alpha}_i - \dot{\alpha}_i^*) + (\dot{L}_i - \dot{L}_i^*) - \frac{(\frac{\dot{r}_K}{r_L^*}) - (\frac{\dot{r}_K}{r_L})}{\log[\frac{(r_K^*/r_L^*)}{(r_K/r_L)}]}(\log\frac{\alpha_i}{\alpha_i^*} + \log L_i - \log L_i^*)\} \tag{8}$$

$$= \omega_0 + \varpi_1 \log RCA_i + \varpi_3 s_i + \varepsilon_i$$

Where s_i is $\log(\frac{\alpha_i}{\alpha_i^*})$.

Equation (8) is precisely the regression model, which we apply. It is applied at the level of broad product categories, within which individual products (SITC 4 digit categories) are distinguished. The constant w_0 is a combination of the difference in national income growth, and the impact of initial total exports in the economy and the comparator. In addition, in the way the model is estimated empirically the relative growth of productivity and of labor inputs and the initial level of labor supplies in the economies also enter into the constant term. w_1 picks up the difference of the change in the relative factor price ratio as a coefficient on the RCA. It can be seen here that if an economy experiences a slower fall in capital cost relative to labor and if that economy initially has a higher endowment of capital to labor creating an initially lower capital rental to wage ratio the coefficient on the RCA term must be negative. This is the result that we find consistently in our empirical analysis.

The third term s_i reflects the productivity difference independent of capital and labor inputs between the two economies, which may be affected by a range of factors like initial resource endowment, spending on R&D, technological infrastructure and other institutional features. Since it is impossible to estimate this term at the 4-digit product classification level we take the Kwan index of technological sophistication as a proxy. We can see from equation (8) that the coefficient of this third term equals that of the RCA term but with the opposite sign. This is because the indicator RCA here is intended to pick up the effects of the factor price ratio and its change, however the measure of RCA by definition is also affected by the productivity term, hence the effects of this productivity term should be excluded to isolate the influence of factor prices. We find in the regressions that most Kwan terms have opposite signs to their RCA counterparts, suggesting they are at least positively correlated to the productivity term. Nevertheless the Kwan terms are rarely significant, casting doubt on their appropriateness as

a proxy. Fortunately inclusion of the Kwan index still contributes to the explanatory power of our model, justifying its use in the regression.

The difference of the change in productivity terms as measured here by the gap between changes in α, is divided technically into two terms, where as noted above the average enters the constant and the variation around this average enters the error term, which should be independent of all explanatory variables. The impact of the term reflecting the difference in growth of labor inputs is also split between the constant and the error term.

The above analysis does not incorporate demand shifts due to taste change since here we focus on the supply side. A taste change can be formally introduced by establishing a formal demand equation and therefore a complete demand-supply model, which is beyond our scope here.

In terms of the wider implications of this simple model competitiveness for an economy in individual product categories can be manipulated through policy by changes in relative factor prices (for example the relative cost of capital can be brought down by measures to increase domestic savings or increase foreign capital inflows) and by relative productivity growth (for example as a result of policies on competition, technology transfer or investment).

Catch-up, competitiveness and RCA.

A critical relationship in the model is that between the RCA and the competitiveness gain or loss induced by changes in the relative capital rental-wage ratio. The model predicts that for a given comparator a country with higher capital-labor ratio than the comparator will exhibit a relationship between the competitiveness measure and the RCA term, whose sign is the opposite to that displayed by a country with lower capital-labor ratio than the comparator. This is due to a relative factor price effect.
Furthermore, there appears a natural tendency for products with extreme high or low RCAs to experience a natural catch-up effect, so that where RCAs are low there will be a tendency to gain market share irrespective of factor price changes and conversely where RCAs are high there will be a natural tendency for a loss of market share. Hence at both extremes of the range of RCAs from the catch-up effect we expect thereto be a negative relation between competitiveness and RCA. Whenever factor prices change, therefore, the sign on the RCA term will depend on the net effect of these two influences, although if the factor price effect suggests a negative relation it will operate in the same direction as the catch up effect.
However, the presence of a 'natural tendency' to catch-up complicates the empirical testing of the mechanism explored in our model. For example, when a country concerned is more developed than the comparator and thus presumably has a higher capital/labor endowment, in the face of unfavorable capital rental-wage shock both mechanisms tend to generate a negative relationship, making it impossible to distinguish between them. Where a country concerned is less developed than the comparator and therefore displays a lower capital/labor ratio, for the same factor price shock the two mechanisms work in opposite directions. In this case we would expect a positive relationship within a normal RCA range – that is for the majority of observations where the factor price effect is dominant - and a negative one for very high RCAs due to catch-up and an ambiguous one at extreme low RCAs, since here both mechanisms can be expected to have a large effect.
Thus for this latter case if we plot the relation between competitiveness and the RCA we expect a polynomial relationship, which crosses the horizontal axis more than once.
Hence this gives us testable prediction that for a country that is more advanced that a comparator (viz ASEAN relative to PRC) in the face of a an unfavorable capital price shock the relation between competitiveness and the RCA will be negative, whilst for a country that is less advanced than the comparator (viz India relative to PRC) the relationship can be plotted by a polynomial curve with a positive relation over the majority of the RCA range.
To test this hypothesis we plot below competitiveness viz PRC and the relative RCA separately for ASEAN as a group and India. As can be seen both results match these a-prior expectations, supporting the validity of the underlying model. For India below an RCA of

approximately 2.7, which covers roughly 70% of the observations, the curve is upward sloping. For ASEAN as a group it is always downward sloping. A similar result of a positive relation with the RCA (not reported) is found if we use Viet nam as the less advanced country in the comparison with PRC.