In China's Wake:
Has Asia Gained from China's Growth?

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We employ a simulation analysis to examine the impacts of China's growth on Asian economies through the terms of trade and its impact on investment costs. We find that China's growth has had very large and positive impact on per capita incomes, consumption and trade flows in both developed Asia and the ASEAN regions. A decade of a decade of China's growth raises GDP per capita in the developed Asian economies by around 13%. With respect to the ASEAN-4 we find that China's growth causes a large decline in durables output and a falling trade to GDP ratio. Nevertheless, in contrast to much of the literature, it still has a large positive effect on trade flows and the net impact of per capita incomes is still substantial, at 7%. The main source of these gains is found to be lower durable goods import costs which induce accumulation of machinery and equipment capital.

Keywords: Economic Growth, China, Trade Costs.

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1. Introduction

In thinking about the impacts of China's growth on the world economy, several facts stand out. First, China's growth is an exceptionally high rate of growth – on par with the highest growth rates attained by Japan in the 1960s and the Newly Industrialised Economies (NIEs) in the 1970s. Second, China's growth has been extremely biased. Though GDP has increased by around 100% between 1995 and 2005, China's international trade flows have far outstripped its GDP growth. Over the same period for example exports relative to GDP grew by 62 precent (World Bank 2010). [1] The bias in China's growth suggests that China may be delivering sizable terms of trade gains to its export markets.

There have been a number of attempts to quantify the impact of Chinese growth, particularly on Asia using gravity models. This literature has given some credence to concerns among developing Asian economies, such as the ASEAN group, that China's growth is having a detrimental impact by increasing competition in their traditional export sectors (Lall and Albaladejo 2004, Eichengreen et al. 2007). Gravity models, however, only examine trade flows and hence are silent on how changes in trade flows flow through to outcomes of interest, such as wages levels, wage inequality, incomes, consumption and industry structure. Hence the gravity model approach falls short of quantifying the potentially most dramatic impacts of China's expansion.

The aim of this paper therefore is to undertake a quantitative assessment of the broad stylized facts regarding China's growth and trade bias focusing in particular on their impacts on the developed Asian economies of Japan and the NIEs, and the ASEAN-4 economies of Malaysia, Indonesia, Thailand and Philippines. Specifically we use a small scale calibrated open economy growth model of the Chinese and the regional Asian economies. The model incorporates inter-temporal optimization with respect to physical and human capital accumulation, and consumption decisions. It also incorporates multiple traded and non-traded sectors. This multi-sector approach is crucial as the effects of China's growth on other countries will be mediated through the terms of trade.

[1] See Amiti and Freund (2008) for a recent discussion of China's export growth and characteristics.

The simulations show that trade biased growth has a large impact on both the developed Asian and ASEAN-4 economies. A decade of China's growth is found to have increased GDP per capita in the developed Asian economies by about 17%, or 1.5 percentage points of extra growth per year over a decade. This figure suggests that China's impact on incomes in that region have been enormous. The impact on the ASEAN-4 economies is also large at 7%. Though more modest, this figure is arguably even more remarkable given the conclusions of gravity model studies such as Lall and Albaladejo (2004) and Eichengreen et al. (2007) which find that China's growth has been detrimental to these economies

The remainder paper is organized as follows. Section 2 establishes some stylized facts regarding China's growth patterns and its integration with the Asian region. Section 3 describes the model structure. Section 4 discusses the experiment designs and the results are reported in Section 5. Section 6 concludes by summarizing the main findings.

2. China's Growth and Integration with Asia

2.1 Growth in China

The structure of China's economy has changed profoundly since the implementation of a comprehensive set of economic reforms to liberalise and open its economy to foreign trade in 1978. It has shifted from an agriculture based economy to an economy with a massive industrial sector and a large services sector. According to Bosworth and Collins (2008), over the period 1979 to 1995, China grew at 6.4% per year but in the decade 1995 to 2005 the growth rate accelerated to 8.9% per year.

Though it is widely believed that growth in China will have large economic impacts on its trading partners, trade theory tells us that the impacts are ambiguous. For example, in a 2x2 Heckscher-Ohlin model, neutral growth in one country will have no impact on the terms of trade, and hence no impact on other countries. China's exports shares have, however, undergone substantial changes with a switch from light manufacturing commodities towards capital- and skill-intensive products. This is shown in Table 1 which reports the changes in China's export bundle over time. Between 1990 and 2005, the share of durables goods more than doubled whereas the shares of all other sectors declined. This trend has been emphasisedby, for example,

Schott (2006), Rodrik (2006), and Amiti and Freund (2008).

Table 1 also shows that the trade structure of China and the ASEAN-4 economies are similar. The composition of exports for the developed Asian region have remained relatively unchanged during 1990 to 2005, exports were dominated by the durables sector. But both China and the ASEAN-4 economies observed a large decline in the importance of the low-tech manufacturing sector in exports while that of the durables sector increased between 1990 and 2005.

[Table 1 about here]

The impact of China's growth on other countries depends on the strength of their international trade linkages. Since we are concerned with historical Chinese growth between 1995 and 2005, the relevant measures of integration are those that existed at the start of this period in 1995. Table 2 provides a summary of the level of integration between China and its Asian neighbours as it existed then. Columns 1 and 2 report the shares of China destined exports from the two Asian regions. Exports to China accounted for 10.6% of all exports from Japan and the NIEs (including intra-regional trade). Exports to China accounted for 3.5% of ASEAN-4's exports. Thus, the former region is much more integrated with China in terms of its export markets. ASEAN-4's main export to China is low-tech manufacturing goods whereas for the developed Asian region, durable goods sector is the main export category.

Table 2 also shows China's export patterns (Columns 3 to 6). As destination countries, Japan and the NIEs accounted for 31.0% of China's exports. Around one-third of this is low-tech manufacturing goods. ASEAN-4. Columns 5 and 6 report the same Chinese export values, but this time expressed as a fraction of world exports to each region. Thus, they correspond to the Chinese sourced import shares for developed Asian and ASEAN-4 economies. It can be seen, for example, that 8.4% of world exports to developed Asia are from China whereas only 3.9% of world exports to the ASEAN-4 economies are from China. Thus, circa 1995, developed Asia, consisting of Japan and the NIEs, were much more integrated with the Chinese economy than the ASEAN-4 economies.

[Table 2 about here]

2.3 Policy Debates

China's rapid growth has given rise to concern among the Asian economies that China has been crowding out their manufacturing export industries. China's export share for the US market, for example, increased from 3.1% in 1990 to 15.0% in 2005, whereas the market shares of Japan and the NIEs have fallen. The concern seems to be particularly acute for Asian economies that have lower income levels and a trade structures that are less complementary to that of China, such as the ASEAN group (see for instance Weiss and Gao 2003; Ahearne et al. (2003), Lall and Albaladejo 2004; Chia 2006; Ravenhill 2006; Coxhead 2007, Eichengreen et al. 2007).

Lall and Albaladejo (2004), for example classify the exports of China's neighbours into five levels of "threat".[2] According to their definition, most of the exports of the NIEs and the ASEAN-4 economies are under some form of threat from China's exports. A more sophisticated approach is to employ the gravity model to measure the partial effect of China's exports on other countries export patterns. Eichengreen et al. (2007) and Ahearne et al. (2003) examine the effects of China's export growth on the exports of other Asian countries using this approach. Ahearne et al. (2003) find no significant effects but Eichengreen et al. (2007) find that China's exports tend to "crowd out" the exports of Asian neighbours in third country markets. The crowding out is felt more strongly in the developing Asian economies than in the industrialised Asian economies. Eichengreen et al. (2007) also find that China's growth has a positive effect on the exports high income Asian economies, that are significant exporters of capital goods, and a strong negative effect on low income Asian countries that are dependent on the production and exports of consumer goods.

A more recent study by Athukorala (2010), however, finds little evidence to indicate that increases in China's exports reduce the market shares of other Asian economies in third country markets. To the contrary, he finds that China's exports to third country markets have had complimentary effects on Asian exports.

Though the gravity model literature recognises the impact of changes in countries GDP on trade

[2] For example, Lall and Albaladejo (2004) define "threat" as being if China gains export market share and the other countries lose, and "no threat" is where both China and the other economy gain market share, but with China growing more slowly.

flows, these studies only explain trade flows and fall short of telling us how changes in China's growth affect incomes, consumption and wages in other countries. The weak theoretical foundations of these models mean that that it is difficult to make any inferences regarding economic policy responses from these results.

These mixed results are also reflected in simulation studies that have looked at the effects of China's WTO accession on other regional Asian economies, for example Ianchovichina and Walmsley (2005) and Roland-Holst and Weiss (2005). In particular Roland-Holst and Weiss (2005), however, dismiss the apprehension of China's growing world trade shares arguing that there is no convincing evidence that China's trading partners are losing comparative advantage in higher value added or more skill-intensive activities.

As yet, however, there has been no analysis of the long run effects of China's growth per se. China's accession to the WTO, for example, is only a very small part of China's overall reform process. Moreover, the changes in trade patterns and increased trade flows arising from China's growth miracle, vastly exceed the changes implied by trade reforms alone. Moreover,

3. The Model

The aim is to simulate the impact China's growth on other Asian economies, holding other factors constant. To allow for trade-growth interactions we introduce long run neoclassical steady state factor accumulation conditions into an open economy multi-sector growth model. The model includes eleven sectors (six traded and five non-traded) and three separate regions. The focus of the model is to see how commodity price changes can affect factor prices – the Stolper-Sameulson effects – and how these in turn affect physical and human capital accumulation decisions in each region.

3.1 Structure of the Model

We consider three regions, China, "Asia" and the ROW. In one application, "Asia" will be an aggregate of Japan and the NIEs. In a second application, "Asia" is the ASEAN-4 economies group: Malaysia; Indonesia; Thailand and; the Philippines. We assume that the non-ROW regions face a constant world price for goods exported to the ROW. Critically, however, these

non-*ROW* regions, i.e. China and "Asia" are not assumed to be small with respect to each other. Domestic prices in China and Asia are determined by domestic demand and export supplies from each region. Thus the model will evaluate the first round terms-of-trade effects of one region's growth on the other non-*ROW* region. Growth in China, for example, will have an impact on prices in the ASEAN-4 economies and this in turn will induce growth effects through capital accumulation.

To allow for interesting terms of trade effects our model is disaggregated both at the sectoral level and at the factor input level. We therefore consider six traded goods, 5 other non-traded goods and seven factors of production. In what follows we give a brief overview of the main features of the model.[3]

3.2 Trade

Within each region we want to keep the motivation for trade close to standard trade theory. Thus, we retain the traditional "Heckscher-Ohlin" assumption that goods are homogenous within each region, in contrast to the more common "Armington" model of differentiated goods. Rather we assume that firms are joint producers producing three goods, each distinguished by its market destination. Let $\overline{R}$ denote the set of regions in the model. Then each firm is assumed to face a constant elasticity of transformation (CET) unit revenue function, which depends on the prices the producer receives for its commodities sold in each market. The CET revenue function is

$$\phi_i^r = \mu_i^r \left[\sum_{j=1}^{3} \delta_{i,j}^r \left(\lambda_i^{r\,j}\, p_i^{r\,j} \right)^{\eta_i} \right]^{\frac{1}{\eta_i}}, \; r \in \overline{R}, \; j \in \overline{R} \qquad (1.)$$

where p_i^{rj} are producer prices for firms in region *r*, $r \in \overline{R}$, received in each market, $j \in \overline{R}$, and $p_i^{r,j}(1+\tau^{j,r}) = q_i^j$, where $\tau^{j,r}$ is the tariff rate by region *j* on region *r*'s exports.

The parameters, $\lambda_i^{r\,j}$, in the revenue function can be interpreted as "iceberg" trade costs (Bergstrand 1985; Baier and Bergstrand 2001). That is, they represent the fraction of value received by firms per unit of value received in each market. We will later consider the

[3] A more detailed description of the model is available upon request.

implications of falling trade costs, represented by increases in $\lambda_i^{r\,j}$, as part of the growth process in China.

The regional supply function denoted by $x_i^{r,j}$ refers to the supply supply of good *i* from region *r* to region *j*. Using the envelope theorem we have $x_i^{r,j} = (\partial\phi_i^r / \delta p_i^{r\,j}) g_i^r$, where g_i^r is the gross output of commodity i in region *r*. A representative firm in in each traded sector thus maximizes profits given these revenue functions as well as nested CES unit costs functions. For non traded goods however, the revenue side of profit equation is simply the domestic price. In equilibrium zero profits for all firms implies unit revenue equals unit costs.

3.3 Investment in Physical and Human Capital

The demand side of the model is given by standard CES unit expenditure functions for different categories of consumption, investmnet and government spending. Since consumption and governmnet spending are standard we focus here on the investment decision. Investment demands for each type of physical capital, (*M*, structures, *S*, and residential housing, *D*) and skilled labour, *LS*, are derived from perfect foresight present value maximisation problems.

Let u_k^r refer to the after factor tax rentals on physical capital $k \in \{M, S, D\}$ in region r. Hence, $u_k^r = (1 - \mathrm{T}_k^r) w_k^r$, where T_k^r is the tax rate on each factor *k*, in region *r*. Then for each capital good households in each non-ROW region choose a sequence of gross investment spending to maximize the discounted flow of net rentals. This yields 3 x 2 "Tobin-Q" investment demand equations and 3 x 2 inter-temporal arbitrage conditions for each asset price, $\Pi_{k,t}^r$.

On a steady state, the growth rate of capital is given by $Q_k / V_k = \gamma + \delta_k$ where Q_k is the investment quantity index for type *k*, V_k is the asset stock, γ is the exogenous growth rate of labour productivity. In this case investment demand equations yield a simple relationship between the investment price index and the rental rate, where $\Pi_k^r = e_k^r$ and

$$\rho + \delta_k = \frac{u_k^r}{e_k^r} \qquad (2.)$$

A similar investment demand equation drives the accumulation of skilled labour. At a point in time the labour force consists of skilled labour, LS_t, unskilled labour, LU_t, and stock of students, H_t. We define a skilled worker as a worker who possesses a tertiary degree or comparable post-secondary qualification. The education sector transforms unskilled workers into skilled workers. Thus, there is an endogenous flow of students graduating and entering the skilled labour force each year. On a steady state $H / LS = b\zeta$, where *b* is the birth rate and ζ is the number of years of education. Inter-temporal arbitrage requires that the skill premium is related to the interest rate and the cost of education.

4. Policy Simulations

The nature of our enquiry is on the long run economic impacts, over a decade or more, rather than short term unanticipated shocks. We therefore limit our attention to comparative steady state analysis. We consider a calibrated model where the stylized facts of China's growth and trade bias are reproduced by the model. By comparing this benchmark solution with a counterfactual, where China's per capita growth is only growing at the world average of around 2% per year, we can evaluate the impact of China's biased growth on the Asian economies.

We begin by constructing a benchmark equilibrium. This is calibrated to steady state growth path where all variables are growing proportionally, prices and factor returns and the debt to GDP ratio are constant, and there is balanced trade. The principal data sources are Dimaranan (2006), Barro and Lee (2001), Heston et al. (2006), and Brown and Stern (2001). We then solve the model with endogenously chosen technology parameters so that the stylized facts are reproduced exactly by the model solution. Thus we first ask, what must be assumed about neutral technical change; trade sector biased technical change, and reduction in trade barriers - to reproduce different aspects of China's growth experience.

4.1 Growth Targets

Bosworth and Collins' (2008) measure of growth of 8.9% implies a 2.15 fold increase in China's GDP per capita over a decade. The underlying assumed world trend rate of growth, of just under 2% per year, leaves an additional growth premium for China of 6.8% per year, or equivalently, a

80.8% increase in GDP per capita, above the trend rate over 10 years. In the simulations below, we use this figure as a target for the aggregate growth of the Chinese economy. Likewise from 1995 to 2005 China's export to GDP ratio increased from approximately 22% to 35% of GDP, which represents a target increase of 59%.

As noted above perahsp the most remarkable features of China's growth has been the rapid growth in the export sector and particularly durable goods. Part of the explanation for this is likely to be due to falling trade barriers. Nevertheless, the exceptionally strong growth in the durables sector points to some form of sector specific, or export specific, technological change. A possible source of this is falling trade costs in these sectors associated with not only transport and communications costsand but also theglobal fragmentation of the production process in the Asian region (Athukorala 2009; Branstetter and Lardy 2006). Unfortunately, as noted by Anderson and van Wincoop (2004), the evidence on how trade costs have fallen over time and the relationship to global fragmentation is very limited.

Rather than attempting to quantify the impact of these trade costs we calibrate these cost reductions by choosing changes in the trade cost parameters in (1.) that achieve the export growth shares observed in the data. Given a benchmark value of these revenue function parameters, or "iceberg costs", $\lambda_{i,j}$, equal to to unity, a fall in trade costs means choosing $\lambda_{i,j} > 1.\ j \in \overline{R}$

Given these productivity parameters, we proceed as follows. Simulation 1, *s1*, examines the effects of a pure labour augmenting increase in productivity, that is a uniform increase in the effective labour supply parameters on skilled and unskilled labour, across all sectors, *i*=1-11. In the second simulation, *s2*, we add to this a fall in Chinese export trade costs across all tradable sectors so that (i) the export value share in each sector reaches the 2005 share value, as given in Table 2, and (ii) the export to GDP ratio increases to its 59% target. In the third simulation, *s3*, the targets remain the same but we also include the tariff reductions.

5. The Impact of China's Trade Biased Growth

5.1 Steady-State Solutions for China

Table 4 reports the steady state solutions to the simulations for China.[4] Column 1 shows the neutral, or "unbiased growth" scenario. In this case China's growth is assumed to be driven by labour augmenting productivity which applies equally across all sectors, and across domestic and export markets. The values of skilled labour productivity, A_{LS} and unskilled labour productivity, A_{LU}, are chosen so that GDP increases by 80.8%. It can be seen that the target increase in GDP requires a 102% increase in the labour productivity parameters, A_{LS} and A_{LU}. The target growth rate is achieved through this productivity change and endogenous accumulation of the capital stocks and a more modest 25% increase in skilled labour.

[Table 4 about here]

In this scenario, however, it can be seen that exports relative to GDP fall rather than increase. This counterfactual result clearly indicates that the Chinese growth experience cannot be explained by a neutral growth process as it would imply that China, through domestic expansion was becoming more closed. Likewise the pattern of trade is highly counterfactual under unbiased growth assumption with too much expansion of low-tech manufacturing exports and insufficient growth of durables exports, which should have a share of 50.7% rather than the 37.7% reported.

Column 2 shows the results for China of simulation *s2*, which examines the effects of export sector biased growth. This bias could be due either to falling trade costs or productivity spill-over due to heavier FDI in the export sectors. In this scenario the trade cost parameters for China's exports, $\lambda_{i,j}$ adjust to the sector specific targets and the overall export to GDP ratio target of 59.1%. It can be seen that this requires a 42% fall in "trade costs" on average across each sector as indicated by the 73% increase in λ_i^{rj}. The required aggregate labour augmenting productivity in this case is just 30%. Thus, the trade sector biased growth accounts for the bulk of China's

[4] These results shown are for the version of the model where China and developed Asia are the two non-*ROW* regions. The results for China when ASEAN is the other region are almost identical and therefore not reported here, but are available upon request.

productivity growth. Simulation s3 allows for the observed pattern of tariff reforms. The economy-wide results in this case are very similar, though there are some important differences at the sectoral level particularly for agriculture. Note also that in both *s2* and *s3*, there is quite substantial deterioration in China's terms of trade.

5.2 Results of China's Expansion on Japan and the NIEs

We now turn to the main results of interest which are the effects of China's growth on the other Asian economies. The results for developed Asia are reported in Tables 5 and 6, and the results for ASEAN-4 are reported in Tables 7 and 8. As shown in Table 5, under the assumption of unbiased productivity growth in China, s1, there is only a small impact on the developed Asian economies with GDP per capita increasing by just 1.6%. Allowing for biased trade patterns in *s2*, however, generates a massive 16.2% improvement in GDP per capita in developed Asia, and a similar 13% increase in consumption per worker.

[Tables 5 & 6 about here]

This translates to a growth elasticity of approximately 0.25. That is for every additional percentage point of biased growth in China, developed Asia gains approximately 0.25 percentage points of annual growth. This emphasises the importance of the pattern of bias in Chinese growth process. Neutral growth in China would have little impact on it trading partners. The gains are similar once China's tariff reductions are included (*s3*), though not quite as large with a 12.6% increase in GDP and an 11% increase in consumption.

The sources of this growth are the terms of trade improvement of 7.5%, and the induced effects of factor accumulation. In particular there is a 29% increase in both machinery and equipment, and structural capital. The gains in developed Asia are driven primarily by the lower cost of capital, generating increased capital deepening via the steady state asset pricing equation (2). China's growth also causes developed Asia to become more open with the export to GDP ratio increasing by 8%.[5]

Crowding out effects are, however, notable at the sectoral level. China's growth implies a large

[5] Since trade is balanced in equilibrium this also implies an identical increase to import—GDP ratio for the USA.

fall in developed Asia's durables sector. More detailed results on the pattern of trade are shown in Table 6. It can be seen that rising openness is driven by increasing trade with China at the expense of the ROW. Under the biased growth scenario, *s2*, China's share rises from 13% of developed Asia's export market in the base, to over 50.7% of developed Asia's export market. Particularly notable is the expansion of intermediate (components) and low-tech manufactured goods exports to China.

5.3 Results of China's Expansion on ASEAN-4

For the ASEAN-4 economies, Tables 7 and 8, it can be seen that the effects on per capita incomes in the ASEAN-4 economies are much more modest, at 7.7% in *s2* and 7.3% in *s3*. The smaller GDP gains primarily reflect ASEAN-4's lower level of integration with China in terms of ASEAN-4's import shares from China, discussed above. Nevertheless these still represent very large increases in GDP for this region. Likewise real consumption increases are 6.3 to 6.7%, and real wages rise by around 4 to 5% with little change in wage inequality. As with developed Asia region these GDP gains are driven primarily by capital accumulation due to falling prices of capital inputs, particularly for machinery and equipment.

The large positive GDP and consumption gains for the ASEAN-4 is important given the emphasis on "crowding out" and competitive pressures in the gravity model literature. In this context it is interesting to note that China's growth does cause the ASEAN-4 countries to become more closed, relatively speaking, with trade to GDP ratio declining. Thus the ASEAN-4 export sectors do not grow quite as fast in ASEAN-4 as the domestic market. Nevertheless in absolute terms there is an increase in trade.

Table 8 breaks down these trade flow changes by region and commodity. First it can be seen that there is substantial crowding out of the durables sector in the ASEAN-4 Whereas durables accounts for 40.6% of total trade (0.7% to China and 39.9% to the ROW) in the base 1995 case, under Chinese growth expansion this falls to 25.1% (1.4% to China and 23.7% to ROW). Thus there is a substantial decline in the durables export sector.

It can also be seen that that China becomes a much more important export destination for ASEAN-4. China's share of ASEAN-4's exports rises from 3.7% in the base case, to around

20% of ASEAN-4's exports in *s2* and *s3*. By far the largest growth on a sector basis occurs in the low-tech manufacturing sector. As a whole this sector expands by 35 to 36% in *s2* and *s3*.

[Tables 7 & 8 about here]

Thus China's growth, in these experiments indeed is shown to cause a sharp change in ASEAN-4 countries' trade patterns, crowding out the higher end sectors such as durables and causing ASEAN-4's production patterns towards greater specialisation in agriculture and low tech sectors. However, we also found substantial growth benefits, rising wages and no significant impact on skill accumulation for the ASEAN-4 economies. The results thus emphasize that this fall in durables export is part of the restructuring of the ASEAN-4 economies that is necessary to realize the gains from China's growth.

6. Conclusion

The principal conclusion is that the impact of China's growth on its Asian neighbours has not only been positive, but also very substantial. This is particularly so for the developed Asian economies of Japan and the NIEs. As a group, a decade of China's growth is shown to generate a 16% increase in GDP with similar gains in consumption. The gains to Japan and the NIEs concord with the general conclusions from the WTO accession literature, and also with the gravity model literature. Our results emphasis the substantial magnitude of income gains from China's growth on this region and also the mechanism by which these income and consumption gains are achieved.

This result is perhaps unsurprising given the gravity model literature that has emphasised the complementarity between China and these developed Asian economies. This literature however has also emphasised the competitive effects of Chinese growth on the ASEAN economies whose trade structure is much closer to that of China. Importantly the current results show that the ASEAN-4 economies also experience gains in the order of 7 to 8% of GDP, from a decade of China's growth. Such gains do not come without significant economywide adjustments and the results also point to large crowding out effects in durables manufacturing, under competition from the rapidly growing Chinese durables export sector. They also show that there is a substantial redirection of trade towards China and away from other markets. Nevertheless, these

changes are shown to be consistent with large gains to GDP and consumption.

The main source of these gains is from the long run dynamics, specifically the capital deepening that is induced by falling investment costs. In short falling Chinese manufactured goods make investment cheaper is these Asian economies and hence induces capital accumulation, especially for machinery and equipment The overall conclusion for these countries is that growth rates over the last several decades would have substantially smaller in the absence of China's growth.

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Appendix

Table 1: Merchandise Exports Shares -China, Developed Asia and ASEAN-4

	China	Developed Asia	ASEAN-4
1990			
Agriculture	14.5	3.5	17.6
Minerals	9.8	2.7	22.0
Low Tech Manufacturing	35.8	16.4	24.6
Intermediate Manufacturing	13.8	13.1	10.8
Durables	26.1	64.3	24.9
1995			
Agriculture	9.2	1.9	13.9
Minerals	4.4	2.0	10.9
Low Tech Manufacturing	37.0	12.3	22.1
Intermediate Manufacturing	16.5	14.0	11.2
Durables	32.9	69.8	41.9
2000			
Agriculture	5.9	1.3	8.7
Minerals	3.7	2.8	11.6
Low Tech Manufacturing	32.1	10.8	16.5
Intermediate Manufacturing	13.4	13.2	9.5
Durables	44.9	71.8	53.6
2005			
Agriculture	3.5	1.0	9.5
Minerals	2.7	4.0	14.4
Low Tech Manufacturing	24.2	7.8	13.1
Intermediate Manufacturing	14.0	16.0	13.0
Durables	55.7	71.1	50.0

Source: Comtrade.

Table 2: Regional Export Shares in 1995

	Exports to China (% Total Exports)		Chinese Exports to Region (% China's Exports)		Imports From China (% Total Imports)	
	Developed Asia	ASEAN-4	Developed Asia	ASEAN-4	Developed Asia	ASEAN-4
Agriculture	0.1	0.6	3.4	0.5	0.9	0.4
Minerals	0.4	0.3	1.5	0.1	0.4	0.1
Low-tech Manufacturing.	2.0	0.8	11.3	0.6	3.1	0.5
Intermediate Manufacturing	3.0	0.7	4.8	1.0	1.3	0.9
Durables	4.8	0.7	8.6	1.6	2.4	1.5
Traded Services	0.3	0.4	1.3	0.5	0.3	0.5
Total	10.6	3.5	31.0	4.2	8.4	3.9

Source: GTAP Data Base Export Values 1995. Note: 'Imports from' are measured as exports from China to developed Asia and ASEAN as a fraction of world exports to these regions, including intra-regional and international trade.

Table 3. China's Average Tariff Rates: 1995 and 2005

	Average Tariff, 1995	Average Tariff ,2005
Agriculture and Raw Materials	48.5	18.4
Minerals	22.3	7.9
Low-Tech Manufacturing	49.3	10.9
Intermediate Manufacturing	22.9	7.4
Durables	28.2	8.5

Source: Authors calculations from Trade and Protection database, World Bank.

Table 4: Alternative Historic Growth Scenarios for China

	Unbiased Growth s1	Trade Biased Growth s2	Trade Biased Growth & Tariff Reform s3
Real GDP per capita	*80.8*	*80.8*	*80.8*
Exports relative to GDP	-25.3	*59.1*	*59.1*
Real Skilled Wages	57.1	35.8	35.8
Real Unskilled Wages	86.5	51.9	52.6
Real Consumption per worker	76.4	81.1	77.9
Machinery and Equipment	76.0	103.3	104.6
Structures	84.2	76.0	81.9
Residential Capital	87.1	89.4	85.3
Skilled Labour	21.8	29.0	31.5
Unskilled labour	-1.3	-1.8	-1.9
Tertiary Enrolments	21.8	29.0	31.5
Terms-of-Trade	-9.8	-32.5	-31.3
Real Exchange Rate (Traded /Non-traded)	-0.3	-3.5	-3.9
Inverse Trade Costs Index	0.0	73.2	64.0
Labour Productivity Index	102.3	30.2	31.9
Industry Outputs			
Agriculture	77.4	12.4	3.1
Minerals	100.1	-19.0	58.1
Low-tech Manufacturing	75.7	48.8	34.8
Intermediate Manufacturing	96.6	62.7	70.6
Durables	93.3	143.7	147.0
Traded Services	104.1	92.2	96.0
Construction	85.8	76.2	79.9
Non-traded Services	86.3	72.4	74.4
Public	92.4	69.3	71.6
House	80.0	81.8	79.3
Education	21.8	29.0	31.5
Trade Shares (%)			
Agriculture	4.6	3.2	3.2
Minerals	2.4	2.4	2.4
Low-tech Manufacturing	28.3	22.0	22.0
Intermediate Manufacturing	15.5	12.7	12.7
Durables	37.7	50.7	50.7
Traded Services	11.4	8.9	8.9

Note: Numbers in italics are the target values and are determined by calibrated changes in productivity and trade costs parameters in the simulation.

Table 5: Long Run Effects of China's Growth on Developed Asia

	Unbiased Growth s1	Trade Sector Biased Growth s2	Trade Sector Biased Growth & Tariff Reductions s3
Real GDP per capita	1.6	16.2	12.6
Exports relative to GDP	3.4	8.1	10.3
Real Skilled Wages	1.1	10.0	9.3
Real Unskilled Wages	1.2	10.6	9.9
Real Consumption per worker	1.4	13.1	11.0
Machinery and Equipment	3.1	29.2	27.0
Structures	2.0	29.4	15.0
Residential Capital	1.3	13.0	10.8
Skilled Labour	0.2	0.0	-0.8
Unskilled labour	-0.1	0.0	0.3
Tertiary Enrolments	0.2	0.0	-0.8
Terms of Trade	1.1	7.5	6.9
Real Exchange Rate (Traded /Non-traded)	-0.8	-6.3	-6.0
Industry Outputs			
Agriculture	-1.5	6.5	9.5
Minerals	23.8	590.1	19.6
Low-tech Manufacturing	-2.5	99.3	180.4
Intermediate Manufacturing	0.5	26.0	15.7
Durables	2.7	-61.8	-57.1
Traded Services	0.3	12.7	5.4
Construction	1.6	22.6	13.4
Non-traded Services	1.4	15.9	9.1
Public	1.1	6.6	2.3
House	1.3	12.8	10.5
Education	0.2	0.0	4.4

Table 6: Changes in Export Shares for Developed Asia

	Base Values 1995		Trade Shares with Unbiased Growth in China		Trade Shares with Biased Growth In China		Trade Shares with Biased growth and Tariff Reform	
	China	ROW	China	ROW	China	ROW	China	ROW
Agriculture	0.1	0.7	0.2	0.6	0.8	0.4	0.8	0.4
Minerals	0.5	0.8	0.8	0.9	10.0	4.4	10.8	4.6
Low Tech Manu.	2.5	5.0	3.5	4.5	21.0	8.8	17.3	7.2
Int. Manu.	3.6	10.1	4.8	9.4	13.6	8.7	15.6	9.2
Durables	5.9	53.8	8.6	50.8	4.8	13.0	5.6	14.3
Traded Services	0.4	16.6	0.4	15.6	0.6	13.8	0.6	13.6
Total	13.0	87.0	18.3	81.7	50.8	49.2	50.7	49.3

Table 7: Long Run Effects of China's Growth on ASEAN-4

	Unbiased Growth s1	Trade Sector Biased Growth s2	Trade Sector Biased Growth & Tariff Reductions s3
Real GDP per capita	0.6	7.7	7.3
Exports relative to GDP	1.0	-1.8	-1.7
Real Skilled Wages	0.3	4.0	3.7
Real Unskilled Wages	0.4	5.4	5.1
Real Consumption per worker	0.5	6.7	6.3
Machinery and Equipment	1.0	14.3	13.7
Structures	0.6	9.6	9.0
Residential Capital	0.6	7.5	7.0
Skilled Labour	-0.1	-0.3	-0.2
Unskilled labour	0.0	0.0	0.0
Tertiary Enrolments	-0.1	-0.3	-0.2
Terms of Trade	0.3	2.8	2.7
Real Exchange Rate (Traded /Non-traded)	-0.1	-1.5	-1.4
Industry Outputs			
Agriculture	0.6	14.6	13.3
Minerals	0.4	6.8	6.4
Low-tech Manufacturing	1.9	35.4	36.3
Intermediate Manufacturing	-0.8	6.4	5.4
Durables	1.3	-37.8	-36.0
Traded Services	-0.9	1.0	1.0
Construction	0.5	8.5	8.0
Non-traded Services	0.5	5.3	5.1
Public	0.3	5.4	5.1
House	0.5	6.4	6.0
Education	-0.1	-0.3	-0.2

Table 8: Changes in Export Shares for ASEAN-4

	Base Values 1995		Trade Shares with Unbiased Growth in China		Trade Shares with Biased Growth In China		Trade Shares with Biased growth and Tariff Reform	
	China	ROW	China	ROW	China	ROW	China	ROW
Agriculture	0.7	8.2	1.1	8.0	7.8	7.2	7.1	7.3
Minerals	0.4	7.0	0.5	6.8	1.7	6.3	1.6	6.3
Low Tech Manu.	0.8	14.4	1.3	14.3	5.6	17.7	5.6	17.9
Int. Manu.	0.8	9.0	1.0	8.7	3.7	8.5	3.4	8.5
Durables	0.7	39.9	1.1	39.4	1.4	22.9	1.4	23.7
Traded Services	0.4	17.8	0.4	17.3	0.7	16.4	0.6	16.5
Total	3.7	96.3	5.5	94.5	20.9	79.1	19.8	80.2