Comments Welcome

The Consequences of China's WTO Accession on its Neighbours

Warwick J. McKibbin
Research School of Pacific & Asian Studies
Australian National University
Canberra ACT 0200, Australia
&
The Brookings Institution
1775 Massachusetts Avenue NW
Washington DC 20036, USA
wmckibbin@msgpl.com.au

and

Wing Thye Woo
Economic Department
University of California
One Shields Avenue
Davis, California 95616, USA
wtwoo@ucdavis.edu

Revised October 18, 2002

We thank Iwan Jaya Azis, Jonathan Anderson, Huang Yiping, Lu Ding, Jeffrey D. Sachs, Raed Safadi, Xiao Geng, Wang Zhi, and Jennie Woo for insightful discussions on this topic. We are grateful to Rakhi Mehra, Alison Stegman and Wu Ruojun for excellent research assistance. We benefited from the discussions on an earlier version of this paper presented at the Seminar on Asian Competitiveness organised by the Socio-economic & Environmental Research Institute in Penang, Malaysia on September 30, 2002; and at the Economics Department of the National University of Singapore. The views expressed in the paper are those of the authors and should not be interpreted as reflecting the views of those who have helped with the paper, the trustees, officers or other staff of the Brookings Institution, Australian National University, and University of California at Davis.

18 October 2002

The Consequences of China's WTO Accession on its Neighbours

Warwick J. McKibbin and Wing Thye Woo
Australian National University and University of California at Davis

Abstract

Southeast Asian industrial exports are now facing intense competition from Chinese industrial exports. How much more would competition increase with China's recent accession to the World Trade Organisation? Would Indonesia, Malaysia, Philippines and Thailand (the ASEAN-4) de-industrialize and return to their roles in the 1950s and 1960s as primary commodity exporters? Or would there be sufficient lucrative niches within the manufacturing production chains that the ASEAN-4 could specialize in? Our simulations of a range of scenarios using a dynamic, multi-sector, multi-country, macroeconomic model suggest that China's WTO accession *per se* is likely to:

- generate substantial benefits for China,
- have little impact on the OECD economies, and
- will only create significant welfare losses in the ASEAN-4 if there is significant redirection of FDI away from these countries to China and even in this case only if the ASEAN-4 countries are ineffective in quickly upgrading their abilities to absorb new foreign technologies and to engage in indigenous technical innovations.

Our simulations suggest that the full integration of China's huge labor force into the international division of labor could de-industrialize the ASEAN-4, but this will happen only if the ASEAN-4 allow any drop in FDI inflow to lower the rate of technological diffusion to their economies. If the ASEAN-4 can prevent themselves from falling behind technologically, then they can find lucrative niches within the international production chains that characterize manufacturing activities. This finding suggests that the ASEAN-4 must give the highest priority in deepening and widening their pools of human capital by speeding up the diffusion of new knowledge to their scientists and managers, and providing appropriate retraining programs for the displaced workers.

It is, however, most important to emphasize that the growth rate of a country depends on a number of other important factors beside technological capacity. For market economies, factors like economic openness, meritocracy, adequacy of infrastructure, efficiency and incorruptibility of the government, quality of financial institutions, and astuteness in macroeconomic management are of fundamental importance in economic growth. The general low ranking of the ASEAN-4 in these other dimensions along with their low ranking in technological capacity help explain why it has performed quite poorly in the final index for growth competitiveness computed by the World Economic Forum for 59 countries.

18 October 2002

The Consequences of China's WTO Accession on its Neighbours

Warwick J. McKibbin and Wing Thye Woo
Australian National University and University of California at Davis

Section 1: China's Emergence as a Major Trading Nation

At the end of 1978, China made the historic decision to initiate the process of allowing its economy to converge to a normal market economy, which is characterized by the predominance of private ownership and by integration into the international economic system[1]. Before the momentous 1978 decision, China had withheld a quarter of the world's population from participating in the international division of labor. During the period of China's self-imposed isolation, the rest of the world (with some notable exceptions, especially Africa) created new wealth on an unprecedented scale. It is now conventional wisdom to attribute this generalized increase in prosperity to the open international trading system that was institutionalized at the end of World War II.[2] Clearly, China agrees with this conventional wisdom. China has stated numerous times that its full participation in the international trading system is fundamental to keeping its economic growth sustainable[3]. This explains why China has tenaciously pursued arduous trade negotiations with the United States for over a decade in order to win WTO membership.

While there is general agreement that China's WTO accession would benefit China, there is no general agreement that it would also benefit other countries, especially China's neighbors in

[1] See Lardy (2002) for an overview.
[2] Sachs and Warner (1995) present convincing evidence in support of this professional consensus.
[3] For an overview of China's economic growth and a survey of the competing interpretations on the sources of the growth, see Woo (1998, 199a, 1999b , and 2001).

East and Southeast Asia. For example, in his address to the country on its national day in 2001, the Prime Minister of Singapore, Mr. Goh Chok Tong told his fellow citizens that:

> "... China poses a big economic challenge. Some economists describe China as an *800-pound trading gorilla.* A Hong Kong newspaper added that this gorilla was *very hungry* ...
>
> "Even India is being flooded with cheap but good quality Chinese goods. Some Indian manufacturers are finding it hard to compete. So they have done the next best thing. They stick 'Made in China' labels on their products to boost sales...
>
> "Our biggest challenge is therefore to secure a niche for ourselves as China swamps the world with her high quality but cheaper products. China's economy is potentially ten times the size of Japan's. Just ask yourself: how does Singapore compete against ten post-war Japans, all industrializing and exporting to the world at the same time?
>
> "I do not mean that China will overpower every other economy, and grow at the expense of everybody else. As China develops and exports more, its imports will grow too. There will be many opportunities to invest in China. We must grasp those opportunities."

Mr. Goh is certainly correct in pointing out that China cannot just be an exporter without also being an importer too. But the crucial issue is whether the composition of goods that China would import would require a complete overhaul of the production structures of East and Southeast Asia. Would Indonesia, Malaysia, Philippines and Thailand (the ASEAN-4) de-industrialize and return to their roles in the 1950s and 1960s as primary commodity exporters? Or would there be sufficient lucrative niches within the manufacturing production chains that the ASEAN-4 could specialize in?

The second scenario is certainly a possibility (maybe, especially for Singapore, Taiwan, and South Korea). Examples of niches abound, "the Swiss make watches and run top banks, and the Italians produce shoes for the elite."[4] In the opinion of Stanley Fischer, the former deputy managing director of the IMF:

[4] "Rising China to be key importer of ASEAN goods," The Straits Times, 30 August, 2002

> ... there is little cause for fear ... a big dynamic economy in the neighborhood is a benefit, not a curse, for those around it – look at Canada or Mexico ... Or, one might add, look at Asia after Japan emerged as an economic power from the 1970s onward.[5]

So, boom or doom? This is the question that is the focus of this paper. To anticipate our quantitative analysis, our short answer to this question is that China's WTO accession is likely to:

- generate substantial benefits for China;
- have little impact on the OECD economies; and
- may create significant welfare losses in the ASEAN-4, only if there is a significant diversion of FDI flows into these economies and even then, only if the ASEAN-4 are ineffective in quickly upgrading their abilities to absorb new foreign technologies and to engage in indigenous technical innovations.

Section 2: Guidance from Theory

An adherent of standard international trade theory as embodied by the Heckscher-Ohlin (H-O) model might find it amusing that a large part of this report focuses on the implications of China's WTO membership for other economies. It is amusing because China's WTO membership means the lowering of China's trade barriers, and the H-O model shows unambiguously that the welfare of China's trade partners have only upward potential: their welfare will be either unaffected or higher. What is not obvious from the H-O model is the impact of China's tariff reduction on its own welfare. The answer depends to a large extent on whether China is a small economy in the economic sense. A small economy is defined as a price-taker in the international markets, i.e. its terms-of-trade are exogenous.

[5] "Don't fear China threat," The Straits Times, 4 September 2001.

If China is a small country, then its tariff reduction will definitely benefit itself, and (by definition) will have no repercussions on other economies. However, if there are short-run rigidities in labor movements (like sticky nominal wages) in China, then the additional imports will create (temporary) unemployment immediately, and this cost has to be balanced against the present discount value of the long-run benefits from the more efficient allocation of resources. So, if China is a small country, the interesting question about China's WTO membership is not its welfare implications for other economies but its welfare implications for China's economy.

If China is a large economy in the economic sense, then the answer depends on where its present effective tariff rate stands with respect to, what we will call the optimum tariff rate (t_A) the threshold tariff rate (t_B), and the trade-terminating tariff rate (t_C). Diagram 1 identifies the locations of these three tariff rates in the inverted U-curve, which shows the relationship between China's welfare level and its tariff rate. The U-shape emerges from the changes in two different welfare components induced by changes in the tariff rate.

The imposition of a small tariff starting from a zero-tariff situation will reduce China's demand for the imported good, and this demand reduction will cause the international price of the imported good to fall. The decline in China's consumption of the imported good means a decrease in welfare (a negative quantity-welfare effect), but the drop in the price of the imported good means an increase in welfare (a positive price-welfare effect). As long as the tariff rate increases toward t_A, the optimum tariff, the negative quantity-welfare effect is smaller than the positive price-welfare effect, and no net welfare goes up. If the tariff rate moves beyond t_A, net welfare goes down. If the tariff rate is larger than t_B, the threshold tariff, then the negative quantity-welfare effect exceeds the positive price-welfare effect, and net welfare is lower than

the free trade case. At t_C and beyond, trade ceases, causing the price-welfare effect to disappear and putting China's welfare at its lowest level.

In order to simplify the exposition on the relevance of Figure 1 to the topic of this paper, we will heuristically posit that, to a first approximation, WTO membership will require China to lower its effective tariff rate to a low enough level where the resulting welfare level is close to the free trade welfare level. This means that WTO membership will increase China's welfare if China's present effective tariff rate is higher than t_B, but will decrease welfare if tariff rate is lower than t_B. However, even if China's present effective rate were indeed higher than t_B, the best thing to do is not to move to the WTO-required almost free-trade position but to t_A, the optimum tariff. So if China were indeed a large country, it is not clear what it should not just undertake the amount of unilateral tariff reduction required to bring it to t_A.

Figure 2 shows for China's trade partner, the relationship between its welfare level and China's tariff rate. This is a monotonically declining relationship because an increase in China's tariff rate will, one, drive down the amount of goods it will export to China (a negative quantity-welfare effect); and, two, drive down the price of the reduced amount of goods that it will export (a negative price-welfare effect). The unambiguous conclusion is that any lowering of China's trade barriers will increase the welfare of the trade partner. As in the (China as a) small country case, the interesting question about China's WTO membership is not its impact on <u>other</u> economies but its impact on China's own economy.

We now add two facts to the discussion. First, China was virtually an autarkic economy before 1978 and, since then, the biggest reductions in trade barriers occurred in the area of imported inputs required by the export-processing industries. Trade barriers to final consumption goods are in general still very high in China. Second, China sought WTO

membership voluntarily and pursued the matter with great tenacity (the U.S.-China bilateral trade negotiations took over a decade to complete). China was certainly not coerced by its trading partners to joining the WTO. Drawing upon these two facts, the logic of the H-O model would lead one to speculate that China's present tariff rate is likely to be above t_B.

To summarize the discussion so far, the H-O model can explain China's eagerness to join WTO only if China is a small economy in the economic sense whereby tariff reduction will surely increase its welfare. If China is a large country, then China's eagerness to join WTO is a mystery because H-O would predict that China would reduce its tariff from beyond t_B to t_A, but not to the very low tariff rate agreed to during the WTO negotiations. Furthermore, the H-O model cannot explain why some of China's trade partners, especially the Southeast Asian economies, have been so anxious about China's WTO membership. Because we do not regard any of the following three reasons – ignorance in China about optimum tariff, pervasive paranoia in Southeast Asia, and widespread macroeconomic rigidities in Southeast Asian economies -- to be the motivating factor behind the China's eagerness to join WTO and behind Southeast Asia's worries, we conclude that there is something missing in the logic of the H-O model about China's WTO membership.

Before we turn to discussing the additional elements that are needed to make the H-O model's analysis more relevant to the focus of this report, we temper the strong conclusions of the H-O to arrive at what we see to be the two most useful broad messages from standard international trade theory. First, it is likely that the economy that will experience the biggest impacts will be China. Second, it is likely that the majority of China's trade partners will experience little significant effects that are negative.

Section 3: Supplementing Theory with the Specific Situation in East Asia

It is inevitable that the H-O model, being a distillation of many case studies, misses a circumstance-specific but fundamental reason for China's enthusiasm for WTO membership, which is that WTO membership will greatly enhance China's economic security. Until China is a WTO member, it requires annual approval from the U.S. Congress for most-favored-nation (MFN) status in order for its exports to compete in the U.S. markets on equal terms against the exports from WTO countries. This annual congressional approval process inevitably renders China's exports vulnerable to passing passions in the U.S. political arena over accidents like military airplane collisions in the South China Sea, and the Chinese burning of the US consulate in Chengdu following the unintended US bombing of the Chinese embassy in Belgrade. The importance to China of maintaining high export growth and of maintaining the access of its exports to the U.S. market is hard to overstate.

The high and growing global demand for China's exports in the last two decades has been a powerful force in hastening the transformation of China from a subsistence peasant economy to an industrialized economy. The contribution of exports to China's growth has become more important since 1998 when the quickened pace of state enterprise reform interacted with the dysfunctional financial system to impart a deflationary tendency to the economy. Deficit spending and exports are the two growth engines that have kept recent GDP growth rates above 7 percent. The problem is that China's weak fiscal position makes deficit spending a non-sustainable engine of growth.[6] The present fiscal situation is marked by the constant need to re-capitalize the state banks, the need to fund future pension claims, and the inability of the government to increase revenue collection substantially. Hence, if exporting is also not a sustainable engine of growth, then a drastic slowdown in growth is inevitable.

[6] See Sachs and Woo (2002) for a discussion on China's difficulties in macroeconomic management.

The United States is China's biggest export market. The United States, until the recent restrictions on steel imports, had been perceived as ideologically committed to free trade and consequently less prone to protectionism than Europe and Japan.[7] Clearly, in order for exports to be a sustainable growth engine, China must secure assured access to its biggest market. And, only WTO membership can prevent the United States from the impulsive unilateral action of switching off one of China's most important growth engines by simply denying MFN status to China in any year.

What are the implications of China's enhanced economy security for its trade partners? By removing the annual uncertainty about China's exports, WTO membership has increased China's reliability as a supplier to the international markets. This development has two immediate consequences. First, buyers can source a larger proportion of their purchases from Chinese producers without increasing the risk of non-delivery or late delivery. Second, producers of labor-intensive goods destined for sale in the high-income economies can now reduce management cost by reducing the geographical diversification of its production facilities.

The primary competitors to China's mostly labor-intensive exports are its East Asian neighbors: South Korea, Taiwan, Hong Kong, Singapore, Indonesia, Malaysia, Philippines and Thailand. Of these countries, the last four, commonly referred to as the ASEAN-4, are competitors to China for FDI that engage in export-processing activities. The ASEAN-4 are, therefore, likely to be negatively impacted through two channels from China's enhanced reliability as a supplier. The fact that labor costs in China are lower than in the ASEAN-4 magnifies these two negative effects.

[7] A recent well-known example of Europe-China trade dispute is the imposition of restrictions on Chinese cigarette lighters, and a recent example of Japan-China trade dispute is over the alleged dumping of Chinese garlic.

Before discussing the possible diversion of FDI to China from its trade partners, we turn to Tables 1 and 2 to review the relative importance of FDI to growth in the Asian economies. Table 1 reports the inward and outflow FDI stock as a proportion of GDP in selected economies, and Table 2 reports the inward and outward FDI flow as a proportion of investment. The net FDI[8] stock (normalised by GDP) data show that Japan has been a capital exporter at least since 1980, and Taiwan has become a capital exporter by 1990. South Korea, Hong Kong, Singapore, and the ASEAN-4 are the net capital importers. Combining the FDI stock data in Table 1 with the FDI flow data in Table 2, wee see that Hong Kong and Korea, until the Asian financial crisis of 1997-99, were in the process of relocating a significant amount of their labor-intensive industries abroad. This is evident from their outward FDI flow being bigger than their inward FDI flow in the 1990-95 period. The biggest recipients of the outward FDI flows from Japan, Taiwan, South Korea and Hong Kong were China and the ASEAN-4.

The economic health of the ASEAN-4 has become highly dependent upon foreign capital despite some seeming exceptions in the data in Tables 1 and 2. Although Indonesia has been experiencing net FDI outflow since the Asian financial crisis, its net FDI stock-GDP ratio in 2000 still stood at 38 percent which is the same as Malaysia's ratio and higher than Thailand's ratio of 18 percent. While the net FDI stock-GDP ratio of 14 percent for the Philippines in 2000 makes it the lowest in ASEAN-4, the proportion of Philippine investment funded by net FDI inflow was over 7 percent in the 1990-95 period, and reached 8.4 percent in 2000. The degree of foreign financing in Philippine's investment in 2000 was lower than in Thailand (10.2 percent) but higher than in Malaysia (7.7 percent).

The above conclusion about the great importance of FDI to the economies of the ASEAN-4 also holds for China's economy. China's net FDI stock-GDP ratio of 30 percent

[8] Net FDI is inward FDI minus outward FDI.

places it below Malaysia and Indonesia but above Thailand. Net FDI inflow has been accounting for an increasing proportion of China's investment, rising from an average of 8.4 percent in the 1990-95 period to 10.3 percent in 2000. On the eve of China's WTO accession, China resembled the ASEAN-4 in the strategy of harnessing FDI to accelerate economic development.

Our conclusion on the important role of FDI to the economic development of the ASEAN-4, is confirmed by the Inward FDI Performance Index for 140 countries constructed by the United Nations Conference on Trade and Development (UNCTAD, 2002) and presented in Table 3. The value of the FDI Performance Index for the country is the ratio of its share in global FDI to its share in global GDP. A value of 1 on the performance index denotes that the country is receiving FDI exactly in line with its relative economic production. The index values in 1988-90 for the ASEAN-4 were generally very high, the value for Malaysia was 4.4, Thailand was 2.6, Philippines was 2.6, and Indonesia was almost 1.

China's attractiveness as a location for FDI in 1988-90 was the same as Indonesia's. Their respective rank of 61 and 63 were greatly below those of Malaysia (8), Thailand (25) and Philippines (39). However, in the aftermath of the Asian financial crisis and after a decade more of economic opening by China, China's value on the performance index rose while those of the ASEAN-4 fell. In 1998-2000, China's rank was 47 compared to 41 for Thailand, 44 for Malaysia, 89 for the Philippines and 138 for Indonesia. While there is little doubt that most of the downward movement in the rankings of the ASEAN-4 was caused by the Asian financial crisis, one cannot rule out that a part of the downward movement was due to the diversion of FDI from the ASEAN-4 to China.

Analytically, the removal of the MFN threat when China officially became a WTO member at the end of 2001 is equivalent to a reduction in the risk premium demanded by

investors in China's export-oriented industries. The complete picture of China's WTO membership is more than a reduction in China's effective tariffs; it also includes a reduction in the risk premium for investment in export-oriented production inside China. The effect of the tariff reduction is to reallocate the composition of China's output from importables to exportables and non-tradeables; and the effect of the risk premium is to reconfigure the global distribution of FDI in China's favor.

There is indeed evidence of the FDI diversion effect created by China's WTO membership. The Japan Bank for International Cooperation (JBIC) conducts an annual survey of Japanese trans-national corporations (TNCs) to find out which are the top 10 locations for manufacturing FDI over the next three years. Table 4 contains the results from the surveys undertaken in 1996, 2000 and 2001. 68 percent of Japanese TNCs listed China as one of the top 10 locations in 1996, and 65 percent did so in 2000. These responses made China the most frequently identified promising location for FDI in both years, i.e. China was ranked first in the list of 10 locations.

The evidence in favor of our FDI diversion hypothesis is captured in the 2001 survey. It became clear to the international community at the end of 2000 that China's accession to WTO was imminent. The upshot was that the proportion of Japanese TNCs in 2001 that identified China as one of the 10 most promising locations for manufacturing FDI jumped to 82 percent from 65 percent in 2000. Most telling of all, the "identification gap" between China and the United States, which were ranked first and second respectively in 2000 and 2001, widened from 24 percentage points in 2000 to 50 percentage points in 2001.

The frequency that the ASEAN-4 economies were identified as top 10 locations for FDI dropped between 1996 and 2000, and the most important reason for this change in TNC's

perception could be the Asian financial crisis. The frequency that Thailand was identified fell from 36 percent to 24 percent, Indonesia from 34 percent to 15 percent, Malaysia from 20 percent to 12 percent, and Philippines from 13 percent to 8 percent. In terms of ranking within the 10 most cited locations, Thailand shipped from 2 to 3, Indonesia from 3 to 4 and Philippines from 8 to 10, while Malaysia improved from 6 to 5.

As the Asian financial crisis was over by early 2000, the changes in the frequency of identification and ranking of the ASEAN-4 economies on the list of profitable FDI locations between 2000 and 2001 could therefore justifiably be attributed to the WTO-created improvement in China' reliability as an international supplier. The frequencies that Thailand and Indonesia were identified as desirable FDI locations are practically identical in 2000 and 2001, but the identification gaps between them and China increased significantly. The China-Thailand gap went up from 41 percentage points to 57 percentage points, and the China-Indonesia gap from 50 percentage points to 68 percentage points. The frequency that Malaysia was cited declined from 12 percent to 8 percent, and the Philippines dropped out of the top 10 list. Malaysia's rank moved from 5 to 9, and the China-Malaysian identification gap soared from 53 percentage points to 74 percentage points. These differences in the survey results of 2000 and 2001 are certainly consistent with our hypothesis of WTO-induced diversion of FDI to China.

Even more direct evidence of our FDI diversion hypothesis are found in a survey undertaken by the Japan External Trade Organization (JETRO) in October 2001. JETRO asked Japanese trans-national corporations (TNCs) whether they would relocate their existing production facilities to China in response to China's accession to WTO, and 21 percent replied that they were planning to do so. Of those intending to relocate, 67.5 percent of them would be relocating from Japan, 9.0 percent from Hong Kong, 6.6 percent from Taiwan, and 6.0 percent

from the ASEAN-4. The complete breakdown of the locations to be abandoned is given in Table 5. While it is that 99 percent of Japanese TNCs with existing investments in ASEAN-4 and Singapore stated in another survey that they would stay put, UNCTAD (2002, pp.44) insightfully noted that "[this] does not, of course, mean that their production in China will not expand faster than in ASEAN."

The two main findings from the JBIC survey and JETRO survey are that:

- there was a 17 percentage point jump in 2001 in the frequency that China was identified as a top FDI location, and a general decline in the frequencies that the ASEAN-4 economies were identified as top FDI locations; and
- 21 percent of firms indicated that they would move their existing production to China.

It therefore appears reasonable to us to conclude from these findings that China's WTO membership is encouraging producers to choose China over the other East Asian economies as the site for their investments in additional capacity, and/or to move their existing production capacity to China. We realize that the JBIC and JETRO surveys did not cover non-Japanese TNCs, but anecdotal evidence from the authors' visits to East Asia suggest that, one, relocation of existing investments to China, and, two, location of new production capacity in China also apply to U.S., Hong Kong, South Korean, and Taiwanese producers.

A recent news report makes clear that the drop in inward FDI in Malaysia has been substantial in 2002, and that the Malaysia government has no doubt that much of the drop is due to FDI diversion to China:

> "Malaysia attracted approved manufacturing FDI of only RM 2.16 billion ... for the first six months of this year [2002]. This is a sharp drop from the RM 18.82 billion it pulled in for the whole of last year.

> ... 'Everybody is feeling the pinch because the amount of FDIs has shrunk and then, a lot of that is going to China,' Dr. Mahatir [Prime Malaysia] told a news conference later."[9]

Indeed, the consulting firm, A.T. Kearney just released in September 2002 a survey of senior executives of the world's largest corporations which found that "China has for the first time supplanted the US as the most attractive destination for foreign direct investment."[10]

We now ask the question of whether effects generated by the diversion of FDI from the ASEAN-4 can be fully captured by a decrease in the capital stock of the ASEAN-4 and a corresponding increase in the capital stock of China? The answer, in our opinion, is no for at least two reasons.

The first reason is that the diversion of FDI does not necessarily produce a new steady-state where there are winners and losers. In a dynamic, optimizing general equilibrium model, the new steady-state could have only winners, distinguished by big winners versus small winners. *Ceteris paribus*, an increase in the rate of return on investments in China (i.e. a decrease in the size of the risk premium required for investments in China), could motivate the world to save more, and produce a larger global capital stock in the new steady-state. The fact that a bigger proportion of the expanded global capital stock is now located in China does not rule out the possibility that the final capital stock in the ASEAN-4 would be larger than the original capital stock. We note that it is almost a mathematical necessity that a zero-sum outcome in economic welfare is very more likely in a static general equilibrium model (like a computable general equilibrium, CGE) model because the size of the global stock is fixed by assumption. In short, we can analyze FDI diversion adequately only if we use a model where the global capital stock is endogenously generated.

---

[9] "Malaysia turns inward for growth," The Straits Times, 21 September, 2002

[10] "China attracts more foreign investors than US," Financial Times, 22 September 2002.

The second reason why FDI diversion should not be thought of as a simple relocation of the capital stock is because FDI could also generate externalities. The East Asian experience suggests that FDI could facilitate technological transfers (i.e. generate technological spillovers) not only to domestic firms in the same industry but also to domestic firms in other industries.[11] Furthermore, FDI could also help solve the difficulties of access to the international markets in these goods. In short, a country gaining FDI could experience not only a bigger capital stock but also possibly a (maybe temporary) increase in its total factor productivity (TFP) growth rate; while a country losing FDI could experience a (maybe temporary) slowdown in TFP growth as well as a (maybe temporary) lower capital stock.

We now close the theoretical discussion by summarizing the guidance provided by standard international trade theory on thinking about China's WTO membership, and the analysis on how to supplement standard theory in order to analyze the issue more adequately. There are three levels of answers to this question.

The first level is the most straightforward because it is the standard analysis of a unilateral cut in effective lower rates. The expectation is that the biggest impact from the WTO accession would be on China, and that there would be zero or positive impact on most trade partners. We call the first level answer the *naive analysis*.

The second level answer recognizes that not only would there be tariff cuts as required by WTO membership but also that the removal of the annual MFN threat to China would likely lower the risk premium required for investing in China. The expectation generated by the latter development is that there would be diversion of FDI to China, especially from its East and Southeast Asian neighbors. We call this second level answer the *FDI Diversion analysis*.

[11] See Okabe (2002) for a recent confirmation of the existence of these technological spillovers.

The third level answer enriches the second level answer by pointing out that FDI would not only increase the domestic capital stock, but some argue that it could also increase technological transfers to the whole economy and improve the access of more Chinese goods to foreign markets. We call this the *analysis of the diversion of FDI with technological spillovers*.

Section 4: Modeling China's Economic Linkages to the World – the G-Cubed (Asia-Pacific) Model

Any analysis of the implications of China joining the WTO on the region needs to be undertaken with a model that adequately captures the important linkages between China and the Asia-Pacific region through the trade of goods and services and capital flows[12]. The G-Cubed Asia Pacific (AP-GCUBED) model is ideal for such analysis having both a detailed country coverage of the region and rich links between countries through goods and asset markets.[13] The AP-GCUBED model encompasses the United States, Japan, Australia, New Zealand, South Korea, the Rest of OECD (ROECD), China, Indonesia, Malaysia, Philippines, Taiwan, Thailand, Hong Kong, Singapore, India, OPEC, EEFSU (Eastern Europe and the former Soviet Union), and the Rest of the World (ROW). Each of the 18 countries in the AP-GCUBED model has 6 sectors: energy, mining, agriculture, durable manufacturing, non-durable manufacturing, and services.

Each core economy or region in the model consists of several economic agents: households, the government, the financial sector and the 6 production sectors. Intertemporal

[12] There have been many studies of trade reform in China but most studies ignore the role of capital flows and dynamic adjustment. For recent studies using CGE models see Adhikari and Yang (2002), Jiang (2002), Ianchivichina and Martin (2001) and Wang (2002). A comprehensive survey of studies before 1998 can be found in Table 2 of McKibbin and Tang (2000) which uses an earlier version of the same model used in this paper.

[13] Full details of the model including a list of equations and parameters can be found online at: http://www.msgpl.com.au/msgpl/apgcubed46n/index.htm . The AP-GCUBED is based on the GCUBED model (described in McKibbin and Wilcoxen, 1998), which is in turn an expansion of the MSG2 model founded by McKibbin and Sachs (1991).

budget constraints on households, governments and nations (the latter through accumulations of foreign debt) are imposed. To accommodate these constraints, forward looking behavior is incorporated in consumption and investment decisions. The investment process is assumed to be subject to rising marginal costs of installation. Aggregate consumption is chosen to maximize an intertemporal utility function subject to the constraint that the present value of consumption be equal to human wealth plus initial financial assets.

We take each region's real government spending on goods and services to be a fixed share of GDP and assume that it is allocated among final goods (consisting of both domestically produced and imported goods), services and labor in fixed proportions, which we set to 1992 values. We assume that agents will not hold government bonds unless they expect the bonds to be paid off eventually. A government that is running a budget deficit today must run an appropriate budget surplus as some point in the future. Otherwise, the government would be unable to pay interest on the debt and agents will not be willing to hold it.

International trade imbalances are financed by flows of financial assets between countries (except where capital controls are in place). We assume that existing wedges between rates of return in different economies are generated by various restrictions that generate a risk premium on country denominated assets. These wedges are assumed to be exogenous during simulation. Thus when the model is simulated the induced changes in expected rates of return in different countries generate flows of financial capital reacting to return differentials at the margin.

As a result of this structure, the AP-GCUBED model contains rich dynamic behavior, driven on the one hand by asset accumulation and, on the other by wage adjustment to a neoclassical steady state. It embodies a wide range of assumptions about individual behavior and empirical regularities in a general equilibrium framework. The interdependencies are solved out

using a computer algorithm that solves for the rational expectations equilibrium of the global economy. It is important to stress that the term 'general equilibrium' is used to signify that as many interactions as possible are captured, not that all economies are in a full market clearing equilibrium at each point in time. Although it is assumed that market forces eventually drive the world economy to a neoclassical steady state growth equilibrium, unemployment does emerge for long periods due to wage stickiness, to an extent that differs between countries due to differences in labor market institutions. The model has approximately 7,400 equations in its current form with 140 jumping or forward looking variables, and 263 state variables.

To recapitulate, there are three significant qualitative differences between the AP-GCUBED model and the standard general computable equilibrium (CGE) model[14]:

1. The AP-GCUBED is based on explicit *intertemporal* optimization by the agents (consumers and firms) in each economy. In contrast to static CGE models, time and dynamics are of fundamental importance in the AP-GCUBED model.
2. There is an explicit treatment of the holding of a range of financial and real assets in the AP-GCUBED model (money, bonds, equity, household capital, physical capital etc). Money is introduced into the model through a restriction that households require money to purchase goods. The model distinguishes between the stickiness of physical capital within sectors and within countries and the flexibility of financial capital, which immediately flows to where expected returns are highest. This important distinction leads to a critical difference between the *quantity of physical capital* that is available at any time to produce goods and services, and the stock market *valuation of that capital* as a result of decisions about the allocation of financial capital. So the AP-GCUBED model

[14] Morrison (2001) summarises many CGE-based studies about the impact of China's WTO membership; and Lejour (2000) and Wang (2002) are recent good examples of CGE-based analyses.

has linkages between the financial markets and the real sectors, unlike the usual CGE models, which have real sectors only.

3. In AP-GCUBED, the behavior of agents is modified to allow for short run deviations from optimal behavior either due to myopia or to restrictions on the ability of households and firms to borrow at the risk free bond rate on government debt. The model also allows for short run nominal wage rigidity (by different degrees in different countries) and therefore allows for significant periods of unemployment depending on the labor market institutions in each country. The deviations from intertemporal optimizing behavior take the form of rules of thumb, which are chosen to generate the same steady state behavior as optimizing agents so that in the long run there is only a single intertemporal optimizing equilibrium of the model. The AP-GCUBED model's assumptions hence differ from the market clearing assumption in most CGE models.

Section 5: Specifications of the Simulations

We will undertake four sets of simulations that are guided by the theoretical discussions in Sections 2 and 3 of this report. The simulations are (1) Baseline simulation; (2) Naïve simulation; (3) Reduction in risk premium simulation; and (4) Diversion of FDI with technological spillovers simulations.

5.1: Baseline Simulations

This simulation generates the future values of all the endogenous variables based on the assumption that the existing policy regimes in the world will persist indefinitely into the future. To generate the results we first solve the model from 1999 to 2070 to generate a model baseline

based on a range of assumptions. One set of assumption is that the year 2000 tariff rates are constant forever. Other crucial assumptions needed for generating the baseline include assumptions about population growth (form World bank projections) and sectoral productivity growth by country as well as fiscal and monetary policy settings. Productivity growth in each sector in each country is assumed to catch up to the rate of productivity growth in the equivalent sector in United States with the gap in the growth rates closing at 2% per year. The initial "productivity gaps" for each sector in each country are calibrated to be consistent with the underlying catch-up model and the average growth rates of economies from 1990 to 1995. The issue of projection using a model such as that used in this paper is discussed in detail in Bagnoli et al (1996).

The tariff rates we use are based on the GTAP 4 database which estimates both tariff and non-tariff barriers. We assume that the tariff rates in 2000 are continued forever.

5.2: Counterfactual Simulation No. 1: Naive Simulation

This is the straightforward simulation where the only changes are the reduction in China's trade barriers (both tariff and non-tariff barriers). We assume that trade barriers are reduced gradually over time by an equal amount (measured in percentage points) over the ten-year period of 2003 to 2012[15]. There is some uncertainty about the size and timing of tariff reductions. The assumptions we use in this paper are meant to be illustrative of the orders of magnitude of the changes. Specifically, for commodities, we specify that:

[15] The proportional reductions in Wang (2002) are used. These are presumably based on the reductions agreed to by China as part of the WTO accession negotiations.

1. energy tariffs are reduced by 0.1 percentage point (with respect to the baseline tariff rate) each year beginning in 2003 until they are reduced by a total of 1 percentage point (compared to the baseline) in 2012;
2. mining tariffs are reduced by 0.2 percentage point each year to reach a total reduction of 2 percentage points in 2012;
3. agriculture tariffs are reduced by 2.8 percentage points each year to reach a total reduction of 28 percentage points in 2012;
4. the tariffs on manufactured durable goods are reduced by 0.6 percentage points each year to reach a total reduction of 6 percentage points in 2012; and
5. tariffs on manufactured non-durable goods are reduced by 1.2 percentage points each year to reach a total reduction of 12 percentage points in 2012.

AN important aspect of China's accession to the WTO is the opening of trade in services that China has promised. This is a wide-ranging reform which will have important implications for the services sector in China. Our specification of the liberalization of services is based on the arguments in McKibbin, Stoeckel and Tang (2000) that the entry of foreign service providers generally cause the formerly sheltered domestic service providers to improve their efficiency to meet the new competition. For example, the entry of McDonald into Beijing has caused the domestic fast-food outlets to improve their service package, the most noticeable of which is the provision of clean toilets for the use of customers. In short, the liberalization of trade in services forces efficiency improvements that lower of the cost curves of the domestic service industries. We will hence specify the liberalization of the service sector as an improvement in labor-augmenting technology of 0.12 percentage beginning in 2003 to reach a total improvement of

1.08 percentage points (above baseline) in 2011, i.e. a temporary rise in the rate of labor-augmenting technology growth for nine years.

We call this simulation the *naive case*.

5.3: Counterfactual Simulation No. 2: A Reduction in the Risk Premium Demanded by FDI

This simulation supplements the naive simulation with a 1 percentage point reduction in the risk premium demanded by foreign investors in China. This 1 percentage point reduction is small compared to the jump of 8 percentage points in the risk premium demanded by foreign investors in Southeast Asia at the height of the Asian financial crisis figure. We call this simulation *the FDI diversion case*.

5.4: Counterfactual Simulation No. 3: FDI creates technological spillovers in the host economy

In the first 2 simulations there is a response of international capital flows to the changes in expected rates of return to capital. However capital flows are assumed not to have any direct affect on technological change. There is a large debate on whether FDI flows might change the rate of technical change in economies. In this simulation we incorporate this effect o illustrate how the results for the first two simulations might change as a result of FDI induced technological change. Our modeling of possible technological spillovers created by FDI flow from a richer country to a poorer country is based on the following four assumptions.

Assumption 1: There is a "natural" steady-state TFP growth rate for every sector, and this rate is determined by the expansion of global scientific knowledge that is relevant to that sector. We assume that the governments of the developing economies with large amounts of inward FDI (e.g. the ASEAN-4) would eventually establish effective catch-up programs in science to

supplement the natural process of technological diffusion to bring their steady-state sectoral TFP growth rates up to the internationally-determined natural sectoral TFP growth rates. This is illustrated in Figure 3 which shows the developing country catching up the the rising technology frontier of the industrial economies. We assume that changes in FDI alter the speed of catch-up over a decade.

Assumption 2: The differences between a developed economy and a developing economy is that the steady-state TFP growth path of the former is at a higher level than that of the latter.

Assumption 3: When the FDI outflow from the richer economy increases, the TFP growth rate in the developing economy increases temporarily to bring the developing economy to a new higher steady-state TFP growth path (which is still below the steady-state TFP growth path of the richer economy). The faster the developing economy can absorb the new technological knowledge contained in the additional FDI inflow, the shorter is the length of the transition period. In the limit, where the developing country instantaneously grasps the new knowledge fully, it jumps closer to the new higher steady-state TFP growth path, with the instantaneous catchup only being limited by the need for physical capital accumulation to catch up to the new growth rate.

Assumption 4: When the FDI outflow from the richer economy decreases, the TFP growth rate of the developing economy decreases (with the lower bound of zero growth rate). Our assumption 1 that the authorities in the developing economies will at some point establish effective catch-up scientific programs to bring the TFP growth rate back to the international steady-state TFP growth rate means that the developing economy will be on a lower new steady-state TFP growth path. In the limit, where the authorities are able to instantaneously raise its scientific base adequately to prevent the slowdown in FDI inflow from lowering the TFP growth

rate, then the developing country will stay on its original steady-state TFP growth path. In other words in the policy response is to completely offset the loss of technology from FDI loss then the results will be the same as simulation 1. Figure 3 illustrates both the effect of FDI inflow and outflow on technical change under the assumptions just outlined.

In line with the above four assumptions and the interpretation in Figure 3, we supplement the simulation of the FDI diversion case with the 5 conditions of:

1. a temporary decrease in the total factor productivity[16] (TFP) growth rate of the manufactured durable goods industries located in Indonesia, Malaysia, Philippines, and Thailand. We assume an annual decline of 1 percentage point beginning in 2003 until TFP level is 10 percentage points below baseline TFP level in 2112;
2. a temporary decrease in the TFP growth rate of the manufactured nondurable goods industries located in Indonesia, Malaysia, Philippines, and Thailand. We assume an annual decline of 1 percentage point beginning in 2003 until TFP level is 10 percentage points below baseline TFP level in 2112;
3. a temporary increase in the TFP growth rate of the manufactured durable goods industries in China. We assume an annual increase of 1 percentage point beginning in 2003 until TFP level is 10 percentage points above baseline TFP level in 2112;
4. a temporary increase in the TFP growth rate of the manufactured nondurable goods industries in China. We assume an annual increase of 1 percentage point beginning in 2003 until TFP level is 10 percentage points above baseline TFP level in 2112; and

[16] In our model, total factor productivity growth is the residual contribution to output growth after the contribution from capital accumulation and the contribution from the growth of effective labor supply have been taken into account. Effective labor is "raw" labor multiplied by the level of labor-augmenting technology.

5. a temporary increase in the TFP growth rate of the service industries in China. We assume an annual increase of 1 percentage point beginning in 2003 until TFP level is 10 percentage points above baseline TFP level in 2112.

   We call this the *case of FDI with technological spillovers*.

The above 5 conditions are assumptions about the stances of public policy and the steepness of the learning curves in the ASEAN-4 and China. We assume that it will take a decade for the ASEAN-4 to improve their scientific bases sufficiently to offset the slowdown in technological diffusion due to the lower FDI inflows. We also assume that it will also take a decade for the Chinese sectors to fully master the new technology contained in the diverted FDI. Again these are assumptions rather than predictions, but they give indicative estimates of the impacts of a range of plausible assumptions.

5.5: Some Considerations in Thinking about the Simulation Results

It is important to keep in mind that we are not forecasting the future value of each variable, we are forecasting the WTO-induced deviation in the future value of each variable under a range of different assumptions. We are not arguing that any of the simulation are more or less realistic but are presenting alternative possible scenarios for consideration. The closest to a forecast of future values are the baseline projections that are conducted under the assumption of the credible maintenance of the status quo (*existing policy regimes*) from 1999, e.g. no WTO membership for China, into the indefinite future. Our rules of thumb for simplifying the assessment of the simulation results are that we will regard:

1. deviations that are less than 1 percentage point deviation from the baseline to be of little practical importance;

2. the deviation in 2005 as representing the short-run effect; and
3. the deviation in 2020 as representing the long-run effect.

The focus group of our study consists of China, U.S. Japan, Australia, New Zealand, Korea, the Rest of OECD (ROECD), Taiwan, Indonesia, Malaysia, Philippines, and Thailand.

Section 6: The Results of the Simulations

6.1: The Naive Simulation

The overall results are that, as long as the removal of trade barriers in China are not accompanied by a diversion of FDI into China, China's WTO membership will have significant economic effects only on China's economy. For the 11 countries in the focus group, all their deviations in export, GDP, consumption and investment are less than 1 percent from the baseline. *Figure 4* reports that China's exports will be slightly above the baseline by 1 percentage point in the long-run. The next highest deviation is a long-run increase of 0.8 percentage point for US exports. The short-run deviations in China's and U.S. exports are about half of the long-run deviations. The other ten economies in out focus group have deviations that are less than 0.3 percentage point from the baseline.

Figures 5 report the deviations from baseline GDP, private consumption, and investment respectively. None of the GDP deviations are more than two-tenths of one percent from the baseline, and all of the consumption and investment deviations are less than 1 percent from the baseline. *Figure 6* shows that the short-run impact on China's GDP, consumption and investment are almost negligible, and the respective long-run impact are 2.5, 1.2, and 0.8 percentage points above the baseline. The interesting feature of this naive simulation is that it

shows that the immediate impact (2003 and 2004) on China is slightly deflationary, reflecting perhaps the increase inflow of imports.

6.2:Simulation of the FDI Diversion Case

The overall results in the FDI Diversion Case are qualitatively similar to those in the Naive Case in the long-run, with the key difference that the quantitative effects on China are magnified. *Figure 7* reports an interesting flip-flop impact on China' exports. In 2005, China's exports will be 7 percent lower than the baseline, but, in 2020, they will be almost 4 percent higher. There are two alternative (and equivalent) ways of thinking about the adjustment. The export drop in 2005 is caused by the rise in consumption and investment (whose movements we will explain later), the rise in the domestic absorption of goods and services means less goods and services are leftover for exports. China's investment boom (to be shown in Figure 9) will mean that more capital goods (i.e. manufactured durable goods) will be imported. The alternative insight is that the large inflow of capital into China causes a real exchange rate appreciation in the short run which makes Chinese exports more expensive and Chinese imports cheaper. The inflow of real resources is accomplished by the exchange rate adjustment and the net deterioration in net exports. Over time the returns to the foreign investment in China re repatriated to foreigners and this shows as an improvement in Chinese net exports induced by a weakening exchange rate. The inflow of capital into China is an outflow of capital from the US which weakens the $US and increases the demand for US exports. Some of these exports are capital goods to China. For the rest in the focus group, the export deviations are minor.

Figure 8 reveals that while the deviations in GDP for everyone except for China (Figure 12) are negative, their magnitudes are trivial. In 2020, the deviations of 10 economies are below

three-tenths of one percent, and Korea's deviation is almost half of one percent. It is hard to say that any of the eleven economies are hurt in a non-trivial way. *Figure 9* shows China embarking upon a sustained boom upon WTO accession. China's GDP jumps to 3.6 percent above baseline in the first year, slows down in the following three years, and then resumes it's high growth to be 5 percent higher than the baseline in 2020. The end of the annual MFN threat to China's exports increases the effective rate of return on capital in China, and causes the long-run level of investment to be almost 20 percent above the baseline. The significant but temporary rise in China's consumption in the short-run may reflect the relaxation of the liquidity constraints imposed by China's inefficient financial system. Given China's expected higher future income, it would be rational for economic agents to smooth their consumption but the absence of consumer credit prevents this from occurring. The WTO-induced inflow of foreign funds relaxes the liquidity constraint and allows consumption to jump.

6.3: Simulation of the Case of FDI with Technological Spillovers

The overall results for the case where FDI outflows induce slower technological change and inflows induce faster technological change, show large gains for China, sizeable losses for the ASEAN-4 (Indonesia, Malaysia, Philippines, and Thailand). There is very little impact on the other countries, other than Hong Kong. *Figure 10* shows a long-run rise in China's exports that is 31 percent above baseline, while Indonesian exports are down by 1.7 percent, Malaysian exports down by 6.4 percent, Philippines's exports down by 4.7 percent, and Thai exports down by 6.8 percent. Everyone else has export deviations of less than 1 percent from baseline export levels.

Figure 11 shows substantial long-run GDP losses by four Southeast Asian economies: 7 percent for Thailand, 5 percent for Malaysia and Philippines, and 3 percent for Indonesia. *Figure 12* shows that China's GDP, consumption, and investment decline initially but then recover to move strongly to reach long-run levels that are, respectively, 25 percent, 15 percent, and 30 percent above their baselines. Although not shown in the figures presented here, we note that, because Hong Kong is so deeply integrated into China's economy, China's high growth raised Hong Kong's GDP 2.7 percent higher than its baseline. This high growth still does not generate much positive growth effects on the other non-ASEAN trade partners, even on East Asian neighbors who do not depend much on FDI: Japan's GDP is only 0.4 percent higher in 2020, Korea's GDP is 0.6 percent higher, Taiwan's GDP is 0.3 percent higher, and the Rest-of-OECD's GDP is 0.3 percent higher.

Section 7: Changes in the Composition of Exports – De-Industrialisation or New Niches

In this section, we quantify the changes in the export compositions of China's trade partners in each scenario. Table 6 shows the total exports of each economy (or grouping) generated by the 4 sets of simulation. The Naive and FDI Diversion simulations show no case (not even for China) where exports deviated more than 5 percent from the baseline. Large deviations in the simulation of the Diversion of FDI with Technological Spillovers were seen for four countries: China (31 percent), Malaysia (6.4 percent), Philippines (4.7 percent) and Thailand (6.8 percent) – suggesting that these four economies might be the ones with the biggest changes in their production structures. It is important to note that during the adjustment period, although competitiveness improvements in China caused by lower tariffs and cost reductions due to induced technical change make Chinese exports more competitive, the capital inflows induced

by a rise in the return to capital in China, causes an appreciation of the Chinese real exchange rate which makes Chinese exports less competitive overall. These two offsetting effects explain why trade flows respond by less in the short to medium term than might be expected.

When we examine the export composition in each scenario for every country and the changes in each export component, we find no substantial changes in any country under Naive Simulation. The only export composition under FDI Diversion that shows substantial changes was China's, see Table 7. In the export compositions from the Technological Spillover simulation, we observe significant deviations from baseline only in the ASEAN-4 and China.[17] Table 7 reports that:

1. China shows that manufacturing exports accounted for 27 percentage points of the 33 percent increase in total exports above the baseline;
2. the manufacturing sectors in the ASEAN-4 show substantial long-run declines vis-a-vis their baselines. In Indonesia and Phillipines, the drop in manufactured exports exceed the drop in total exports; and in Malaysia and Thailand the decline in manufactured exports accounted for, respectively, 97 percent and 91 percent of the fall in total exports.

The only economies that may be de-industrialised by China's WTO accession are the ASEAN-4 but for that to happen, they will have to be slow in reversing the reduced rate of technological diffusion, a byproduct of the reduced FDI inflow. When the ASEAN-4 are able to correct this problem quickly, then we are back in the FDI diversion case. In the FDI diversion case, China's insertion of one-third more workers into the international division of labor leads to further division of labor (i.e. to even finer specialisation in production activities) within the manufacturing sector worldwide rather than the displacement of the ASEAN-4 from manufacturing. The lengthening of the production chains in manufacturing creates niches in

[17] The rest of the countries do not show large deviations in their top 2 exports.

manufacturing activities that the ASEAN-4 can fit themselves in because they are technologically versatile. For the ASEAN-4 to have such versatility, their governments must invest in strengthening the scientific and technological capability of their citizens.

Section 8: Changing the Course of the Fate of the ASEAN-4

There are two ways for the ASEAN-4 to enhance their technological capacity and get new cutting edge technology. The first way is to have the ability to innovate indigenously. The second way is to have the ability to obtain technology transfer from elsewhere, e.g. technological diffusion via foreign direct investment. The Global Competitiveness Report 2000 published by the World Economic Forum has an overall ranking of 59 countries according to technological capacity. This technological capacity index is determined by averaging two other indices, the "indigenous innovation index" and the "technology transfer index." The three right hand side columns in Table 8 show the national ranking in the two component indices and in the overall technology index.

We see in the ranking of the Overall Technology Index that Malaysia (18), Philippines (32), and Thailand (43) are above China (48) while Indonesia (50) is only slightly below China in ranking. However, when we see that the higher average rank of the ASEAN-4 comes from the higher technology transfer from abroad – the rank of Malaysia is 7, Philippines is 19, Thailand is 36, China is 43, and Indonesia is 45 – we realise how critically the average ASEAN-4 depends on technological diffusion through FDI. FDI diversion from China's WTO membership is therefore likely to cause the future rank of Indonesia, Malaysia, Philippines, and Thailand in the Overall Technology Index to fall, and of China to rise.

The ASEAN-4 have a lot of work to do in enhancing their indigenous technological capabilities. In the Indigenous Innovation Index, China ranks almost as high as Malaysia, and significantly higher than Philippines, Thailand, and Indonesia.

Of course, the growth rate of a country depends on a number of other important factors beside technological capacity. For example, the story of the Soviet Union is the story of world-class accomplishments in basic scientific research but of abysmal performance in applied scientific research, and, hence, in overall economic growth. The fundamental problem in the former Soviet Union was the absence of a market economy, which meant that there were grossly inadequate incentives to mobilize people to translate basic research into commercial applications. For market economies, factors like economic openness, meritocracy, adequacy of infrastructure, efficiency and incorruptibility of the government, quality of financial institutions, and astuteness in macroeconomic management are of fundamental importance in economic growth. *The general low ranking of the ASEAN-4 in these other dimensions* along with their low ranking in technological capacity help explain why it has performed quite poorly in the final index for growth competitiveness for the 59 countries, see the left hand side column in Table 8. The high rankings that Hong Kong has in these other dimensions (e.g. 1 in trade openness, 4 in sophistication of financial markets) boosted its overall ranking despite being ranked 30 in technology level.

Clearly, while the ASEAN-4 should boost its technological capacity by focusing on applied research, it also needs people at the frontier of research. It means that there should be more investment in higher education and not in airplane factories. The establishment of linkages between the universities and the business sector should be fostered, and the establishment of state-owned factories be stopped.

We should be clear that our suggestion that aggressive technology policies be adopted in Southeast Asia is compatible with our acceptance of the comparative advantage principle, and the importance of pursuing market-compatible economic policies. Specifically, the comparative advantage principle would counsel against the use of industrial policies to ensure that a country's chief export be technology-intensive goods when the inherited factor endowment of the country shows a higher ratio of unskilled labor to skilled labor compared to other countries.[18] The comparative advantage principle would not, however, counsel against policies to increase human capital formation and to enhance technology and capital transfers from abroad so that the country will begin to export more goods that are technology-intensive. Our point is simply that there is no inconsistency between producing an output composition that is in accordance with the existing relative factor endowment of the country, and seeking to change the relative factor endowment by increasing the amount of human capital and raising the level of technology. This is the reason why the United States government, one of the most *laissez-faire*-oriented governments in the world, is spending US$90 billion this year to increase the technological capacity of the United States.

Section 9: Final Remarks

The naive simulation confirms the prediction from standard trade theory that the tariff reductions required of China by WTO membership would render China better off (GDP is 2.5 percent above baseline in the long-run) without hurting any of its trade partners. When we take into account that the removal of the annual MFN threat over China's exports would divert FDI

[18] The theoretically more correct ratio is the ratio of unskilled labor to total capital stock (human capital and physical capital).

toward China, China's welfare is increased further (GDP is now 5 percent above baseline), again with, practically speaking, no negative repercussions on other economies.

If we now assume that it is possible that FDI inflow into a developing economy creates technological spillovers, then we see that the 25 percent higher GDP in China is accompanied by GDP losses of 7 percent in Thailand, 5 percent in Malaysia and Philippines, and 3 percent for Indonesia. We must mention, however, that these results were generated under the assumption that it would take ten years of improvements in the scientific bases of the ASEAN-4 before they could restore the TFP growth rates in their domestic manufacturing sectors to the steady-state TFP growth rates in the manufacturing sectors of the advanced economies. If the improvements in the ASEAN-4 scientific bases could occur faster, then their GDP losses would be smaller. A key part of the adjustment for ASEAN-4 in response to the diversion of FDI to China should be an accelerated upgrading of their indigenous technological capabilities, a large part of which consists of raising the skill level of the workforce and widening the range of skills within the workforce.

Our simulations suggest that the full integration of China's huge labor force into the international division of labor will not reduce the size of the manufacturing sectors in the OECD. Only the ASEAN-4 face the possibility of de-industrialisation, but this will happen only if FDI flows affect domestic technological change (and this is an open question), and if the ASEAN-4 economies allow the drop in FDI inflow to lower the rate of technological diffusion to their economies. If the ASEAN-4 can prevent themselves from falling behind technologically, then they can also find lucrative niches in the lengthened production chains in manufacturing activities. This finding suggests that the ASEAN-4 must give the highest priority in deepening and widening their pools of human capital by speeding up the diffusion of new knowledge to

their scientists and managers, and providing appropriate retraining programs for the displaced workers.

The entry of China to take its place in the international economic system will permit further specialisation of tasks in the workplace, and this is a wealth-creating outcome. The country that can provide its workforce with the depth and range of scientific training required in the new workplace will be in line to receive some of the newly-created wealth. The country that is slow in building up its scientific and technological capability is one that does not understand the right remedy for the constant structural adjustment forced by globalisation.

References

Adhikari R. and Y. Yang (2002) "What Will WTO Membership Mean for China and Its Trading Partners?" Finance and Development, September, International Monetary Fund.

Bagnoli, P. McKibbin W. and P. Wilcoxen (1996) "Future Projections and Structural Change" in N, Nakicenovic, W. Nordhaus, R. Richels and F. Toth (ed) *Climate Change: Integrating Economics and Policy*, CP 96-1 , International Institute for Applied Systems Analysis (Austria), pp181-206.

Ianchovichina E. and W. Martin (2001) "Trade Liberalization in China's Accession to the World Trade Organization" World Bank Policy Research Working Paper no 2623, Washington DC.

Jiang, T. (2002) "China's WTO Accession and the Regional Economy" mimeo Australian National University, Canberra.

Lardy N (2002) Integrating China into the World Economy, The Brookings Institution.

Lejour, Arjan (2000), "China and the WTO: the Impact on China and the World Economy," CPB, the Netherlands Bureau for Economic Policy Analysis, March.

McKibbin W.J. and J. Sachs (1991), *Global Linkages: Macroeconomic Interdependence and Cooperation in the World Economy*, Brookings Institution, June.

McKibbin W. and KK Tang (2000) "Trade and Financial Reform in China: Impacts on the World Economy" *The World Economy*, vol 23, no. 8 pp979-1003, (ISSN 0378 5920)

McKibbin W.J. and D. Vines (2000) "Modelling Reality: The Need for Both Intertemporal Optimization and Stickiness in Models for Policymaking" *Oxford Review of Economic Policy* vol 16, no 4. (ISSN 0266903X)

McKibbin W. and P. Wilcoxen (1998), "The Theoretical and Empirical Structure of the G-Cubed Model" *Economic Modelling* , 16, 1, pp 123-148 (ISSN 0264-9993)
(working paper version: http://www.msgpl.com.au/msgpl/download/struct.pdf)

Morrison, Wayne (2001), "Summary of Studies of the Impact of WTO on China's Trade," Centre for Cooperation with Non-Members, Organisation for Economic Cooperation and Development, October.

Okabe, Misa (2002), "International R&D Spillovers and Trade Expansion," *ASEAN Economic Bulletin*, Vol. 19 No. 2, August.

Sachs, Jeffrey D. and Andrew Warner (1995) "Economic Reform and the Process of Global Integration," Brookings Papers on Eeconomic Activity, 1995:1

Sachs, Jeffrey D., and Wing Thye Woo (forthcoming) "China's Growth after WTO Membership" *Journal of Chinese Economic and Business Studies*.

Stoeckel A., McKibbin W.J., and KK Tang (2000) "Productivity, Risk and the Gains from Trade Liberalisation" *Pelham Papers* – no 9, Melbourne Business School

United Nations Conference on Trade and Development (2002) *World Investment Report 2002: Transnational Corporations and Export Competitiveness*.

Wang, Zhi (2002), "WTO Accession, 'Greater China' Free Trade Area and Economic Relations across the Taiwan Strait." Paper presented at the Fifth Conference on Global Economic Analysis, Taipei, June 5-7.

Woo, Wing Thye (1998) "Chinese Economic Growth: Sources and Prospects," in Michel Fouquin and Francoise Lemoine (ed.), *The Chinese Economy*, Economica, London, pp. 17-47.

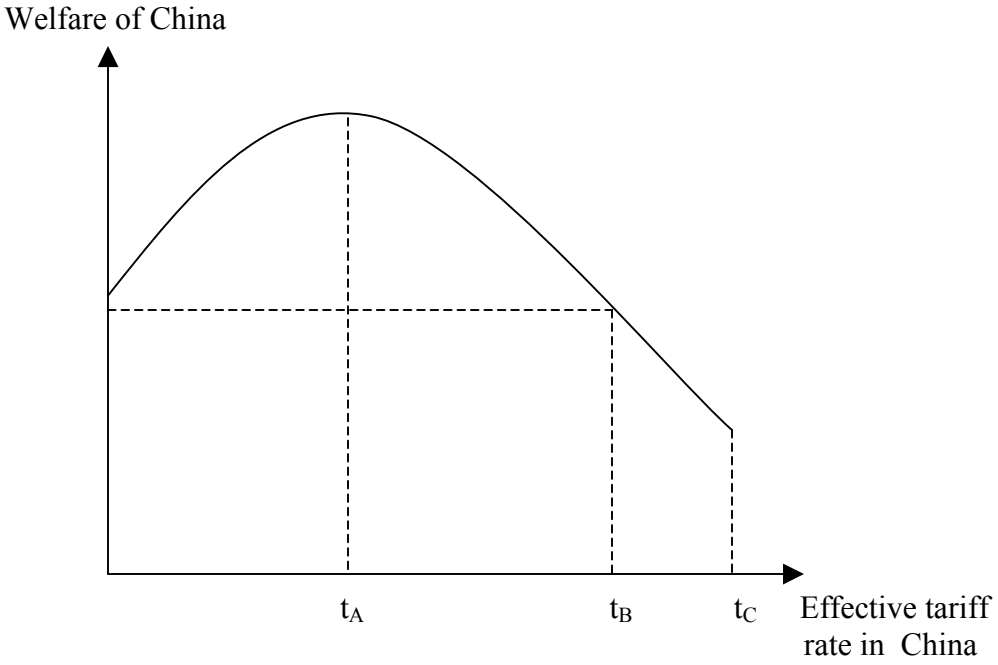
Woo, Wing Thye (1999a) "The Real Reasons for China's Growth," *The China Journal*, October, pp. 115-137.

Woo, Wing Thye (1999b) *The Economics and Politics of Transition to an Open Market Economy: China*, OECD Development Centre, Technical Papers No. 153, October.

Woo, Wing Thye (2001), "Recent Claims of China's Economic Exceptionalism: Reflections Inspired by WTO Accession," *China Economic Review*, Vol. 12, No. 2/3, pp. 107-136.

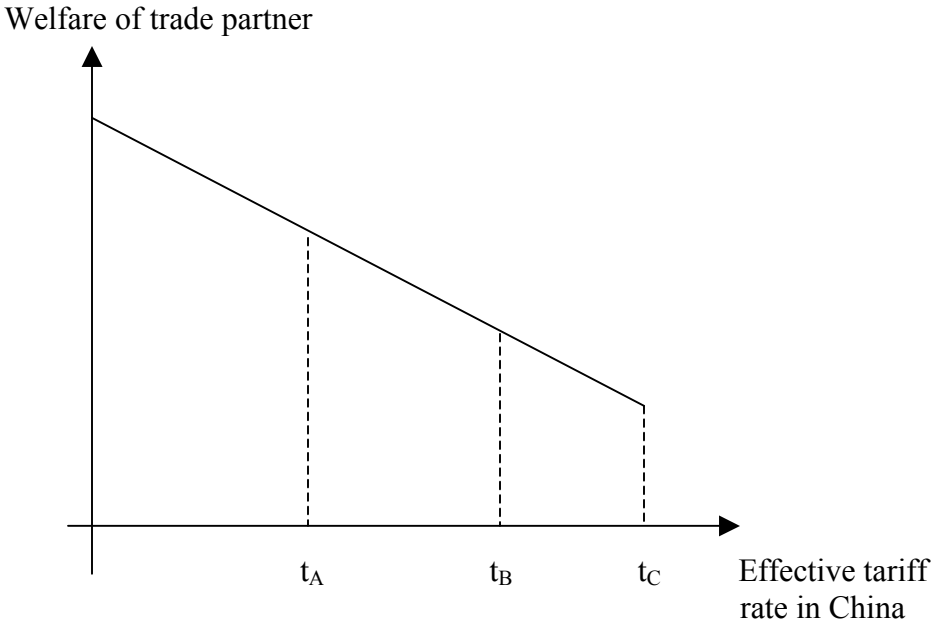
World Economic Forum (2000), *The Global Competitiveness Report 2000*, Oxford University Press.

Figure 1: Relationship between welfare level and tariff rate in China



(The assumption is that China is a large economy.)

Figure 2: Relationship between welfare level of the trade partner and China's tariff rate



(The assumption is that China is a large economy.)

Figure 3: Transition dynamics from changes in FDI Flows

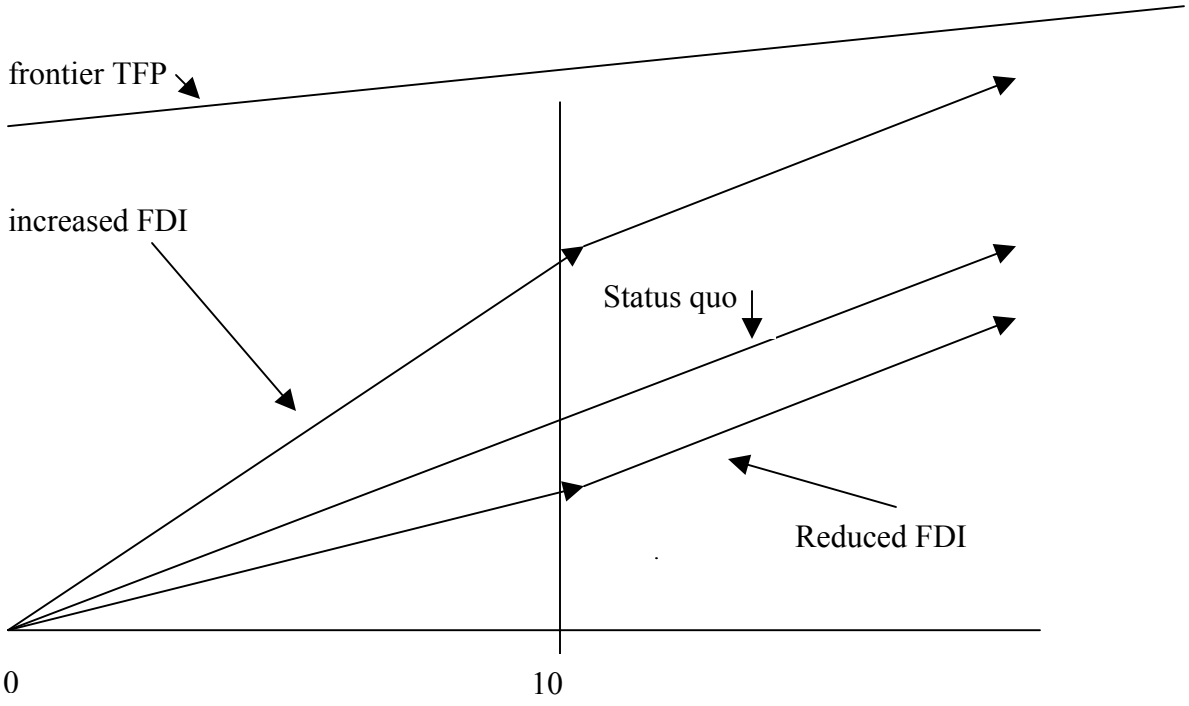


Fig 4: Change in Exports -- Naive Case

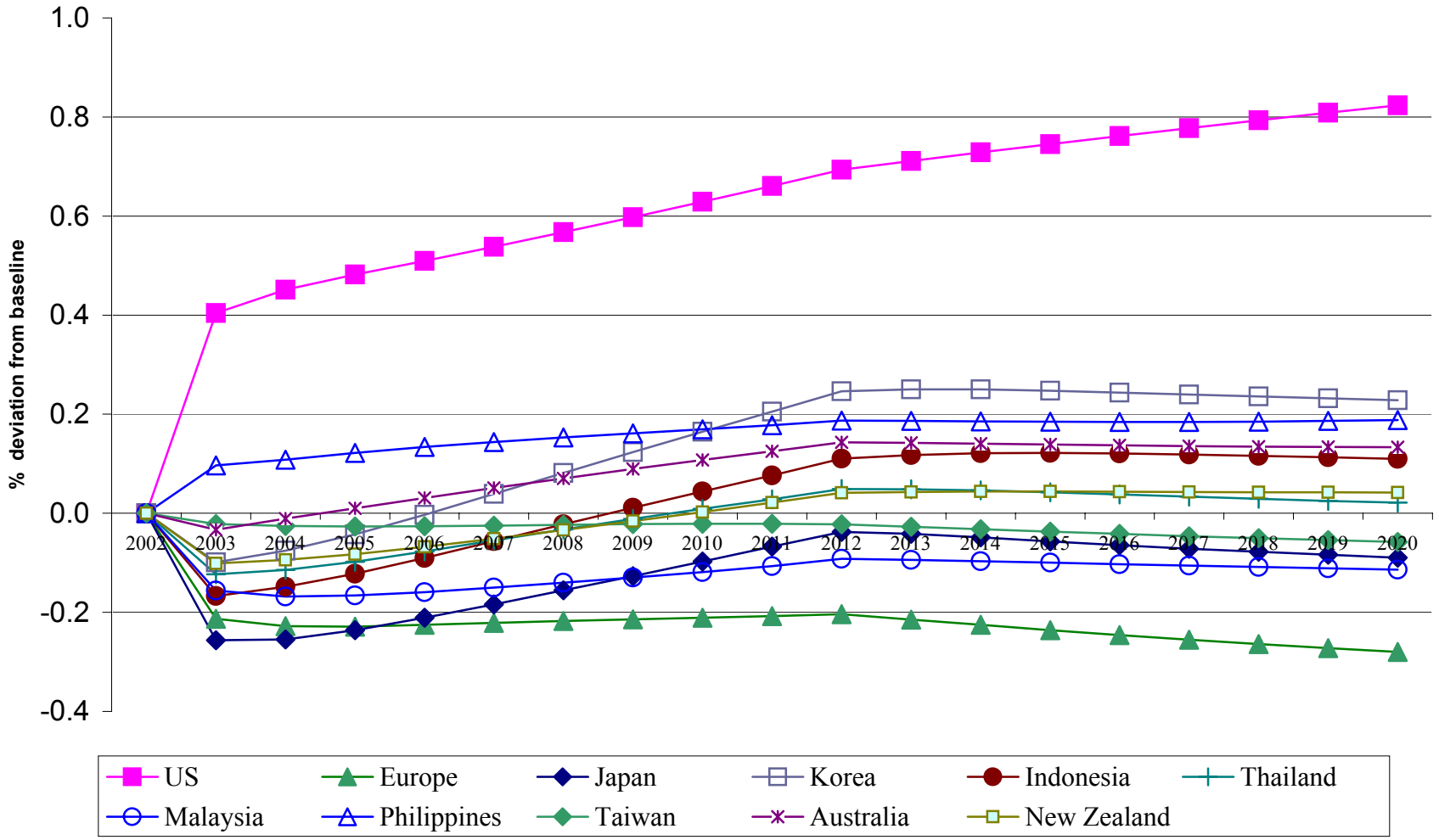


Fig 5: Change in Real GDP in Other Countries -- Naive Case

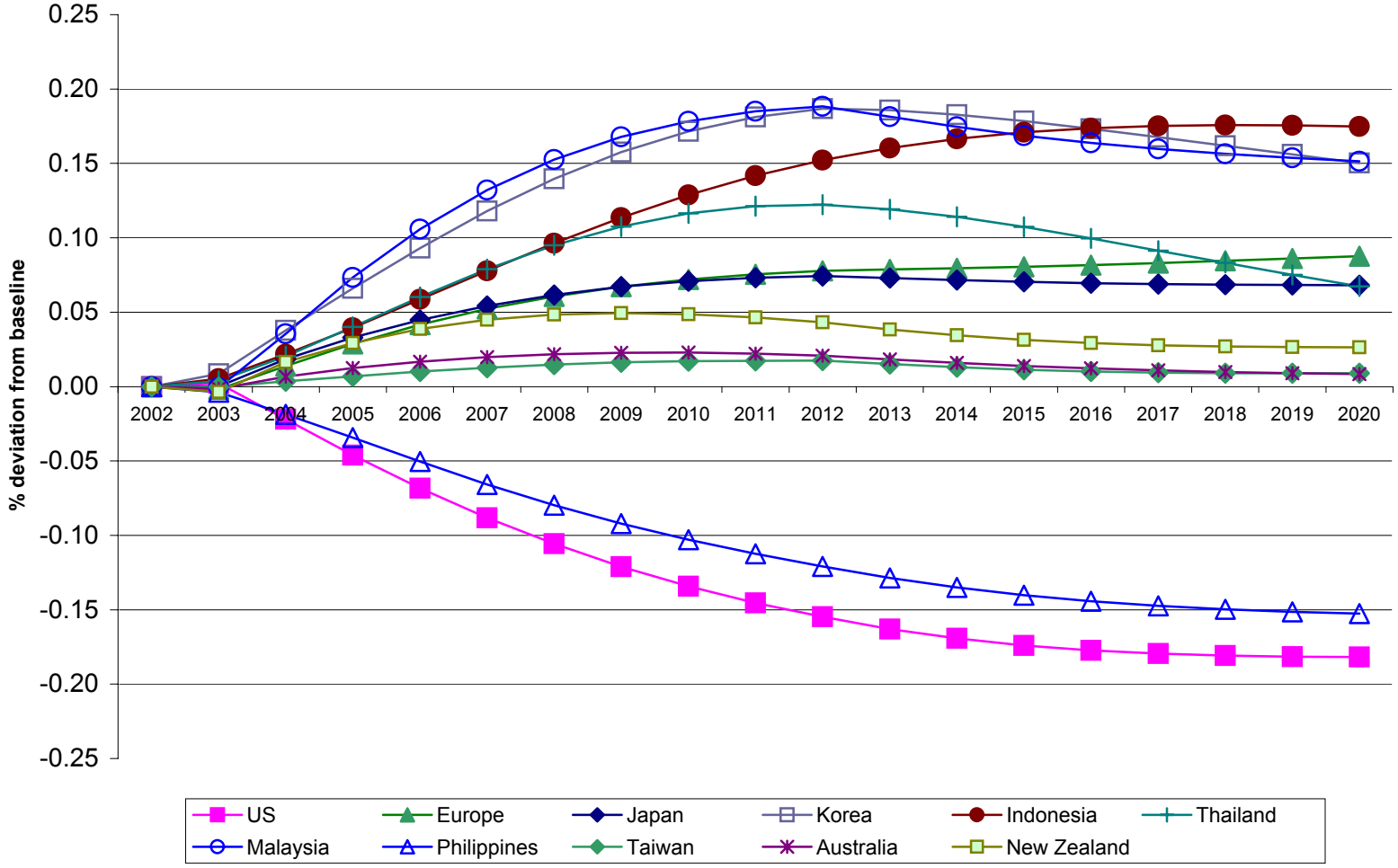


Figure 6: Real Effects on China -- Naive Case

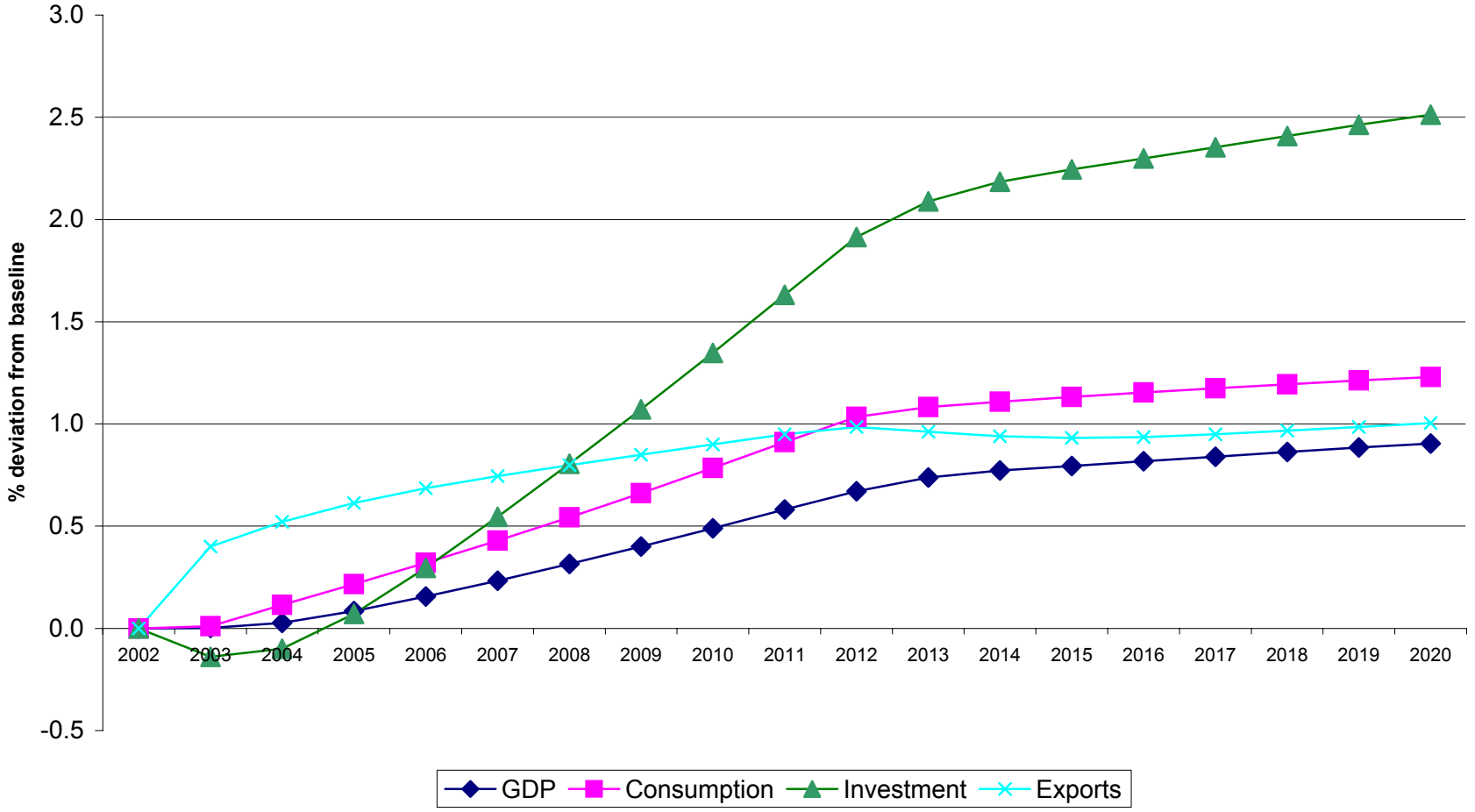


Figure 7: Change in Exports -- FDI Diversion Case

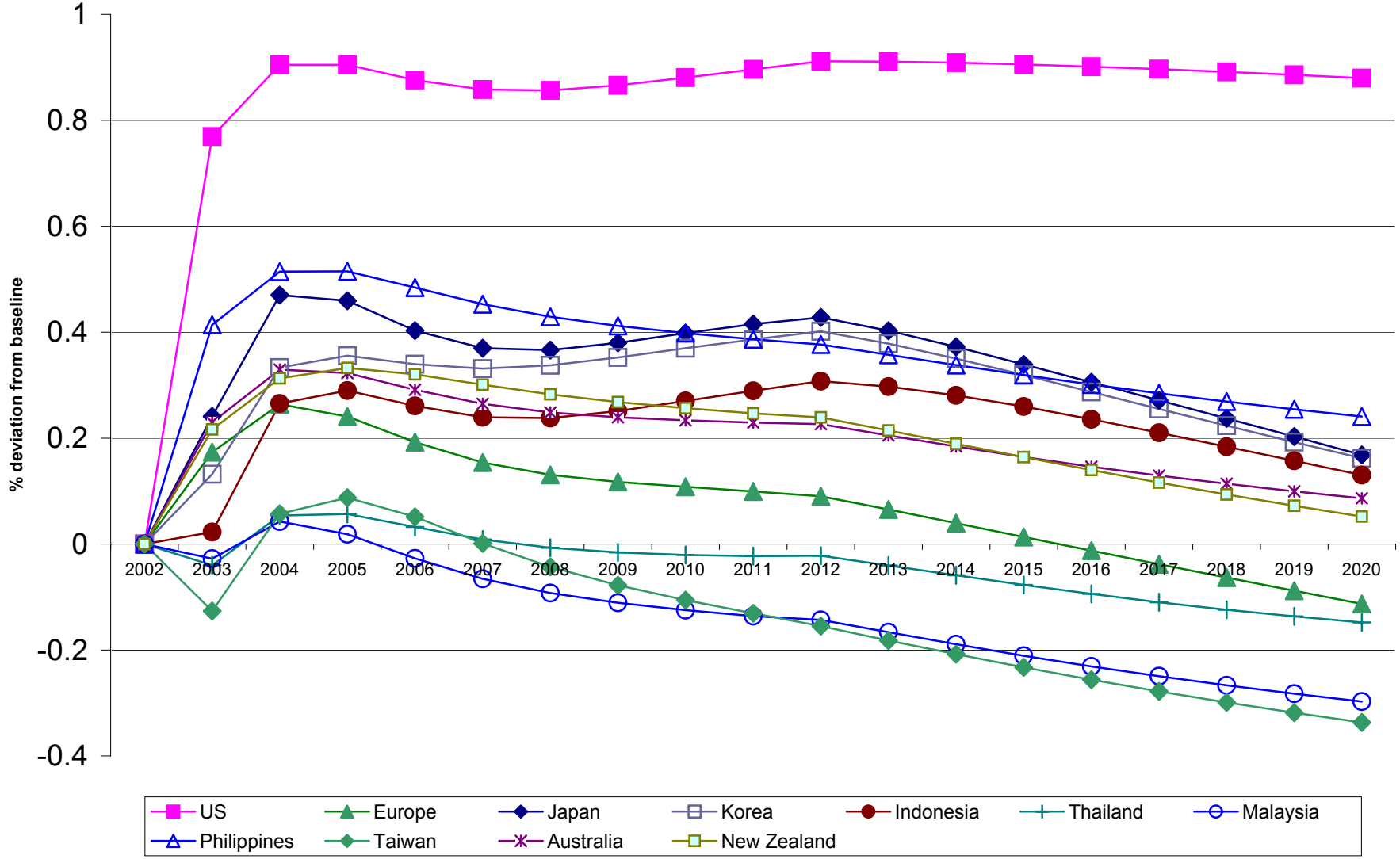


Figure 8 :Change in Real GDP in Other Countries - FDI Diversion Case

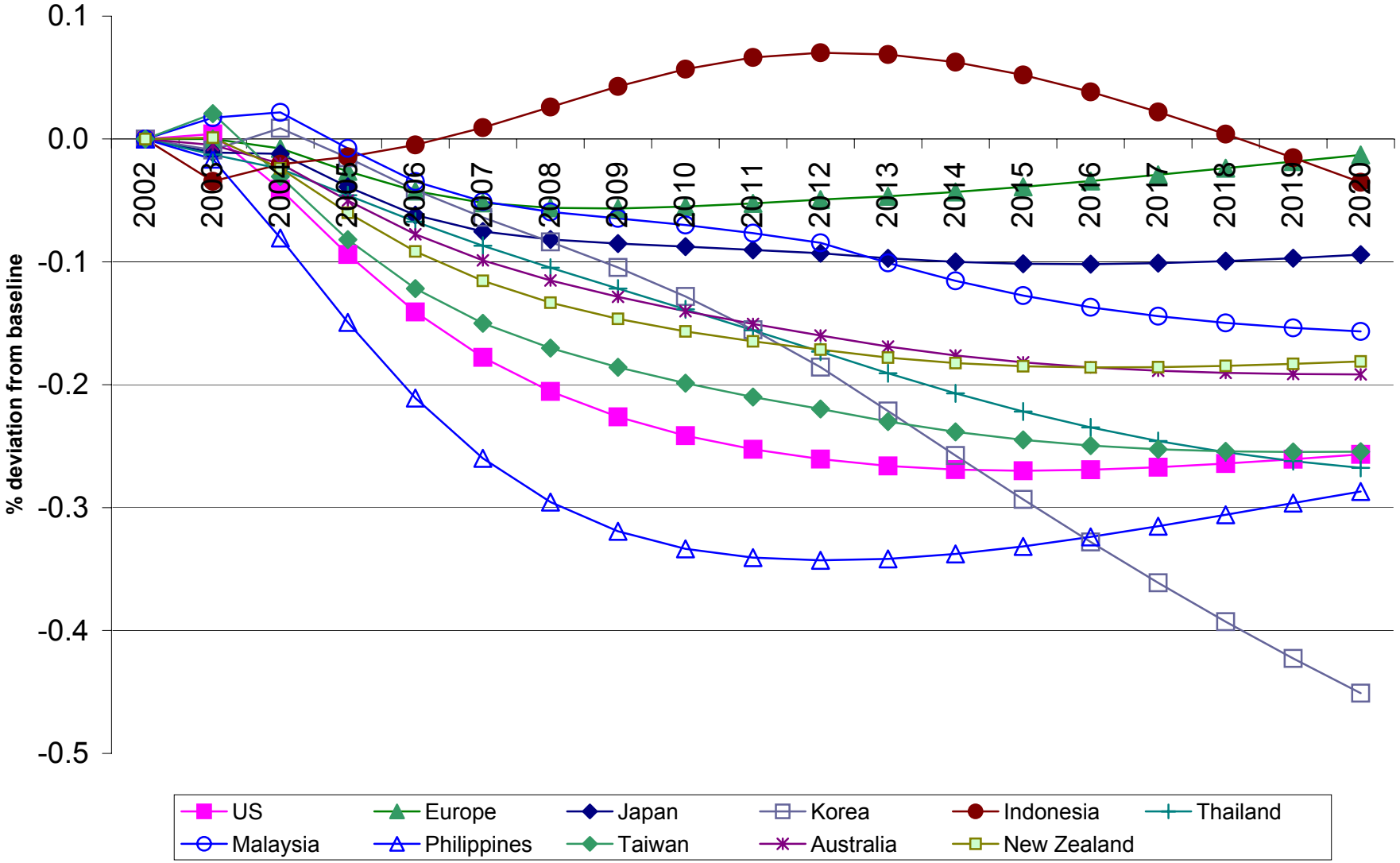


Figure 9: Real Effects on China -- FDI Diversion Case

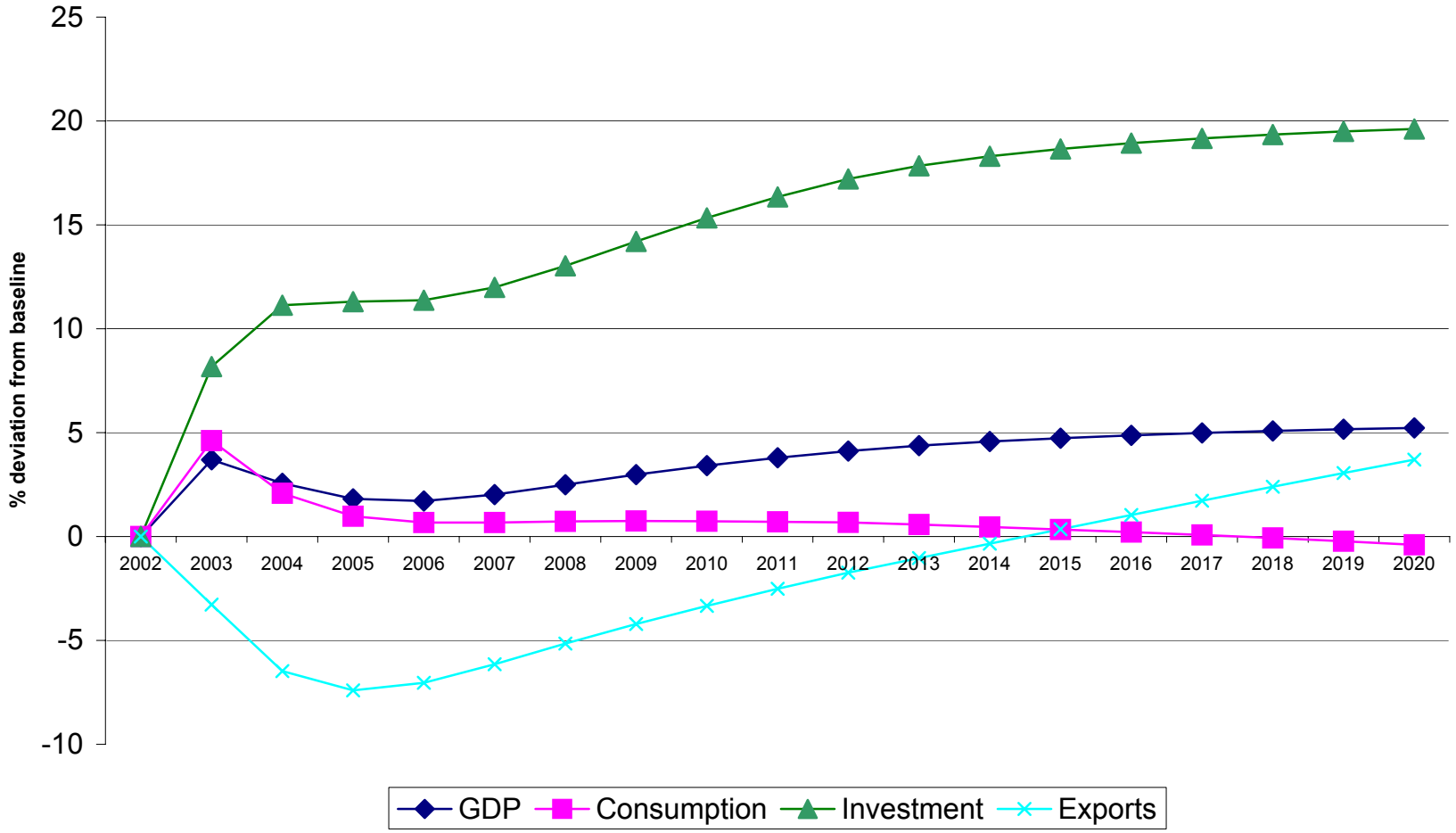


Figure 10: Change in Exports -- Case of FDI with Technological Spillovers

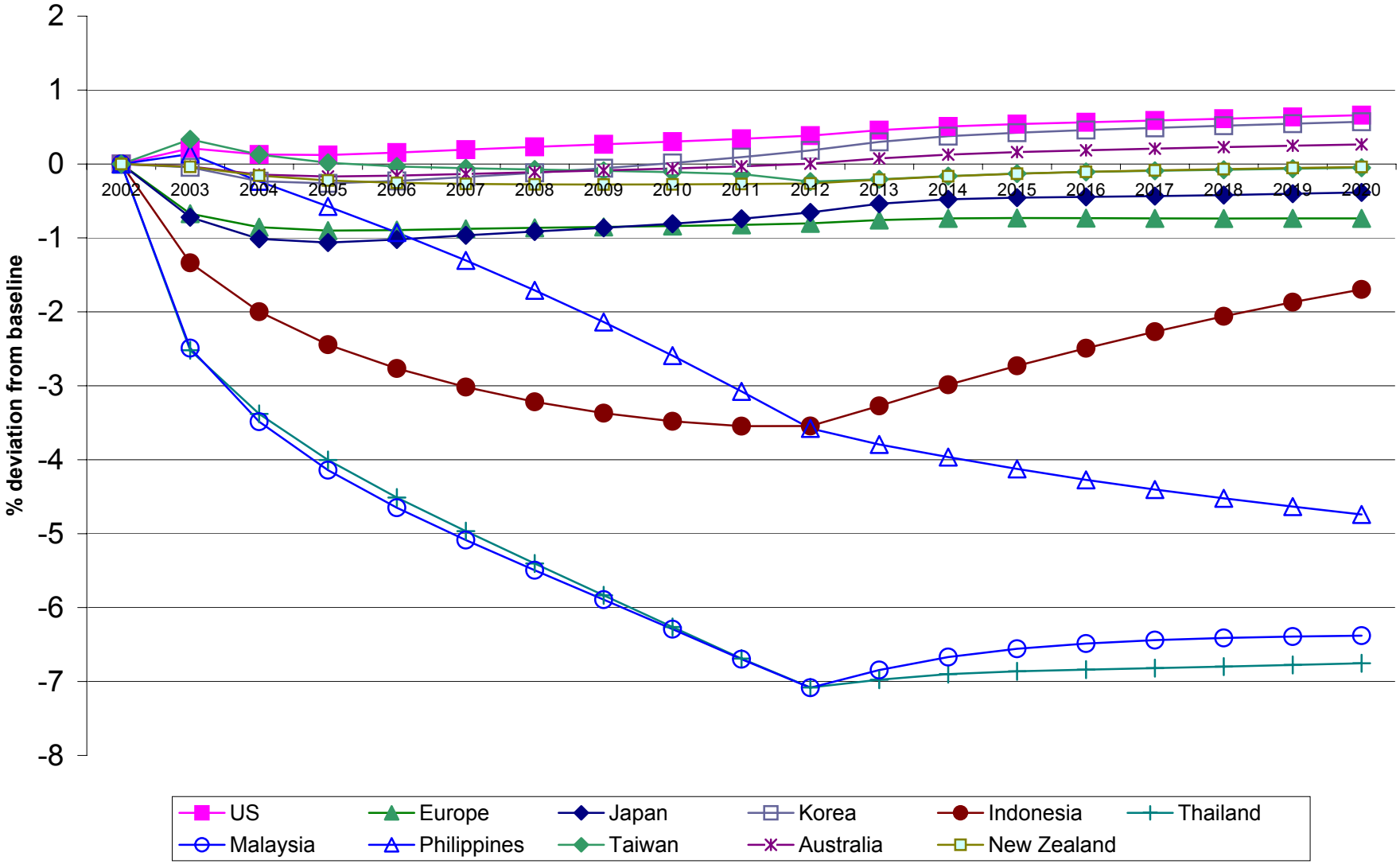


Figure 11: Change in Real GDP in Other Economies - Case of FDI with Technological Spillovers

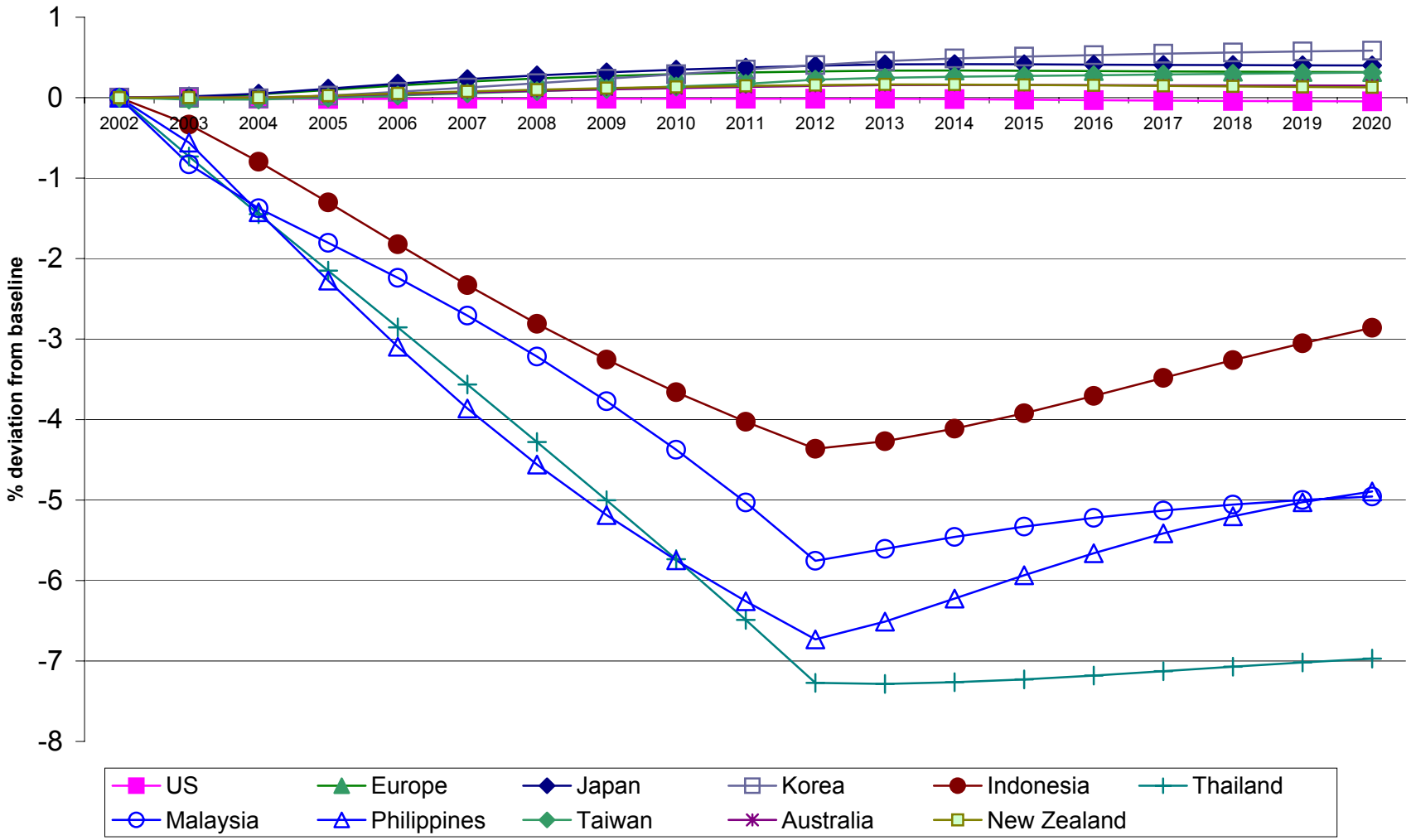


Figure 12: Real Effects on China -- Case of FDI with Technological Spillovers

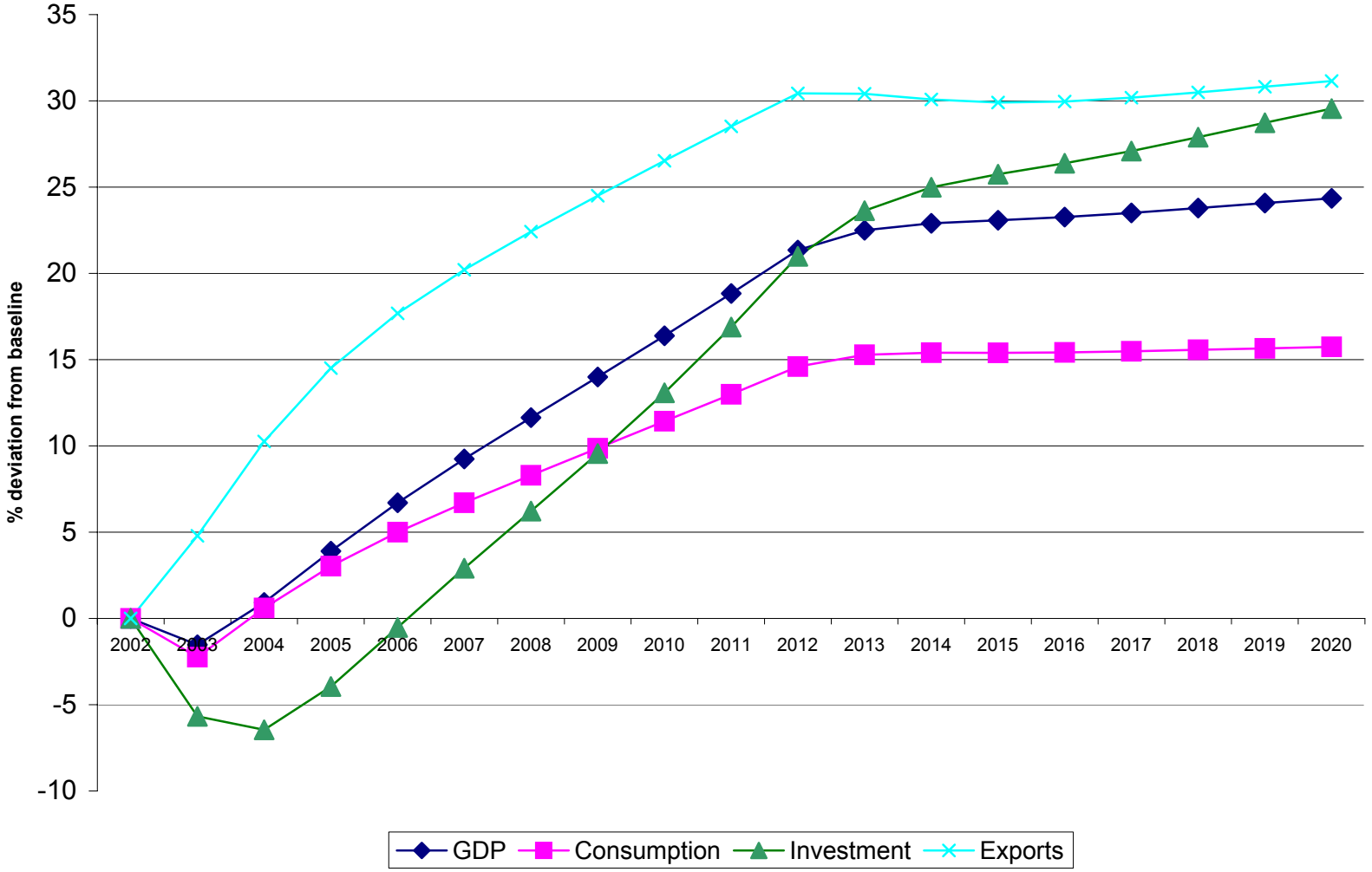


Table 1: Inward and outward FDI stocks as a percentage of gross domestic product by economy, (percent)

economy	1980	1990	2000
China			
inward	3.1	7.0	32.3
outward	-	0.7	2.4
Selected OCED Economies			
U.S.A.			
inward	3.0	6.9	12.4
outward	7.8	7.5	13.2
Canada			
inward	20.4	19.6	28.8
outward	8.9	14.7	32.4
Japan			
inward	0.3	0.3	1.1
outward	1.8	6.6	5.8
South Korea			
inward	2.1	2.3	13.7
outward	0.2	0.9	11.1
Australia			
inward	7.9	23.7	29.2
outward	1.4	9.8	20.9
New Zealand			
inward	10.3	18.2	49.4
outward	2.3	14.7	10.8
France			
inward	8.2	8.2	19.9
outward	3.6	9.9	33.4
Germany			
inward	3.9	7.1	24.1
outward	4.6	8.8	25.2
Italy			
inward	2.0	5.3	10.5
outward	1.6	5.2	16.8
United Kingdom			
inward	11.8	20.6	30.5
outward	15.0	23.2	63.2

	1980	1990	2000
Selected Asian Economies			
Taiwan			
inward	5.8	6.1	9.0
outward	0.2	8.0	15.9
Hong Kong			
inward	436.2	198.1	263.8
outward	0.5	15.9	224.9
Singapore			
inward	52.9	77.9	103.8
outward	31.7	21.3	57.5
Indonesia			
inward	13.2	34.0	39.6
outward	-	0.1	1.5
Malaysia			
inward	20.7	23.4	58.8
outward	0.8	6.1	20.8
Philippines			
inward	3.9	7.4	16.6
outward	0.5	0.3	2.6
Thailand			
inward	3.0	9.6	20.0
outward	-	0.5	2.0

Source: United Nations Conference on Trade and Development (2002)

Table 2: Inward and outward FDI flows as a percentage of gross fixed capital formation by economy (percent)

economy	1990-1995 (Annual average)	2000
China		
inward	9.8	10.5
outward	1.4	0.2
Selected OECD Economies		
U.S.A.		
inward	4.3	17.5
outward	6.1	9.6
Canada		
inward	5.9	47.3
outward	6.6	33.7
Japan		
inward	0.1	0.7
outward	2.2	2.6
South Korea		
inward	0.8	7.1
outward	1.4	3.8
Australia		
inward	9	14.1
outward	3.7	6
New Zealand		
inward	25.2	33.2
outward	7.7	10
France		
inward	6	16.9
outward	8.8	69.1
Germany		
inward	0.9	48.7
outward	5.3	12.4
Italy		
inward	1.8	6.3
outward	3	5.8
United Kingdom		
inward	9.7	46.4
outward	14.7	101

economy	1990-1995 (Annual average)	2000
Selected Asian Economies		
Taiwan		
inward	2.5	6.8
outward	6.2	9.2
Hong Kong		
inward	15.3	144.9
outward	37.4	138.9
Singapore		
inward	30.5	19.8
outward	11.7	18.2
Indonesia		
inward	4.8	-12.2
outward	2	0.4
Malaysia		
inward	19.4	16.5
outward	3.4	8.8
Philippines		
inward	7.9	9.2
outward	0.5	0.8
Thailand		
inward	4.4	10.4
outward	0.6	0.2

Source: United Nations Conference on Trade and Development (2002)

Table 3: Values of and country rankings by the UNCTAD inward FDI Performance Index (Sample of 140 Countries)

	FDI Performance Index			
	Value		Rank	
economy	1988-1990	1998-2000	1988-1990	1998-2000
China	0.9	1.2	61	47
Selected OECD Economies				
U.S.A.	1.1	0.8	50	74
Canada	1.3	1.6	46	30
Japan	0.0	0.1	128	131
South Korea	0.5	0.6	93	87
Australia	2.8	0.6	22	88
New Zealand	4.0	1.0	10	54
France	0.9	0.8	60	69
Germany	0.3	1.3	106	43
Italy	0.6	0.2	79	115
United Kingdom	3.3	1.8	16	25
Selected Asian Economies				
Taiwan	0.9	0.3	58	112
Hong Kong	5.4	5.9	4	2
Singapore	13.8	2.2	1	18
Indonesia	0.8	-0.6	63	138
Malaysia	4.4	1.2	8	44
Philippines	1.7	0.6	39	89
Thailand	2.6	1.3	25	41

Value of FDI Performance Index is the ratio of a country's share in global FDI flows to its share in global GDP. Value of 1 denotes that the country is receiving FDI exactly in line with their relative economic share.

Source: United Nations Conference on Trade and Development (2002)

Table 4: The 10 most promising destinations for manufacturing FDI by Japanese TNCs over the next three years

(frequency, expressed in percent, that the country is identified by Japanese firms responding to annual surveys conducted by Japan Bank for International Cooperation, JBIC)

Rank	1996 survey	Ratio	2000 survey	Ratio	2001 survey	Ratio
1	China	68	China	65	China	82
2	Thailand	36	United States	41	United States	32
3	Indonesia	34	Thailand	24	Thailand	25
4	United States	32	Indonesia	15	Indonesia	14
5	Vietnam	27	Malaysia	12	India	13
6	Malaysia	20	Taiwan province of China	11	Vietnam	12
7	India	18	India	10	Taiwan province of China	11
8	Philippines	13	Vietnam	9	Rep. of Korea	8
9	Singapore	10	Rep. of Korea	9	Malaysia	8
10	United Kingdom and Taiwan province of China	7	Philippines	8	Singapore	6

footnotes:

a The share of firms that consider the country as promising in total respondent firms (multiple responses).

b Fiscal year.

Source: United Nations Conference on Trade and Development (2002)

Table 5: Survey undertaken in October 2001 of the 21 percent of Japanese TNCs which intend to move to China because of China's accession to WTO

(survey by Japan External Trade Organisation, JETRO)

Planned relocation of production sites of these Japanese TNCs (percentage of TNCs responding)

From	Distributive share
Japan	67.5
Hong Kong, China	9.0
Taiwan province of China	6.6
ASEAN-4:	6.0
Malaysia	*3.0*
Indonesia	*1.2*
Philippines	*1.2*
Thailand	*0.6*
United States	4.2
Singapore	1.8
Republic of Korea	1.2
Other Asian countries	1.2
Mexico	1.2
United Kingdom	1.2

Source: United Nations Conference on Trade and Development (2002)

Table 6: Total Exports in 2020
(US$ billion, 1999 prices)

	Baseline	Naive Case	FDI Diversion Case	Diversion of FDI with Technological Spillovers
USA	1334.52	1344.79	1345.97	1343.25
Japan	761.17	760.77	763.09	759.45
Australia	123.05	123.24	123.24	123.43
New Zealand	32.31	32.34	32.35	32.31
Indonesia	108.52	108.68	108.90	105.05
Malaysia	154.18	154.15	154.11	143.46
Philippines	48.42	48.48	48.48	45.89
Singapore	276.82	276.99	277.15	275.96
Thailand	134.06	134.14	134.01	123.21
China	313.03	318.01	324.62	415.21
India	55.92	55.93	55.89	55.94
Taiwan	227.75	227.64	227.25	227.50
Korea	297.33	298.19	298.50	299.48
Hong Kong	123.34	124.43	125.40	126.35
ROECD	2173.98	2168.48	2172.59	2159.56
LDC	799.15	801.35	802.14	799.82
EEFSU	316.33	316.56	317.14	316.78
OPEC	569.05	567.79	567.61	568.94

Table 7: Deviation of Exports from Baseline in 2020

	China	Indonesia	Malaysia		Philippines	Thailand	
Simulation of FDI Diversion							
Deviation of total exports from baseline, in percent	*3.70*	*0.34*	*-0.04*		*0.12*	*-0.04*	
Contribution to deviation from baseline, in percentage points							
Energy	0.11	0.64	0.01		0.04	0.00	
Mining	0.01	-0.02	0.00		0.01	0.00	
Agriculture	-0.10	-0.02	0.08		0.04	0.12	
Durable Manufacturing	1.44	-0.01	-0.08		0.02	-0.01	
Nondurable Manufacturing	0.87	-0.14	0.01		0.02	-0.02	
Services	1.36	-0.10	-0.06		-0.01	-0.13	
Simulation of Diverted FDI with Technological Spillovers							
Deviation of total exports from baseline, in percent	*32.64*	*-3.20*	*-6.95*		*-5.22*	*-8.09*	
Contribution to deviation from baseline, in percentage points							
Energy	0.77	0.19	-0.02		0.02	0.00	
Mining	0.16	0.00	0.00		-0.01	0.00	
Agriculture	0.57	-0.20	-0.30		-0.11	-0.47	
Durable Manufacturing	14.34	-0.07	-4.59		-3.05	-3.94	
Nondurable Manufacturing	13.11	-3.28	-2.14	0.97	-2.36	-3.41	0.91
Services	3.69	0.15	0.10		0.28	-0.26	

Table 8: Indices of Technological Capacity, and of Growth Competitiveness across Countries in 2000

Indigenous Innovation index	
USA	1
Finland	2
Germany	3
Switzerland	4
Japan	5
Singapore	14
Taiwan	16
South Korea	22
Hong Kong	27
Malaysia	30
China	34
India	38
Philippines	47
Thailand	50
Indonesia	55
ASEAN-4(average)	*46*

Technology Transfer index	
Singapore	1
Ireland	2
Luxembourg	3
Malaysia	7
Taiwan	12
South Korea	13
Hong Kong	17
Philippines	19
India	26
Thailand	36
Japan	39
China	43
Indonesia	45
ASEAN-4(average)	*27*

Overall Technology Index	
USA	1
Finland	2
Singapore	3
Ireland	4
Germany	5
Switzerland	6
Japan	7
Malaysia	18
Taiwan	24
Korea	25
Hong Kong	30
Philippines	32
India	37
Thailand	43
China	48
Indonesia	50
Ecuador	58
Bolivia	59
ASEAN-4(average)	*36*

Growth Competitiveness Index	
United States	1
Singapore	2
Luxembourg	3
Netherlands	4
Ireland	5
Finland	6
Canada	7
Hong Kong	8
Taiwan	11
Japan	21
Malaysia	25
Korea	28
Thailand	31
Philippines	37
China	41
Indonesia	44
India	49
Bulgaria	58
Ecuador	59
ASEAN-4(average)	*34*

The Indigenous Innovation Index and Technology Transfer Index are the two components of the Overall Technology Index.
The Overall Technology Index is combined with the Startup Index (relative ease in establishing a new firm) to produce the Economic Creativity Index.
The Growth Competitiveness Idex is constructed from the Economic Creativity Index, the Finance Index (relative efficiency of the financial system), and the International Index (degree of integration into the international economy).

Source: World Economic Forum (2000)