



THE AUSTRALIAN NATIONAL UNIVERSITY

WORKING PAPERS IN ECONOMICS AND ECONOMETRICS

The Crisis and Economic Change in China*

Yongzheng Yang
National Centre for Development Studies
Asia-Pacific School of Economics and Management
Australian National University

Rod Tyers
Faculty of Economics and Commerce
Australian National University

Working Paper No. 383

April 2000

ISBN: 86831 3831

This paper draws on the general equilibrium analysis component of Yang and Tyers: "Weathering the Asian crisis: the role of China", China Economy Program Working Paper No. CEP2000-1, Asia-Pacific School of Economics and Management, Australian National University, January 2000. The complementary macroeconomic modelling offered in that paper is not included here. Special thanks are due George Fane, Meng Xin, Max Corden, Warwick McKibbin, Xiaolu Wang, Xinpeng Xu, E.C. Hwa and Ben Smith for useful discussions and to the Economics Program of the Asia-Pacific School of Economics and Management for resources provided in association with a Visiting Fellowship, August-December 1999. Constructive comments from Kar-yiu Wong on an earlier draft are also much appreciated.

The Crisis and Economic Change in China*

Abstract

During the Asian crisis, China's healthy reserves and low debt made possible the avoidance of a "country run". Nonetheless, it did experience an apparently autonomous rise in private savings, a rise in capital outflow and a slowdown in growth. This paper employs global general equilibrium analysis to examine the relative contributions of external and internal shocks in China during the crisis. The savings rise appears to have been dominant domestically and, by coincidence of timing, it was a significant contributor to the international effects of the crisis. The successful defence of fixed US\$ parity, however, has made the combined shocks more contractionary in China than would have been the case had it been possible to retain a flexible exchange rate regime.

1. Introduction

The heretofore spectacular growth of the East and Southeast Asian economies stalled in 1997 following a combined financial and currency crisis.¹ Several economies that had earlier been major contributors to both Asian growth and commodity imports experienced very substantial contractions associated with a surge of insolvencies following capital flight and unexpectedly large currency depreciations.² The government of China chose to hold fast to its US dollar parity, however. Its comparatively large official foreign reserves and its history of capital controls restricting short-term capital inflow meant less risk of a serious "country run" than in the most affected crisis countries. Nonetheless, the external crisis appears to have combined with domestic reforms and changes in macroeconomic policy to retard overall economic growth and increase unemployment.³

The primary effects of the crisis in China were a real appreciation against most trading partners and a rise in the risk premium demanded by investors in China.⁴ Given the fixed exchange rate regime these external shocks had to be contractionary. But the crisis came at a time when the proportion of total employment in China's relatively secure state sector had begun to decline⁵. Perceiving increased risk from this source, and possibly also from the crisis elsewhere in Asia, Chinese households appear to have chosen an autonomous substitution of savings for consumption. Other things equal, this shock would have tended to offset the real exchange rate effect of the crisis. Nonetheless, both it and the external crisis

¹ Subsequent but associated "crises" in Latin America, Eastern Europe and in Russia followed. We focus on the effects of the Asian shocks only.

² See McLeod and Garnaut (1998), Goldstein (1998) and Wong (1998).

³ See Meng (1999).

⁴ See Fernald and Babson (1999).

⁵ See Meng (1998).

acted to reduce the price level and thereby to retard output growth. The magnitude of these contractionary effects depends on the proportion of the increased saving channelled abroad and on the response of the Chinese government and central bank. The available evidence suggests that the outflow in 1998 was considerable, offset only partially by a virtual cessation of the previously rapid accumulation of official foreign reserves. Over and above the continuing domestic structural reforms, the immediate macroeconomic policy responses were the fixing of parity with the US dollar and a substantial fiscal expansion, described in combination as a “hard currency, soft budget” policy.

We review what information is available about China’s aggregate performance during the crisis and quantify some of the real effects using a global general equilibrium model.⁶ The use of global general equilibrium is important because it enables us to capture the contribution of intra-Asian trade in transmitting the crisis shocks. We address three key issues. First, we ask what are the relative contributions to China’s growth slowdown in 1998 of the external crisis shocks on the one hand and the surge in China’s domestic savings rate on the other. Second, we examine the consequences of China’s retention of fixed parity with the US\$ for its economic performance through 1998. And third, we note that the private savings surge accelerated capital outflow at the same time as capital was fleeing the crisis countries. The changes in the Chinese economy tended, therefore, to enlarge the flow of capital to the industrialised north, and particularly to the United States.⁷ We also examine the implications of this.

In simulating the crisis, we make no attempt to reproduce its short run dynamics.⁸ Instead, our analysis is comparative static, taking as our starting point the real shocks that emerged in its wake. In the short run, these included a severe contraction of domestic investment in affected countries (as home savings fled abroad and foreign savings in Asia were withdrawn). The contractionary effects of this were exacerbated by the temporary unemployment of capital as many Asian firms foundered under the escalated cost of foreign borrowings and the credit crunch that followed. Recent evidence suggests that a considerable number of firms in the most affected countries were rendered insolvent, and a larger number

⁶ Earlier applications of this basic approach to the crisis include those by Adams (1998), Noland et al. (1998), Liu et al. (1998) and Yang and Tyers (1999).

⁷ By the north we mean the older industrialised regions of Western Europe, North America and Australasia.

⁸ Although the events that precipitated the crisis are now fairly well understood (Chang and Velasco, 1998; Krugman, 1999), the best dynamic global macroeconomic models to date still do not fully endogenise the capital flight of 1997 (McKibbin, 1998a, b).

illiquid,⁹ and that this explains the bulk of the initial contractions in output. In estimating the effects of these production changes elsewhere in Asia on China, we avoid the common practice of subsuming them in a generic “productivity shock” by characterising them explicitly.

In Section 2 a brief review of the crisis and the associated events in China is offered. The general equilibrium analysis is then introduced in Section 3, where a summary of the model’s structure and behaviour is provided. Our construction of the crisis and policy shocks is described in Section 6 and the simulation results are presented in Section 7. Section 8 offers conclusions.

2. Events in the crisis countries and China:

We focus here on the real shocks occurring at the time of the crisis, rather than their financial origins. For the most affected Asian economies, the primary real shocks were of two types. First, as savings fled domestic investment declined. In Japan, where the process was more gradual, investment fell by about a tenth in the two years from late 1997.¹⁰ In the most affected economies of developing Asia, however, the initial panic of 1997 was so great that domestic investment declined by as much as half. Domestic capital goods and construction demand collapsed and private consumption demand also fell, driven by the associated wealth effects of asset price declines. Imports therefore fell dramatically.

The second of the real shocks was a further short run decline in domestic production in the affected economies. Because the credit squeeze was greatly exacerbated by an associated currency crisis and hence a blowing out of dollar denominated debt service costs, there was a high incidence of illiquidity and insolvency. This was the more so in developing Asia because of the rapid expansion of private sector credit there during the early 1990s. It was therefore inevitable that the substantial rise in debt service costs would drive more than the usual proportion of firms in the most affected economies into insolvency.¹¹ This was the principal cause of the contractions in output experienced in developing Asia in the first year following the onset of the crisis. Large though these contractions were, however, the corresponding declines in consumption and investment were still larger and so the volume of

⁹ See World Bank (1999).

¹⁰ According to IMF(1998), Table 3, gross fixed capital formation in Japan declined by 3.5 per cent in 1997 and was forecast to decline by 7.2 per cent in 1998.

exports from this region expanded. Large depreciations made them substantially cheaper than before and their competitiveness in third markets rose relative to that of China's exports.

In China, following unification of the exchange rate in 1994 a key policy objective had been to "get the exchange rate right" and a "real targets" approach was adopted whereby the nominal rate was set in relation to the cost of earning a unit of foreign exchange through exports.¹² In effect this ensured the stabilisation of the real exchange rate.¹³ With the advent of the crisis in 1997 the government fixed nominal parity with the US dollar. Although this was initially in defence of Hong Kong and its currency board, the Chinese government held to its commitment beyond the Hong Kong financial crisis. That this brought a departure from the real targets approach is evident from the ensuing effects on China's real exchange rate, which are summarised in Figure 1. Nominal parity with an appreciating US dollar in a period of low inflation ensured real appreciations against almost all of China's trading partners. Deflation in China has, however, ensured that a real depreciation has been enjoyed relative to the US and, more recently, against Europe. In spite of the reduced competitiveness of Chinese exports relative to those from crisis affected countries, the value of Chinese exports continued to grow through early 1998, only beginning to fall off later that year. Exports to other Asian countries fell first and most dramatically while the growth of those to the US and Europe had virtually ceased by the end of the year.¹⁴

China's capital controls notwithstanding, capital outflows appear to have accelerated markedly in 1997 and 1998, as indicated in Table 1. Estimates of unsanctioned outflows include both private flows on the capital account and, on the current account, the effects of under-invoicing of exports on the one hand and over-invoicing of imports on the other. Taken together, these appear to have more than doubled, to about six per cent of China's GDP. Between 1996 and 1998, for example, the change represents a reversal of private flows on the capital account, from a net inflow of about US\$30 billion to a net outflow of almost equal magnitude. These were offset by a decline in the rate of accumulation of reserves by about US\$30 billion. In magnitude, the corresponding change in the current account is about a fifth of that experienced collectively by the crisis affected countries (principally Indonesia,

¹¹ This is borne out in a recent World Bank survey of 3,700 companies in the worst affected economies (World Bank, 1999) as reported in *Asiaweek*, 16 April 1999.

¹² This view is put by Zhang (1999) and borne out in the form of a policy reaction function estimated by L.L. Song (1999).

¹³ This accorded with the strategy advocated by Corden (1993).

¹⁴ See Fernald and Babson (1999) and Hu (1999).

Malaysia, Thailand and Korea). It is smaller than the Korean change but larger than the contribution of any other affected country. As a proportion of GDP it is about half the collective change in those countries.

This substantial increase in net outflows appears to have been stimulated by a crisis-linked rise in the premium demanded on returns earned by investments in China¹⁵ and fuelled by a rise in the domestic rate of private saving. Some evidence for the saving rate change is presented in Table 2. There are many changes within China that could be contributing to this but the most likely causes are twofold. First, liberalisation of the housing market began in the mid-1990s and private ownership sanctioned in urban areas. Since then, there has been a rapid increase in the proportion of accommodations that are privately owned and an obvious incentive to raise private savings to achieve private ownership. Second, the trend of transferring production activity from the state to the private sector has accelerated.¹⁶ The proportion of workers enjoying “cradle to grave” welfare services in the state sector has declined from about 60% in the mid-1990s to less than half, with substantial and comparatively prominent lay-offs taking place in 1997. Thus, the perceived probability of obtaining or retaining state employment has declined and the need for savings to finance health, education and retirement has increased.¹⁷ All this suggests that the rise in savings and the associated increase in the true capital account deficit are largely autonomous and related to the crisis in other Asian countries mainly through an accident of timing.

While the evolution of China’s domestic and macroeconomic policy regimes has continued, two policy changes stand out as having significance for macroeconomic circumstances in the crisis period. First, as indicated above, the retention of the fixed US dollar parity tends to tie up monetary policy, which has been tight. In spite of the increase in the supply of domestic savings, the real interest rate facing the relatively privileged customers of the state banking system is estimated to have risen from –4.8% in 1995, to 1.8% in 1996, 5.8% in 1997 and 7.2% in 1998.¹⁸ Second, a “soft budget” policy has been maintained since the mid-1990s. Official estimates of fiscal deficits ranged in the vicinity of 0.8 per cent of

¹⁵ Fernald and Babson (1999) estimate that this premium rose by about 250 basis points between 1996 and 1998.

¹⁶ See Meng (1999).

¹⁷ See Wu (1999). This is further borne out by a recent survey by the Shanghai Statistics Bureau, which found that a primary objective of household saving is to insure against uncertainty arising from the dissolution of state-owned enterprises (*China News Digest*, 7 February 2000).

¹⁸ The real interest rate is here estimated as the concurrent difference between the state bank lending rate and the rise in the CPI. The source for both is IMF, *International Financial Statistics*, October 1999.

GDP until 1998, when there was a rise to 1.1 per cent. Government spending had been below 12 per cent of GDP in the two years prior to the crisis but rose to 13 per cent in 1998.¹⁹

The combination of the real appreciation, which reduced export growth, restrictive monetary policy and the autonomous switch to private savings appears to have contracted overall domestic demand, causing deflation. Growth in the CPI, which had exceeded 24 per cent in 1994, has since declined each year, reaching -0.8 per cent in 1998. Estimated GDP growth does appear to have slowed as a consequence, from the 10 per cent achieved in the mid-1990s to an official 7.8 per cent in 1998. The 1998 target of eight per cent apparently influenced provincial estimates, leading to some controversy and a slight downward revision. The official rate for 1998 is widely believed to be an overestimate, however. Moreover, an unusually large part of expenditure on GDP in 1998 was investment by state owned enterprises and this included inventory investment.²⁰ Nonetheless, total investment as a share of GDP has risen slightly and productive capacity continues to be transferred from the state sector to the presumably more productive private sector, all of which suggests the slowdown is not the result of slower productivity growth. We therefore look for nominal wages that are sticky downward, excessive real wage growth and rising unemployment.

Wage rigidities are not unexpected in China, where the labour market is more highly regulated than in other developing countries. The evidence presented in Table 3 suggests that the deflation in 1998 was indeed associated with a spurt in real wage levels. Again, however, the data on which this is based ignore non-wage and over-contract (bonus) payments.²¹ The former are large in state-owned enterprises while the latter are comparatively important in the private sector. The evidence on unemployment is also mixed. The principal source of layoffs has been the state sector. Yet workers laid off by the state sector are not included in the unemployment statistics. The official unemployment rate is therefore an underestimate considering that more than a tenth of the nation's workers have moved out of the state sector in recent years.²² In addition, there is anecdotal evidence that millions of rural migrants have

¹⁹ Here, also the source is IMF, *International Financial Statistics*, October 1999. These government spending statistics apparently ignore subsidies to state-owned enterprises. Such subsidies are large, though they probably take the form of transfers rather than spending on goods or services or public investment.

²⁰ See the discussion by Fernald and Babson (1999), p 6.

²¹ Although the data in Table 3 for 1998 are drawn from the indicated sources without adjustment, they do look out of line by more than we would expect and we regard them as questionable at best.

²² The extent of underestimation is moderated, however, by the disguised employment amongst these workers. Because they retain generous allowances and payments in kind, which are denied to workers who take new jobs, when new employment is attained these workers rarely concede it to officialdom. See Meng (1999).

returned to the countryside because of reduced opportunities in urban employment (Macro Team of CASS ,1999). On balance, we conclude that there has been a slowdown in output growth associated with a rise in unemployment.

From China's perspective, then, the key events during the crisis period are the external price decline, the rise in the interest premium on investments in China, and the spontaneous substitution of private saving for private consumption in the home economy. The associated policy shocks were the adoption of a fixed nominal exchange rate and the fiscal expansion. To examine the impacts of these shocks and policy changes we turn to our global general equilibrium analysis of these events.

3. A Global General Equilibrium Framework

We focus on a short run in which the stock of physical capital is fixed and sectorally immobile. Given that the crisis countries have flexible labour markets while China's labour market is highly regulated, we need to accommodate a mix of labour market specifications. The model used must also offer an open capital account in each region and therefore an explicit treatment of savings and investment. We meet these requirements by adapting the GTAP global general equilibrium model to our purpose.²³ Its analytics are summarised in Table 4. As a starting point, it offers the following useful generalisations: (i) a capital goods sector in each region to service investment, (ii) explicit savings in each region, combined with open regional capital accounts that permit savings in one region to finance investment in others, (iii) multiple trading regions, goods and primary factors, (iv) non-traded goods and services, (v) product differentiation by country of origin, (vi) empirically based differences in tastes and technology across regions, (vii) non-homothetic preferences, and (ix) explicit transportation costs and policy distortions. To complement the model we also adapt the GTAP Version 4 database to our purpose, aggregated into the regions listed in Table 5.²⁴ Note that we use the aggregate, "recessed developing Asia" to represent the most seriously affected Asian region.

Households and firms in the model consume a composite of goods and services that is a blend of home products and imports the composition of which depends on relative prices

²³ For a detailed description of the standard version of this model, see Hertel (1997). Our modifications to the structure of the model are principally changes to the factor demand structure (Yang and Tyers 1999) and the sector specificity of capital in all regions.

²⁴ For a detailed description of the database, see McDougall et al. (1998).

and an elasticity of substitution. In turn, imports are a blend of the products of all regions and its composition depends on regional trading prices and a further elasticity of substitution. This structure facilitates the departures from the law of one price that tend to occur even in tradeable goods sectors in the short and medium run.²⁵ For this reason, we do not adopt the practice common amongst GTAP users of choosing larger than the standard elasticities of substitution in all industries when doing long run comparative static analysis.²⁶

4. Constructing three scenarios:

We begin with a reference scenario that includes all the real shocks associated with the crisis as well as the simultaneous changes in China. Two counterfactuals are then considered. First, we imagine that the Chinese economy was passive during the crisis, being subjected to no domestic shocks. This scenario indicates the contribution of the external crisis to China's economic slowdown. The difference between it and the reference scenario tells us how changes in China affected the crisis countries and the capital flows to the north. The second counterfactual is designed to shed some light on the effects of the fixed parity decision. In it we introduce all the shocks of the reference scenario but assume that a floating exchange rate regime allowed control over the price level via monetary policy and that this would have prevented any over-trend rise in the Chinese real wage. The full set of reference shocks and closures is detailed in Table 6.

4.1 The reference crisis shock:

Consider first the crisis-affected regions, "recessed developing Asia" and Japan. Because our comparative static model does not have intertemporal optimisation by households or firms, we capture the capital account effects of the crisis by observing levels of investment and current account imbalances in the immediate aftermath, making these exogenous and then endogenising average rates of private saving.²⁷ By themselves, however,

²⁵ The early literature on real exchange rate changes tended to focus on associated relative price changes where tradeable goods prices retained parity with international trading prices. More recently it has become certain that short run departures from the law of one price occur across all tradeable goods sectors. See Engel (1999).

²⁶ See the discussion of long run shocks in Hertel et al. (1996, Appendix C: 212). Indeed, to reflect the unusually short run nature of the shocks, we use smaller than the standard elasticities. The elasticities associated with trade in the relatively standardised natural resource based goods and labour intensive manufactures are reduced by two thirds, while those associated with skill intensive manufactures and services are reduced by three quarters.

²⁷ As discussed later in the text, in order that the global distribution of investment be exogenous in this scenario, we must endogenise the risk premium on each region's "expected" rate of return.

the capital account shocks had only small short run effects on output. As indicated in Section 2, the more serious problem was exposure to foreign denominated debt by domestic firms and financial institutions in recessed developing Asia. “Country runs” therefore precipitated numerous insolvencies and the sluggish resolution of the associated property rights issues led to the closure of some plants and considerable lay-offs at others. To capture this, we make output exogenous in affected sectors, based on the survey by the World Bank (1999), and allow some sectoral physical capital to be idled.²⁸

Turning to the representation of China, once again the level of investment and the current account imbalance are exogenous and shocked as observed in the crisis period (Table 1). The associated change in China’s average rate of savings (private plus government gross of depreciation), S/Y , is endogenous, so that this scenario also serves to calibrate the Chinese savings shock.²⁹ This change turns out to be from 35 to 42 per cent, a rise of four percentage points, which is about the same as the change observed in the rate of private saving (Table 2).

Because China’s labour markets are more regulated than those elsewhere in Asia, we assume there is downward rigidity of the nominal wage over the length of run considered and that the nominal exchange rate is fixed against the US dollar.³⁰ To incorporate these nominal rigidities in our real model, we take advantage of the definitions of the real wage and the real exchange rate and the fact that data are now available on changes in price levels during and since the crisis. Eliminating the home price level from the definitions of the real wage, $w = W/P$, and the real exchange rate, $e_R = (E/P^*)P$, we have that:

$$w = \left(\frac{WE}{P^*} \right) \frac{1}{e_R}.$$

In proportional change form, when the nominal wage is fixed, this implies:

$$\hat{w} = -\hat{P} = (\hat{E} - \hat{P}^*) - \hat{e}_R.$$

²⁸ This approach and what it implies about the behaviour of firms is detailed in Yang and Tyers (1999).

²⁹ Total savings comprises private savings, S , and government saving, $S_G = T - G - \Delta R$, where ΔR is the rise in official foreign reserves. The information in Section 2 suggests that, in spite of the rise in G , both private and government saving moved in the positive direction after 1996, the latter rising because foreign reserves grew by US\$ 30 billion less in 1998 than in previous years.

³⁰ As indicated in Table 5, both skill and raw labour are included as primary factors. Since both markets are regulated in China, the resulting real wage rigidity applies to a weighted average of the two real wages.

This equation is incorporated in the model, in which the real wage, w and the real exchange rate, e_r are already endogenous variables. For China alone, this change also renders the real wage w , and the level of employment endogenous. Thus, when nominal wage rigidity is assumed in the first scenario, the observed proportional change in E/P^* is introduced as an exogenous shock. For this purpose, we use the trade weighted average of the ratio E/P^* for the five regions trading with China. Over the first four quarters following the crisis, this rose 3.5 per cent.

A key element of the crisis and its consequences for the world economy is the flight of savings from Asia and the resulting global redistribution of investment. When investment is made endogenous, it is allocated across regions so that its proportional change is larger in regions, i , with high values of the average rate of return on installed capital, r_i^c . In this process, a global “expected return”, r^w , is calculated such that $\sum_i S_i = \sum_i s_i Y_i = \sum_i I_i (r^w, r_i^c, \pi_i)$, where s_i is the domestic saving rate in region i , Y_i is total income, I_i is (net) investment and π_i is a region-specific risk premium. The investment demand equation for region i takes the form:

$$\frac{K_i + I_i}{K_i} = \beta \left(\frac{(1 + r^w)(1 + \pi_i)}{(1 + r_i^c)} \right)^{-\varepsilon_i}$$

Where K_i is the (exogenous) installed capital stock, β is a positive constant and ε is a positive elasticity.³¹ In this reference crisis scenario, however, the observed global distribution of investment is imposed as exogenous. This requires that the risk premia, π_i , be endogenous. The simulated changes in these premia then imply the extent of crisis-linked risk as perceived by investors in China. From the results, relative to the US, the largest value is for “recessed developing Asia” at 78 per cent. In the case of China the premium relative to the US is 14 per cent.³² In the subsequent counterfactual scenarios, these risk premia are imposed as exogenous shocks and the current accounts are made endogenous. Investment is then allocated across regions so as to equalise expected rates of return adjusted for the fixed risk premia.

³¹ This modifies the standard GTAP practice, described by Hertel and Tsigas (1997: 54-60).

³² Relative to the US rate of return, the premia for the other regions were: Japan: 25 per cent; the EU three per cent; Canada and Australasia two per cent, and the collective “rest of the world” six per cent.

4.2 *The “passive China” scenario:*

In our first counterfactual scenario, the crisis experiment is run against a China in which there is no change in the savings rate, implying no change in the rate of private savings and no fiscal policy shock. Recall that the crisis, as it affected China, comprised three elements. First, there was a trade shock due principally to the collapse of imports and the expansion of exports in recessed developing Asia and Japan. Second, there was a rise in the risk premium on investment, not only in the affected countries but also in China, and, third, there was an increase in the savings rate and an associated expansion in the capital account deficit. To construct the passive China scenario, then, we replace the shocks to investment and the current accounts of recessed developing Asia and Japan with shocks to risk premia and savings rates. The same is done for China, except that the savings rate is held at its pre-crisis level.

We had intended to simulate the continuation of the “real targets” approach to exchange rate policy by holding China’s real effective exchange rate constant. When subjected to the decline in the foreign price level and the rise in the investment premium, however, a constant real exchange rate could only have been maintained with an unrealistically extreme contraction of the domestic economy.³³ Moreover, we have no observations on nominal variables with which to complement our real model in this case. We therefore retain the fixed parity with the US dollar and assume that, had China remained otherwise “passive” during the crisis, the changes in bilateral nominal exchange rates and foreign price levels would have been the same as in the reference case. The same shock as before is therefore administered to the real wage equation. Of course, relative to the reference scenario, the change in the Chinese real wage will differ in this passive China scenario because the Chinese real exchange rate differs.

4.3 *The flexible exchange rate scenario:*

The second counterfactual scenario differs from the reference one only in that China is assumed to adopt a flexible exchange rate and a monetary policy designed to keep employment constant. As in the passive China case, we first replace the shocks to investment and the current accounts of the affected countries and China with the reference changes in

³³ See a more complete discussion of the macroeconomics of this point in Tyers (2000).

risk premia and savings rates. This time, however, the Chinese foreign exchange policy response is to adopt sufficient nominal exchange rate flexibility to give monetary policy power over the domestic price level. The real wage is then unaffected by nominal wage rigidity. In this closure, we therefore fix total labour supply and allow the real wage to be determined endogenously. The real wage equation in Section 4.1 is therefore disabled and replaced with the labour supply constraint.

5. Simulation results:

The three scenarios were run as three different sets of shocks against the GTAP Version IV database. For each of the six regions represented, the effects on the balance of payments, real exchange rate and the terms of trade are summarised in Table 7. The corresponding changes in output and in total employment are given in Table 8, while Table 9 lists the effects on real unit factor rewards. All the results are comparative static and should therefore be seen as changes relative to some growth trend.

5.1 The reference scenario:

The substantial redistribution of global investment away from Asia and into the industrialised north is clear from Table 7. In China, a rise in total domestic savings and a fall in investment fuel the outflow in the capital account. The Chinese average domestic savings rate (private plus government), S/Y , rises from 35 to 42 per cent. Since the Chinese ratio I/Y is exogenous and increased slightly in this shock, the decline in investment stems from a contraction in GDP, as indicated in Table 8.³⁴

In these results, China's real appreciation against other Asia, and the loss of export markets there, is more than offset by its real depreciation against the industrialised north. In this short run, Chinese exports therefore expand since they compete against exporters elsewhere in Asia constrained by insolvencies and idled capital.³⁵ Output of Chinese agricultural and mineral products, directed largely to other Asia, falls, as does output of

³⁴ Investment as a proportion of GDP has not fallen in China, but the GDP growth rate has. A decline of four per cent relative to trend is a fall of US\$40 billion, at least a third of which would be investment.

³⁵ China's export growth remained strong until mid 1998. See the Ministry of Foreign Trade and Economic Cooperation website at: <http://www.moftec.gov.cn/moftec/>. The more recent slowdown in exports (Fernald and Babson, 1999; Hu, 1999) may reflect the resolution of property rights in the affected countries and a subsequent surge in competing exports. The true trade effects on China remain unclear, however, because of inaccuracies in the measurement of the current account, as indicated in Table 1.

“elaborately transformed” products and services. China’s main export sector, labour intensive manufacturing, expands in spite of this economy wide contraction.

The reference shocks generally raise real unit factor rewards in the north and shrink them in Asia, as indicated in Table 9. There are three clear exceptions to this pattern, however. First, the real return to installed physical capital rises in the affected Asian countries. This is because so much of it is idled by insolvencies. Second, Chinese workers gain while those in the rest of Asia are worse off. This is because of the substantial deflation in China and our assumption that nominal wages are rigid downward there in the short run. The model predicts a decline in China’s real effective exchange rate of 1.9 per cent, while the exogenous nominal ratio E/P^* rises 3.5 per cent. The result is an average real wage rise of 5.4 per cent.³⁶ Third, owners of land, natural resources and manufacturing capital in the north are losers. This is because of the loss of exports of agricultural and natural resource based goods to Asia and of competitive pressure from cheaper imports following the northern real appreciations.

5.2 The “passive China” scenario:

This scenario is designed to indicate the relative contributions to economic change in China of the external crisis shock on the one hand and the domestic savings shock on the other. It therefore differs from the first only in that there is no departure from the pre-crisis savings rate in China, implying no change in the private savings rate and no change in fiscal policy. Investment levels and current account imbalances are now endogenous in all regions, while the shocks come from the investment premia and any changes in average savings rates in recessed developing Asia and Japan.

From Table 7 the decline in Chinese investment is smaller than before, even though the risk premium change is the same as in the reference crisis scenario. This is because, by the investment demand equation given in Section 4.1, China’s share of the world’s investment depends on the relative magnitude of China’s rate of return on installed capital. The contraction in this rate of return is smaller in this scenario (Table 9) because the endowment of capital is fixed and the contraction in employment is now much smaller (Table 8). In the end, the marginal product of capital is higher at the end of the passive China shock than at the end of the reference crisis shock. But why does employment contract less in the

³⁶ This rise is relative to China’s GDP deflator, however, and so overstates that relative to the CPI.

passive China case? This is because there is no rise in Chinese home savings to fuel the capital outflow of the reference scenario. S/Y remains constant. The contraction in aggregate domestic demand in China is therefore smaller than before and there is a smaller deflation. This implies a smaller rise in the real wage and hence a smaller decline in employment. This smaller decline in employment yields a much smaller decline in Chinese GDP (Table 8).

In our real model, the change in the deflation is reflected in the change in the real exchange rate. Recall that $e_R = (E/P^*) P$, where the ratio in parentheses is exogenous and rises 3.5 per cent in both cases. From Table 7, in the reference crisis scenario the Chinese real effective exchange rate falls by 1.9 per cent, implying a deflation of 5.4 per cent and hence a real wage increase of this magnitude. In the passive China scenario the real effective exchange rate rises 2.6 per cent, implying a deflation of only .9 per cent and a much smaller real wage increase. The more moderate contraction in domestic demand in the passive China case, combined with the smaller decline in employment, is then consistent with smaller contractions in skill intensive manufacturing and services (Table 8). Accordingly, real losses sustained by other primary factors are also smaller (Table 9).

Overall, these results indicate that the Chinese savings shock had a greater contractionary effect on the economy than the external crisis. Of course, we have retained the fixed exchange rate here and that does represent a change of policy regime associated with the crisis. Had the government attempted to retain its earlier “real targeting” regime through the crisis, the extent of crisis-driven contraction would have been larger.

5.3 The flexible exchange rate scenario:

Here, the domestic savings shock is reintroduced but monetary policy is assumed free enough to effect a sufficient change in the price level to prevent excessive real wage growth and hence to retain the pre-crisis level of employment relative to trend. There is, therefore, no contraction in Chinese GDP. Output and income are greater and hence China’s savings increase by more than in the reference case, fuelling an increased capital account deficit and yielding a very much larger real depreciation relative to its trading partners than in either of the other scenarios. Exports expand by more and so the production of labour intensive manufactures expands by more. In the north, the corresponding contraction in labour intensive manufacturing is therefore larger than in the other scenarios.

In Chinese factor markets, this time there is no real wage rigidity and employed unskilled workers lose substantially relative to the reference scenario, though only slightly when compared with the pre-crisis equilibrium. Skilled workers also lose relative to the reference scenario. They gain relative to the pre-crisis equilibrium due to an expansion in China's skill-intensive services sector. The average real return on capital in China rises relative to reference scenario and the pre-crisis equilibrium. The real volume of investment in China is therefore slightly higher. Because of the substantial real depreciation, however, the US dollar value of investment in China falls by more than in the reference case (Table 7). Export growth fuels a considerable expansion of China's labour-intensive manufacturing sector. Since this sector is intensive in inputs from the skill-intensive services sector that sector also expands.

Overall, employed Chinese workers are worse off under the flexible exchange rate response to the crisis than in the reference scenario. There is no increase in unemployment, however. The relatively painless return of GDP to trend is the attractive feature of a flexible exchange rate for the Chinese government, particularly given the continuing structural unemployment that must accompany necessary domestic reforms.

7. Conclusion

From the Chinese perspective, the principal external shocks during and since the Asian crisis are a real appreciation against its Asian neighbours and a loss of exports to them, increased export competition in the north and a rise in the interest premium demanded from investments in China. Within China, however, and for reasons mostly independent of the crisis, there has been a significant increase in the private saving rate. This, in combination with the rise in China's investment premium, has caused a large increase in outflows on the capital account. The trade shock, the rise in the investment premium and the change in China's saving behaviour are contractionary in the short run. Our analysis is directed at distinguishing the contributions to the observed slowdown in China's output and employment growth of the crisis-related shocks on the one hand and the domestic savings shock on the other. The results suggest that the private savings rate increase has been the more contractionary, contributing more than three per cent out of a total GDP contraction of 4.2 per cent. The external crisis appears, thereby, to have had only a relatively minor effect on the performance of the Chinese economy overall. At the same time, these changes raised capital

flows into the industrialised north by at least 10 per cent. Northern output has therefore risen, particularly in the services sector, and northern workers have gained at the expense of the owners of capital and other resources specific to tradeable goods sectors.

The deflation in China has also benefited employed Chinese workers, yet the analysis suggests that the number unemployed increased during the crisis not only due to on-going domestic restructuring but also because real wages rose. Although the increased unemployment and the reduced output may be ameliorated as the crisis shocks fade, the more contractionary change in domestic savings is likely to be permanent. To the extent that wage rigidities may be long lasting in China, it is tempting to consider the transition to a flexible exchange rate regime. From a domestic standpoint, this would free monetary policy to adjust the price level, ensuring that real wage rises do not reduce employment and offering the least politically painful approach to the restoration of output to its potential level. Our results suggest that, a depreciation during the crisis could have avoided losses of the order of four per cent of GDP per year. With a more flexible exchange rate, two risks arise, however. First, the exchange rate is lost as a “nominal anchor” and, depending on how China’s wage determination process evolves, it could initiate an inflationary spiral. Second, since China is a large economy, at least in its own region, there is the risk of competing devaluations and another round of Asian capital flight. This risk is the more serious and warrants consideration in the choice of China’s eventual exchange rate regime.

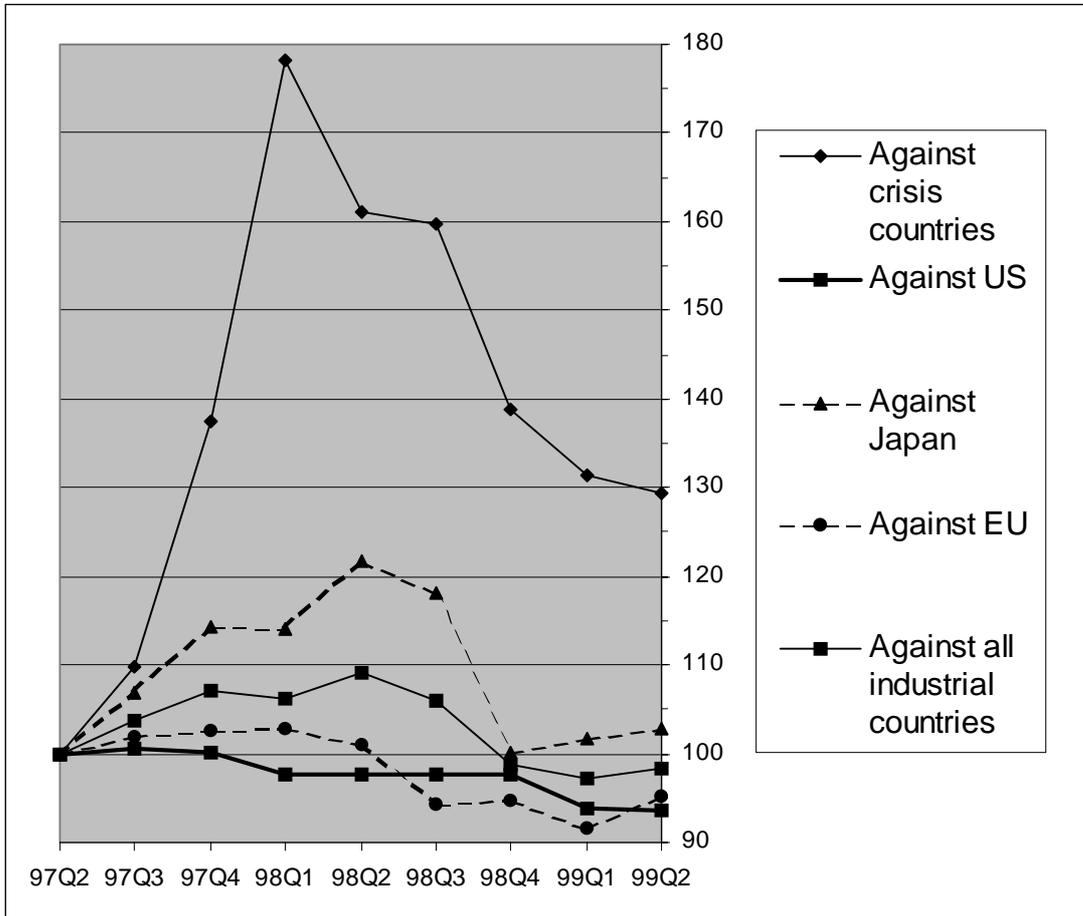
References:

- Adams, P.D., “Computable general equilibrium analysis of the consequences for Australia of the Asian crisis”, Centre of Policy Studies, Monash University, 1998.
- Chang, R. and A. Velasco, “Financial crises in emerging markets: a canonical model”, NBER Working Paper 6606, Cambridge, Massachusetts, June 1998, <http://www.nber.org/papers/w6606>.
- Corbett, J. and D. Vines, “The Asian Crisis: lessons from the collapse of financial systems, exchange rates and macroeconomic policy”, Chapter 2 in R. Agenor, M. Miller, D. Vines and A. Weber (eds.) *The Asian Financial Crisis: Causes, Contagion and Consequences*, Cambridge: Cambridge University Press, forthcoming 1999.
- Corden, W.M., “Exchange rate policies for developing countries”, *The Economic Journal*, 103: 198-207, 1993.
- Dornbusch, R., “Don’t devalue the Renminbi”, The 5th Column, *Far Eastern Economic Review*, August 26, 1999, p 30.
- Duncan, R. and Yang, Y., “The Impact of the Asian Crisis on Australia’s Primary Exports: Why it has not been so bad?”, Working Papers in Development Issues No.

- DI2000-1, Asia Pacific School of Economics and Management, Australian National University, Canberra, 2000 (<http://apsem.anu.edu.au/staff/yyang.htm>).
- Economist, "Money in, money out", *The Economist*, October 23-29, 1999, p98.
- Edwards, S., "The determinants of the choice between fixed and flexible exchange rate regimes", NBER Working Paper 5756, September 1996a, 18pp.
- Engel, C.M., "Exchange rates and prices", *NBER Reporter*, Winter 1998-99, pp 13-17, Cambridge Massachusetts: National Bureau of Economic Research, 1999.
- Fernald, J.G. and O.D. Babson, "Why has China survived the Asian crisis so well? What risks remain?", Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, No.633, February 1999.
<http://www.federalreserve.gov/pubs/workingpapers.htm>
- Goldstein, M., *The Asian Financial Crisis: Causes, Cures and Systemic Implications*, Policy Analysis in International Economics No.55, Institute for International Economics, Washington, DC, June 1998.
- Hertel, T., W. Martin, Y. Yanagishima and B. Dimaranan, "Liberalising manufactures trade in a changing world economy", Chapter 7 in W. Martin and L.A. Winters (eds.), *The Uruguay Round and the Developing Countries*, Cambridge University Press 1996.
- Hertel, T.W. and M.E. Tsigas, "Structure of GTAP" in T.W. Hertel (ed.), Chapter 2 of *Global Trade Analysis Using the GTAP Model*, New York: Cambridge University Press, 1997, pp 13-73.
- Hertel, T.W. (ed.), *Global Trade Analysis Using the GTAP Model*, New York: Cambridge University Press, 1997.
- Horiuchi, A., "Japan". Chapter 12 in McLeod, R. and R. Garnaut (eds.) *op cit*.
- Hu, Yifan, "China's export competitiveness", East Asia Department, World Bank, Washington, DC, 1999.
- Huang, Y. and L. Song, "China in the aftermath of the East Asian financial crisis", Presented at the conference on *International Capital Mobility and Domestic Economic Stability*, hosted by the Reinventing Bretton Woods Committee and the World Bank, Australian National University, Canberra, July 1999.
- IMF, *World Economic Outlook*, International Monetary Fund, Washington DC, October 1998.
- IMF, *World Economic Outlook*, International Monetary Fund, Washington DC, May 1999.
- Liu, L., M. Noland, S. Robinson and Z. Wang, "Asian competitive devaluations", Working Paper 98-2, Institute for International Economics, Washington, DC, September, 1998.
- Krueger, A., "Nominal anchor exchange rate policies as a domestic distortion", NBER Working Paper No. 5968, 1997.
- Krugman, P., "Balance sheets, the transfer problem and financial crises", paper prepared for festschrift in honour of Robert Flood, January 1999a,
<http://web.mit.edu/krugman/www/whatsnew.html>.
- McDougall, R.A., A. Elbehri and T.P. Truong (eds.) *Global Trade, Assistance and Protection: The GTAP 4 Database*, Center for Global Trade Analysis, Purdue University, December 1998.
- McKibbin, W.J., "The crisis in Asia: an empirical assessment", *Brookings Discussion Paper in International Economics 136*, Washington DC: The Brookings Institution, 1998a.
_____ and W. Martin, "The East Asian crisis: investigating causes and policy responses", Working Papers in Trade and Development No.98/6, Department of Economics, Research School of Pacific and Asian Studies, Australian National University, November 1998.

- McLeod, R.H. and R. Garnaut (eds.), *East Asia in Crisis: from being a miracle to needing one*, London: Routledge 1998.
- Meng, X., "Wage determination differences between Chinese state and non-state firms", *Asian Economic Journal*, 12(3): 295-316, September 1998.
- _____, "Recent developments in China's labour market". Presented at the *China Update Conference 1998*, China Economy and Business Program, Asia-Pacific School of Economics and Management, Australian National University, Canberra.
<http://ncdsnet.anu.edu.au/online/>.
- _____, "Rising unemployment and the need for social security". Presented at the *China Update 1999: China After the Asian Crisis*, China Economy and Business Program, Asia-Pacific School of Economics and Management, Australian National University, 1, November, 1999.
- Noland, M., L. Liu, S. Robinson and Z. Wang, *Global Effects of the Asian Currency Devaluations*, Policy Analysis in International Economics No.56, Institute for International Economics, Washington, DC, July 1998.
- Song, L., "The challenges of deflation: policy choices and their effectiveness", presented at the *China Update 1999*, Australian National University, Canberra, 1 November, 1999.
- Song, L.L., "Exchange rate policy reaction in China: 1980-1988", Department of Economics, University of Melbourne, July, 1999.
- Song, W.B., "China's Capital Flight: 1987-1997", *The Economic Research Journal*, 5, 1999.
- State Statistics Bureau, Government of China, *A Statistical Survey of China*, China Statistics Publishing House, Beijing, 1999.
- Tyers, R., "China after the crisis: the elemental macroeconomics", Working Papers in Development Issues No. DI2000-2, Asia-Pacific School of Economics and Management, Australian National University, January 2000.
(<http://ecocomm.anu.edu.au/departments/ecoh/staff/tyers.html>)
- Wong, K.Y. (ed.), "The Asian crisis: what has happened and why?", Department of Economics, University of Washington, Seattle, August 1998.
- World Bank, "The crisis pictured", *Asiaweek*, April 16, 1999, as presented on the web site: www.pathfinder.com/asiaweek/99/0416/cs3a_crisis.html.
- Yang, Y. and R. Tyers, "The Asian recession and northern labour markets", Working Papers in Economics and Econometrics No. 372, Australian National University, Canberra, May 1999 (<http://ecocomm.anu.edu.au/departments/ecoh/staff/tyers.html>).
- Yu, Q., "Exchange rate policy and domestic economic objectives: their conflicts and reconciliation", *The Economic Research Journal*, 7, 1999, in Chinese.
- Zhang, Z., "Exchange rate reform in China: an experiment in the real targets approach", St. Anthony's College, Oxford University, 1999.

Figure1: China's real exchange rate^a



a The real exchange rate is expressed as $e_R = E.P/P^*$, where E is the nominal rate in foreign currency units per unit of home currency, P is the home price level and P^* is the foreign price level.
Source: Data are from IMF (1999).

Table 1: Estimated components of China's balance of payments, US\$ billion

	1994	1995	1996	1997	1998
<i>Capital account</i>					
+ Capital inflow, <i>KI</i>	40.9	41.0	46.2	53.4	50.4
- Sanctioned capital outflow, <i>KOS</i>	5.7	-7.8	6.2	19.0	14.8
- Unsanctioned capital outflow, <i>KOF</i>	8.4	18.3	11.1	31.6	62.9
- Change in reserves, ΔR	30.5	22.5	31.7	35.7	5.1
= Capital account surplus, <i>KA</i>	-3.7	8.0	-2.8	-32.9	-32.4
<i>Current account, CA</i>					
+ Observed CA surplus, <i>CAO</i>	1.6	-5.8	-0.3	20.6	20.1
+ Misinvoicing outflow, <i>CAM</i>	2.1	-2.2	3.1	12.3	12.3
= True CA surplus, <i>CA</i>	3.7	-8.0	2.8	32.9	32.4
<i>Unsanctioned outflows, KOF</i>	8.4	18.3	11.1	31.6	62.9
%GDP	1.5	2.6	1.3	3.4	6.3

a This is an estimate of the true trade surplus, as distinct from the observed one.

Sources: Synthesis of capital flight calculations made originally by Song (1999). Data are from Song (1999) and State Statistics Bureau (1999). For 1998 capital inflows and foreign reserves are from *A Statistical Survey of China*, 1999. The 1998 current account balance and bank foreign asset data are from the *IFS*, October 1999. Capital flight via misinvoicing is assumed to be the same as for 1997 (Song 1999). Smuggling data are from Yu (1999) who assumes that import smuggling is 10-15% of total imports. We assume that net smuggling ($M - X$) is 5% of total imports. Outward FDI is derived from inward FDI from the Survey and the net FDI available from the Macro Team of CASS (1999), "Trade, capital flows and exchange rate policy", *The Economic Research Journal*, No. 9, pp.3-14.

Table 2: The private savings rate in China^a:

	1990	1995	1996	1997	1998
Rural households	15	17	18	23	26
Urban households	15	17	19	19	20
Total	15	17	19	21	24

a Approximated from estimates of private income and consumption expenditure.

Sources: *A Statistical Survey of China*, China Statistics Publishing House, Beijing, 1999 and *China Statistical Yearbook*, China Statistics Publishing House, Beijing, 1997.

Table 3: Real wage growth in China, per cent year on year^a

	1994	1995	1996	1997	1998
State owned enterprises	8.7	0.4	2.6	4.2	14.6
Collectives	0.2	3.7	0.6	1.7	19.1
Other employers	1.5	1.4	1.7	3.2	10.7
All workers	7.7	0.9	2.4	3.8	16.5

a The real wage estimate for all workers is calculated (not copied directly) from the source.

Source: State Statistical Bureau, *China Statistical Yearbook*, China Statistics Publishing House, Beijing, 1998; State Statistical Bureau, *A Statistical Survey of China*, China Statistics Publishing House, Beijing, 1999.

Table 4: Model analytics:

Single household in each region.

Utility Cobb-Douglas in:

private household expenditure

government expenditure

savings (shares and marginal propensities can be modified exogenously)

Government consumption: Cobb-Douglas composite of all goods.

Private household consumption: CDE^a expenditure function.

CES decomposition between home goods and imports

CES decomposition of imports by region of origin.

Firms are perfectly competitive with constant returns to scale.

Technology is a CES combination of intermediate inputs

with a separate CES composite of primary factors.

Intermediate demand is decomposed to home goods and imports as for household final consumption.

Primary factor demand : nested CES system^c.

Factor specificity: Land specific to agriculture

Natural resources specific to mining

Physical capital is sector specific

Labour and skill intersectorally mobile.

Primary factor supply: all factors are inelastic in supply at the regional level.

Capital returns are intra-regional.

Investment: worldwide sum across regions' savings.

Does not affect the current productive capital stock.

Does consume "capital goods" and enter the capital account of each region's balance of payments.

Capital goods are a Cobb-Douglas composite of domestic goods and services.

The endogenous allocation of investment across "non-Asia" equalises "expected returns" in each region. These are a decreasing function of regional investment.^d

a Constant Difference of Elasticities. See Hertel (1997).

b Households can transform labour between skilled and unskilled. However, this capability is reduced to negligibility in the applications discussed in this paper.

c For the primary factor demand structure, see Figure 1 in Yang and Tyers (1999).

d The formulation of expected returns, along with some alternative investment allocation rules, is discussed in Hertel and Tsigas (1997: 54-60).

Table 5: Model structure

Regions	Share of world GDP ^f
1. Recessed developing Asia ^a	5.1
2. Japan	18.0
3. China ^b	2.5
4. European Union ^c	29.0
5. United States	25.2
6. Australasia	1.4
7. Rest of world	18.8
Primary factors	
1. Agricultural land	
2. Natural resources	
3. Skill ^d	
4. Labour ^d	
5. Physical capital	
Sectors ^e	
1. All agriculture	
2. Mining and energy (coal, oil, gas and other minerals)	
3. Skill-intensive manufacturing (petroleum, paper, chemicals, processed minerals, metals, motor vehicles and other transport equipment, electronic equipment and other machinery and equipment)	
4. Labour-intensive manufacturing (textiles, apparel, leather and wood products, metal products, other manufactures)	
5. Skill-intensive services (electricity, gas, water, financial services and public administration)	
6. Labour-intensive services (construction, retail and wholesale trade, dwellings)	

a Korea (Rep.), Indonesia, Philippines, Malaysia, Singapore, Thailand, Vietnam.

b China includes Hong Kong and Taiwan.

c The European Union of 15.

d The labour disaggregation is based on the ILO Classification of Occupations. Professional workers are defined as including managers and administrators, professionals and para-professionals. Production workers are plant and machine operators and drivers, tradespersons, clerks, labourers and related workers, salespersons and personal service workers.

e These are aggregates of the 50 sector GTAP Version 4 database. See McDougall et al. (1998).

f Share of 1995 GDP in US\$ measured at market prices and exchange rates.

Table 6 Reference shocks and closures^a

<p>Recessed developing Asia:</p> <p>Regional investment is exogenous and reduced from 1995 to 1998 levels. Regional expected rate of return on current investment is endogenous.^c The average regional saving <i>rate</i>, <i>S/Y</i>, is made endogenous.^b The trade balance, <i>X-M</i>, is exogenous and changes as observed. Sectoral production volumes are exogenous and shocked as observed.^e Sectoral capital use is endogenous, so that capital is idled in contracting sectors.^e Labour in agriculture is reduced by 5 per cent while land productivity is raised by 2 per cent. Labour (skilled and unskilled) remains sectorally mobile and is fully employed.</p>
<p>Japan:</p> <p>Regional investment is exogenous and reduced from 1995 to 1998 levels. Regional expected rate of return on current investment is endogenous.^c The average regional saving <i>rate</i>, <i>S/Y</i>, is made endogenous.^b The trade balance, <i>X-M</i>, is exogenous and changes as observed. Sectoral production volumes are exogenous and shocked as observed.^e Sectoral capital use is endogenous, so that capital is idled in contracting sectors.^e Labour (skilled and unskilled) remains sectorally mobile and is fully employed.</p>
<p>China:</p> <p>Regional investment as a percentage of GDP is exogenous and is increased by three per cent. Regional expected rate of return on current investment is endogenous.^c Government spending as a percentage of GDP is exogenous and increases as observed. The average <i>rate</i> of saving is endogenous, while the current account surplus (<i>X-M</i>) is made exogenous and shocked as per the observed 1998 change. Sectoral production volumes are endogenous, while sectoral capital use is exogenous. Labour (skilled and unskilled) remains sectorally mobile. Nominal wage is fixed so that real wage depends on the endogenous real exchange rate and external nominal price shock. Full employment is therefore not ensured.</p>
<p>US, EU, Australasia & Canada, and the rest of world:</p> <p>Regional investment is endogenous. Regional current account, <i>X-M</i>, is exogenous and changes as observed. Regional expected return on current investment is endogenous.^c Sectoral production volumes are endogenous, while sectoral capital use is exogenous. Labour (skilled and unskilled) remains sectorally mobile and the real wage of raw labour is flexible upward only.^d</p>

- a In all scenarios, capital is completely sector specific in all regions, so that the rate of return differs across sectors.
- b Since the capital account and current account must be equal in magnitude and opposite in sign, $I-S=M-X$. For both recessed developing Asia and Japan, these shocks impose explicit contractions in investment and in imports relative to exports relative. The volume of saving then follows endogenously.
- c In the subsequent scenarios, regional investment is endogenous to equalise regional average “expected returns”, adjusted for risk premia. The trade balance is endogenous, while the average savings rate is retained exogenous and the observed reference scenario shock to it imposed. Expected rates of return on current investment are then exogenous and also shocked as indicated in the reference scenario.
- d In the end, this constraint does not bind since the real wages of raw and skilled labour both rise.
- e The approach taken to this, and its numerical consequences, are detailed by Yang and Tyers (1999).
- Source: IMF (1998, 1999); Statistics from web sites for countries concerned, as summarised in Duncan and Yang (2000). The sources for China are indicated in Section 3.

Table 7: Short run changes in the balance of payments and the real exchange rate,
1995 US\$ billion^a

Sector	Dev. Asia ^b	Japan	China	USA	EU	Canada, Aust, NZ
Reference crisis scenario						
Capital account surplus (I-S)=(M-X)	-134	-33	-28	126	75	14
Investment, I	-186	-187	-13	162	85	17
Saving, S	-52	-154	15	36	10	3
Imports, M	-166	-48	-19	70	38	8
Exports, X	-32	-15	9	-56	-37	-7
Change in real effective rate ^c (%)	-14.2	-5.5	-1.9	12.9	4.2	0.6
Real appreciation against USA ^d (%)	-21.5	-15.6	-13.5	0.0	-6.4	-5.5
Terms of trade ^e (%)	-5.6	-6.7	-1.2	10.3	1.3	0.2
Counterfactual: passive China^f						
Capital account surplus (I-S)=(M-X)	-135	-37	-3	119	66	13
Investment, I	-186	-191	-7	154	76	16
Saving, S	-50	-154	-5	35	9	3
Imports, M	-163	-49	-5	66	34	7
Exports, X	-28	-12	-2	-53	-32	-6
Change in real effective rate ^c (%)	-13.8	-5.8	2.6	12.2	3.9	0.6
Real appreciation against USA ^d (%)	-20.7	-15.3	-9.4	0.0	-6.3	-5.2
Terms of trade ^d (%)	-5.2	-7.1	1.9	9.7	1.2	0.2
Counterfactual: flexible exchange rate^g						
Capital account surplus (I-S)=(M-X)	-135	-32	-35	128	78	15
Investment, I	-189	-185	-17	164	89	18
Saving, S	-53	-153	18	37	11	3
Imports, M	-167	-47	-17	72	41	8
Exports, X	-32	-15	18	-56	-37	-7
Change in real effective rate ^c (%)	-15.0	-4.8	-4.5	13.3	4.6	0.9
Real appreciation against USA ^d (%)	-22.5	-15.6	-16.2	0.0	-6.4	-5.5
Terms of trade ^d (%)	-5.9	-6.3	-3.2	10.5	1.4	0.3

a Reference closure and shock details are indicated in Table 6. Here, flows on the balance of payments are valued in 1995 US\$ (simulated values in the model are deflated by the simulated US GDP deflator). Imports and exports are valued at border prices.

b Recessed developing Asia, excluding China, or RDA.

c The ratio of the home GDP deflator to a trade-weighted average of the GDP deflators of other regions.

d The ratio of the home GDP deflator to that of the US.

e Change in the value of exports at endogenous prices, weighted by fixed 1995 (base period) export volumes, divided by the value of imports, weighted by fixed 1995 import volumes.

f Here the shocks to other regions are as for the reference case, except that investment risk premia are exogenous in place of current accounts. In China, the savings rate remains at its pre-crisis level and the reference changes to the ratio E/P^* are introduced, implying the retention of fixed nominal parity with the US\$.

g Here the shocks to other regions are as for the reference case, except that investment risk premia are exogenous in place of current accounts. In China, the savings rate rises to its reference (post crisis) level and the nominal exchange rate is assumed flexible enough to permit price level changes that avoid excessive real wage increases. Employment therefore remains constant.

Source: Model simulations described in the text.

Table 8: Short run changes in gross sectoral output and GDP, per cent^a

Sector	Dev. Asia ^b	Japan	China	USA	EU	Canada, Aust, NZ
Reference crisis scenario						
Agriculture	0.2	-0.1	-6.7	-1.6	-0.8	-1.6
Mining	-3.9	-2.7	-1.0	-0.4	-0.2	-0.3
Manufacturing: labour intensive	-11.4	-3.8	2.2	-3.0	-0.9	-2.1
skill intensive	-12.1	-3.0	-4.9	-0.5	-0.4	-0.3
Services: labour intensive	-11.0	-5.4	-5.2	1.2	0.6	0.9
skill intensive	-10.1	-6.2	-3.7	-0.2	0.0	-0.3
GDP	-10.3	-5.1	-4.2	0.1	0.1	0.2
Employment (% labour force)	0.0	0.0	-9.8	0.0	0.0	0.0
Counterfactual: passive China^c						
Agriculture	0.2	0.0	-0.5	-1.4	-0.6	-1.4
Mining	-3.9	-2.7	-0.3	-0.4	-0.2	-0.3
Manufacturing: labour intensive	-11.4	-3.8	1.5	-2.7	-0.7	-1.7
skill intensive	-12.1	-3.0	-1.1	-0.5	-0.4	-0.3
Services: labour intensive	-11.0	-5.4	-1.3	1.1	0.5	0.8
skill intensive	-10.1	-6.2	-0.5	-0.2	0.0	-0.3
GDP	-10.3	-5.1	-0.4	0.1	0.1	0.2
Employment (% labour force)	0.0	0.0	-1.5	0.0	0.0	0.0
Counterfactual: flexible exchange rate^d						
Agriculture	0.4	-0.1	-2.6	-1.6	-0.8	-1.7
Mining	-3.9	-2.7	0.1	-0.4	-0.2	-0.3
Manufacturing: labour intensive	-11.4	-3.8	10.0	-3.2	-1.1	-2.6
skill intensive	-12.1	-3.0	-0.8	-0.5	-0.4	-0.3
Services: labour intensive	-9.4	-5.4	-1.2	1.2	0.7	0.9
skill intensive	-10.1	-6.2	1.5	-0.2	0.0	-0.3
GDP	-9.9	-5.1	0.0	0.1	0.1	0.2
Employment (% labour force)	0.0	0.0	0.0	0.0	0.0	0.0

a Reference closure and shock details are indicated in Table 6.

b Recessed developing Asia, excluding China, or RDA.

c Here the shocks to other regions are as for the reference case, except that investment risk premia are exogenous in place of current accounts. In China, the savings rate remains at its pre-crisis level and the reference changes to the ration E/P^* are introduced, implying the retention of fixed nominal parity with the US\$.

d Here the shocks to other regions are as for the reference case, except that investment risk premia are exogenous in place of current accounts. In China, the savings rate rises to its reference (post crisis) level and the nominal exchange rate is assumed flexible enough to permit price level changes that avoid excessive real wage increases. Employment therefore remains constant.

Source: Model simulations described in the text.

Table 9: Short run changes in real unit factor rewards, per cent^a

Primary factor	Dev. Asia ^b	Japan	China	USA	EU	Canada, Aust,NZ
Reference crisis scenario						
Labour	-8.0	-4.1	5.3	0.5	0.1	0.5
Skill	-10.4	-4.3	6.9	0.2	0.1	0.4
Natural resources	-10.7	-5.5	-13.0	-8.8	-4.5	-8.7
Land	-14.3	-4.5	-23.4	-16.3	-5.1	-13.0
Capital (regional average return)	8.5	6.1	-1.7	-0.1	0.0	-0.1
Capital specific to:						
Agriculture	-8.4	-4.5	-23.4	-16.3	-5.1	-13.0
Mining	30.3	13.9	-9.8	-8.0	-4.3	-8.0
Manufacturing: labour int	108.5	30.7	8.6	-3.7	-0.9	-2.1
skill int	45.5	-3.8	-2.9	-0.3	-0.4	0.1
Services: labour int	-23.1	2.9	-0.6	1.7	0.7	1.6
skill int	4.6	9.6	1.8	0.1	0.0	0.1
Counterfactual: passive China^c						
Labour	-8.0	-4.1	1.1	0.5	0.1	0.5
Skill	-10.4	-4.4	0.9	0.2	0.1	0.3
Natural resources	-10.8	-5.3	-3.1	-8.4	-4.0	-8.2
Land	-14.3	-4.3	-1.1	-15.0	-4.2	-11.1
Capital (regional average return)	8.5	6.1	-0.2	-0.1	0.0	-0.1
Capital specific to:						
Agriculture	-8.5	-4.3	-1.1	-15.0	-4.2	-11.1
Mining	29.8	14.6	-3.7	-7.7	-3.9	-7.7
Manufacturing: labour int	109.1	33.0	3.0	-3.3	-0.7	-1.6
skill int	45.6	-3.6	-0.8	-0.3	-0.4	0.1
Services: labour int	-23.1	2.1	-0.4	1.6	0.6	1.4
skill int	4.6	9.6	0.4	0.1	0.0	0.1
Counterfactual: flexible exchange rate^d						
Labour	-7.9	-4.0	-0.5	0.5	0.1	0.5
Skill	-9.9	-4.3	2.7	0.2	0.1	0.4
Natural resources	-9.4	-5.7	-1.7	-8.9	-4.6	-8.7
Land	-13.1	-4.7	-12.3	-16.6	-5.5	-13.5
Capital (regional average return)	7.8	6.0	0.3	-0.1	0.0	-0.1
Capital specific to:						
Agriculture	-7.2	-4.7	-12.3	-16.6	-5.5	-13.5
Mining	33.2	13.7	1.5	-8.1	-4.2	-8.0
Manufacturing: labour int	114.2	29.3	12.7	-3.9	-1.1	-2.6
skill int	49.4	-3.8	-1.3	-0.3	-0.3	0.1
Services: labour int	-27.6	3.4	-1.3	1.7	0.8	1.6
skill int	7.1	9.5	2.8	0.2	0.0	0.1

a Short run closure details are indicated in Table 6. All entries are unit rewards *relative to the region's GDP deflator*.

b Recessed developing Asia, excluding China, or RDA.

c See footnote c to Table 8.

d See footnote d to Table 8.

Source: Model simulations described in the text.