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American and European financial shocks

Implications for Chinese economic performance

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China's exports amount to almost half of its gross domestic product (GDP), with most of these directed to Europe and North America, so China can expect that negative financial shocks in these regions might retard its growth. Mitigating factors, however, include the temporary flight of North American and European savings into Chinese investment and some associated real exchange rate realignments. These issues are explored using a dynamic model of the global economy. A rise in North American and European financial intermediation costs is shown to retard neither China's GDP nor its import growth in the short term. Should the Chinese government act to prevent the effects of the investment surge, through tighter inward capital controls or increased reserve accumulation, the associated losses would be compensated for by a trade advantage since its real exchange rate would appreciate less against North America than against the rates of other trading partners. The results therefore suggest that, as long as the financial shocks are restricted to North America and Western Europe, China's growth and the imports on which its trading partners rely are unlikely to be hindered significantly.

During the past decade, reference to China in the financial and academic press has lauded its growth performance but tended to emphasise its exchange rate regime and its controversial current account surpluses with the United States and the European Union (see, for example, Tung and Baker 2004; Bernanke 2006; Lardy 2006; McKinnon 2006; Xiao 2006; Callan 2007; Woo and Xiao 2007; Tyers et al. 2008). After the downturn in the US housing market in 2007, however, and the associated credit squeeze in the United States and Europe,

attention shifted to the 'decoupling' issue: whether China's comparatively rapid expansion could be sustained in the face of slow-downs in Organisation for Economic Cooperation and Development (OECD) countries.¹ It appeared that the credit squeeze would bring the oft-anticipated 'hard correction' to the imbalance constituted by the extraordinarily large US current account deficit and that the US dollar would sink, even relative to the renminbi (RMB) (Edwards 2005; Obstfeld and Rogoff 2005; Roubini and Setser 2005; Eichengreen 2006; Krugman 2007). How would this affect China's economic performance?

With exports amounting to almost half of its GDP and most of these directed to Europe and North America, China can expect that negative financial shocks in those regions might retard its growth.² Since China assembles manufactured components from elsewhere in Asia and the Pacific,³ the extent of its 'decoupling' is the key to wider regional performance. In the short term, one mitigating factor is the transitory flight of increased amounts of the world's savings into Chinese investment (McKibbin and Stoeckel 2007b). The Chinese government might, however, oppose this on volatility grounds, via the strengthening of inward capital controls; yet even if the additional financial capital is kept out of China, mitigation remains possible since substantial real exchange rate realignments are likely and these could advantage China in the short term. In the long run, a rising consumption share (Lardy 2006; Kuijs 2006; Kuijs and He 2007; Azziz and Cui 2007) and the redirection of investment within China to its services sector, where considerable potential remains for a productivity catch-up (Ma 2006), will underpin China's growth.

In this chapter, these issues are explored collectively using a dynamic model of the global economy. The model simulates the real effects of shocks that take the form of transitory rises in region-specific interest premiums in North America and Western Europe, combined with increases in investment financing costs in both regions. The key effects of these shocks are for the real net rates of return on North American and Western European investment to fall while the yields demanded by financiers increase. Investment falls in those regions and real wage rigidity ensure that unemployment rises, GDP growth slows and import demand falls in both regions—at least temporarily. The focus of the analysis is, then, on factors influencing China's growth performance in the face of these shocks.

The genesis of the North American and European slow-down

The story of the slow-down is frequently told with a focus on US monetary policy, starting with the succession of monetary expansions by the US Federal Reserve after the stock-market corrections of 2000 and the demand contraction of late 2001 (Figure 3.1).⁴ The federal funds rate fell 5 percentage points by 2002 and a

further percentage point by 2003–04 (Federal Reserve Board of Governors). So the story goes, this unilateral easing inspired a housing bubble, which burst in 2007, unravelling packaged mortgage investments that had, apparently, been priced in a manner that relied on continued housing price inflation (BIS 2007). Linked with this story is the extraordinary blow-out of the US current account deficit since 2000, via the effects of the housing bubble on the US private saving rate. The growth of private wealth, combined with low borrowing rates, tended to boost consumption during this period, requiring that US investment be financed from foreign, rather than US, savings (Edwards 2005; Eichengreen 2006). It stands to reason, then, that the raising of short-term rates by the Federal Reserve during 2004–06 by at least 4 percentage points (Figure 3.1) would eventually prick the housing bubble and that the US economy would have a hard or soft landing, with either outcome redressing the current account imbalance (Krugman 2007).

Figure 3.1 **US short and long Treasury bond rates, December 1998 – May 2009**



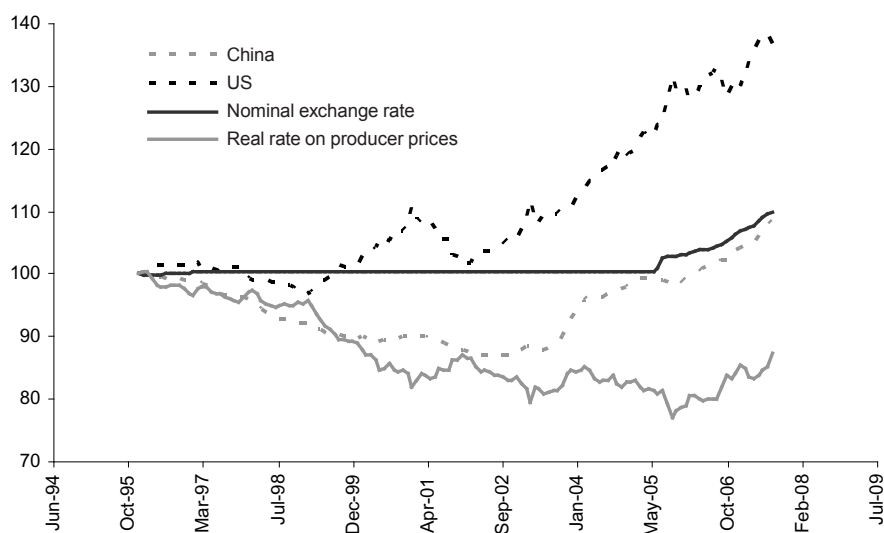
Note: Market yield in per cent per annum on US Treasury securities, quoted on an investment basis.

Source: Federal Reserve Board of Governors. Federal Reserve Board of Governors, Washington DC. Available from www.federalreserve.gov.

These linked stories ignore, however, the considerable role of the surge in the growth of the 'emerging economies', and particularly China, since the late 1990s, and the simultaneous yet independent information technology (IT) related boom in US productivity. The growth surge in emerging economies improved the US terms of trade in this period, raising US imports and increasing domestic price competition.⁵ Its effect on the US price level can be inferred from the decline in the Chinese bilateral real exchange rate with the United States, shown in Figure 3.2. While US producer prices showed a rising trend during 2000–05, the US dollar prices of an ever-expanding supply of Chinese goods were falling. The deflationary force yielded was bolstered by the IT-related US productivity boom, which began in the early 1990s and continued through to 2006 (Table 3.1).⁶ Along with the negative shocks associated with the US stock-market correction and the 11 September 2001 terrorist attacks, the collective deflationary force was considerable, justifying the observed monetary easing on inflation targeting grounds alone. Even with this monetary expansion, a temporary deflationary effect is seen clearly in Figure 3.2 from the decline in the US producer price during 2001. Of course, the coincidence of US asset price inflation with product price deflation was bound to create a crisis of priority in 2000–03. With asset price targeting always controversial, it is not surprising that the Federal Reserve gave priority to the control of product price deflation, thus keeping annual consumer price index (CPI) changes in the positive range (Figure 3.3).

Later in the period, the transitional economies' growth surge caused a global commodity price boom, with oil prices reaching unprecedented highs (Figure 3.4), followed not long after by price spikes in other commodities (Figure 3.5).⁷ This tended to reverse the product price deflationary pressure in the United States and to justify the restoration of the US federal fund rate to more normal levels during 2004–06 (Figure 3.1). At the same time, however, it exacerbated US asset price inflation as oil-exporting countries joined the other transitional economies in building up US dollar-denominated reserve assets.⁸ The financial contraction in 2007 was therefore a consequence of more complex forces to which the relative expansion of the Chinese economy was a contributor. Nonetheless, the contraction originated in the United States and spread to varying degrees to other OECD countries and, particularly, to Western Europe. While Figure 3.1 shows that the easing by the Federal Reserve during 2007–08, in response to the credit contraction, reduced long and short government borrowing rates, anecdotal evidence confirms that refinancing rates for private firms increased substantially as risk was repriced (see, for example, Browning and Silver 2008). Our purpose is to examine the direct and

Figure 3.2 The Mainland China–US real exchange rate since 1995 on producer prices



Note: Here the home prices are, for the United States, the Producer Price Index and, for China, the Corporate Goods Price Index. The Chinese index has more coverage of commodities and services than the US one, so this is a less than perfect comparison. The nominal exchange rate is in red, expressed as US\$/RMB, so that nominal appreciations are upward movements. The implied real exchange rate is in black, expressed as the value of the Chinese product bundle in terms of the corresponding US bundle. A Chinese real appreciation is therefore an upward movement.

Sources: International Monetary Fund (IMF), 2007. *International Financial Statistics*, April, International Monetary Fund, Washington, DC. Available from www.imfstatistics.org; National Bureau of Statistics (NBS), 2007. *China Statistical Abstract 2006*, China Statistics Press, Beijing.

Table 3.1 Growth of US labour productivity in the non-farm business sector

Period	Per cent per annum
1973–95	1.47
1995–2000	2.51
2000–06	2.86

Source: Oliner, S.D., Sichel, D.E. and Stiroh, K.J., 2008. *Explaining a productive decade*, Staff Working Paper 2008-01, Finance and Economics Discussion Series, Federal Reserve Board, Washington, DC.

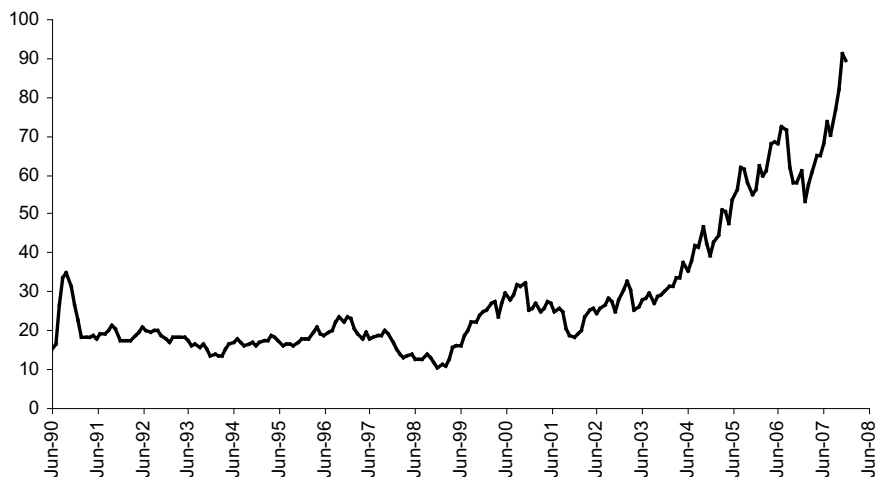
Figure 3.3 **Rate of US CPI inflation, 1990–2008**



Note: Monthly data percentage change in the CPI during the previous 12 months.

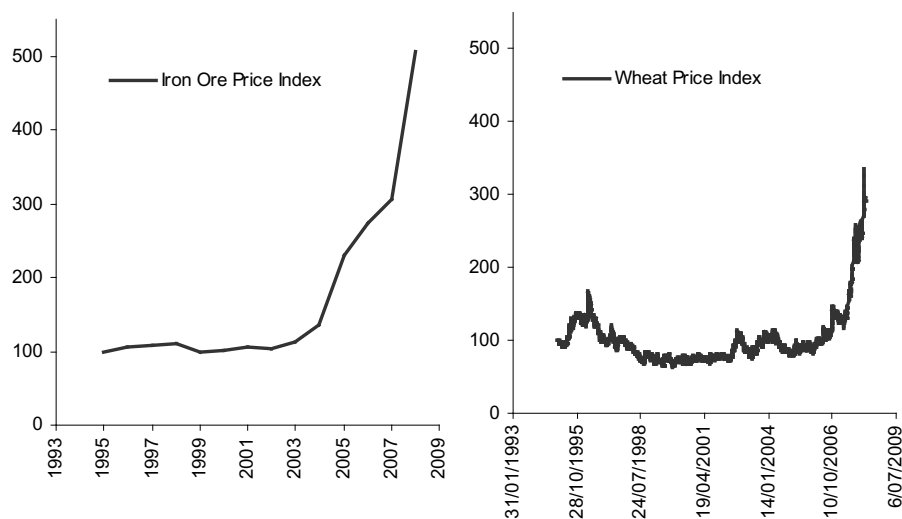
Source: Federal Reserve Board of Governors. Federal Reserve Board of Governors, Washington DC. Available from www.federalreserve.gov.

Figure 3.4 **The average traded price of crude petroleum, 1990–2008**



Note: Monthly data, average traded price in US\$/barrel.

Source: International Monetary Fund (IMF), 2007. *International Financial Statistics*, April, International Monetary Fund, Washington, DC. Available from www.imfstatistics.org.

Figure 3.5 Other commodity price shocks, 1993–2009

Sources: For wheat, Chicago Board of Trade daily wheat price in US\$/bushel, from the Bloomberg Database; iron ore, Hamersley fines, quoted in US cents/dry iron units (dmu). If the ore shipped is 62 per cent iron (the typical Hamersley grade), the price per tonne of ore is the dmu price (for 2007, that would be US\$0.82) multiplied by 62, which means US\$50.84 per tonne, from the IRL Database.

indirect effects of this contraction on China, and thereby on those countries dependent on trade with China. To do this, a dynamic numerical model of the global economy is required.

The model

We use a multi-region, multi-product dynamic simulation model of the world economy, which is an adaptation of the model constructed by Tyers and Shi (2007) and extended for macroeconomic applications by Tyers and Bain (2007) and Tyers and Golley (2008a, 2008b).⁹ Only real shocks and their effects are represented.¹⁰ In the version used, the world is subdivided into 14 regions (Table 3.2). Industries are aggregated into three sectors: agriculture (including processed foods), industry (mining, energy and manufacturing) and services (including construction)—the last being little traded in comparison with the other two. Failures of the law of one price for traded goods are represented

by product differentiation, so that consumers substitute imperfectly between products from different regions. There are two endogenous sources of simulated economic growth—namely, physical capital accumulation and the transformation of labour from unskilled to skilled. Technical change is introduced in the form of exogenous productivity growth that is sector and factor specific, allowing productivity performance to differ between factors and between tradable and non-tradable sectors.¹¹

Regional capital accounts are open so that regional households hold portfolios of assets that are claims over home and foreign capital. Investors in region i have adaptive expectations about real net rates of return, r_i^c , the determinants of which might be summarised simply as

Table 3.2 **Regional composition in the global model**

Region	Composition of aggregates
Australia	
North America	Canada, Mexico and the United States
Western Europe	European Union, including Switzerland and Scandinavia but excluding the Czech Republic, Hungary and Poland
Central Europe and the former Soviet Union	Central Europe includes the Czech Republic, Hungary and Poland
Japan	
China	Includes Hong Kong and Taiwan
Indonesia	
Other East Asia	Republic of Korea, Malaysia, the Philippines, Singapore, Thailand and Vietnam
India	
Other South Asia	Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka
South America	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru, Venezuela and Uruguay
Middle East and North Africa	Includes Morocco through to the Islamic Republic of Iran
Sub-Saharan Africa	The rest of Africa
Rest of World	Includes the rest of Central America, the rest of Indo-China, the small island states of the Pacific, Atlantic and Indian Oceans and the Mediterranean Sea, Myanmar and Mongolia, New Zealand and the former Yugoslavia

Source: The *GTAP 5 Global Database*; Dimaranan, B.V. and McDougall, R.A., 2002. *Global Trade, Assistance and Production: the GTAP 5 Database*, May, Center for Global Trade Analysis, Purdue University, Lafayette.

$$r_i^c = \frac{P_i^Y MP_i^K}{P_i^K} - \delta_i \quad (1)$$

in which P_i^Y is the region's GDP price, P_i^K is the price of capital goods (a separate industry defined in the model) and δ_i is the depreciation rate. Given this rate of return, the determination of investment in each region is complex, but for our purpose it can be characterised simply as follows.¹² It is driven positively by the real net rate of return, r_i^c , and negatively by the rate that must be returned to savers, or the financing cost, r_i . Therefore

$$I_i = I(r_i^c, r_i) \quad (2)$$

To arrive at r_i , a global interest rate, r^w , is first defined such that $r_i = r^w + \pi_i$, in which π_i is a usually exogenous regional interest premium, which captures the effects of capital controls on the one hand (market segmentation) and differential regional risk on the other. The global rate, r^w , and indirectly r_i , is then derived to clear the global capital market.

$$\sum_i S_i(Y_i, r_i) = \sum_i I_i(r_i^c, r_i) \quad (3)$$

in which Y_i is regional income.

Lagged adjustment processes embedded in the $I(r_i^c, r_i)$ ensure that financial capital is not sufficiently mobile internationally to equate r_i^c and r_i in the short term, but that their paths converge in the long term unless exogenous shocks prevent this. General financial reform is represented by a diminution of the interest premium, π_i , which in China's case tends to raise its share of global funds for investment through time.¹³ China's average saving rate is high initially, declining through time as its population ages. The baseline simulation therefore maintains a Chinese current account surplus that diminishes after 2010.

A demographic component of the model tracks populations in four age groups, both genders and two skill categories: a total of 16 population groups in each of the 14 regions. The skill subdivision is between production labour (unskilled) and professional labour (skilled).¹⁴ Each age–gender–skill group is represented as a homogeneous sub-population with a group-specific birth and death rate, labour force participation rate and rates of immigration and emigration. Because the non-traded services sector is relatively skill intensive in all regions, trends in skill composition prove to be particularly important for the alignment of real exchange rates. These depend on the rate at which each

region's education and social development institutions transform unskilled (production-worker) families into skilled (professional-worker) families. Each year, a particular proportion of the population in production-worker age–gender groups is transferred to professional status. The initial values of these proportions depend on the regions' levels of development, the associated capacities of their education systems and the relative sizes of their production and professional labour forces. Rates of transformation change through time in response to corresponding changes in real per capita income and the skilled wage premium.¹⁵

The 16 age–gender–skill groups differ in their shares of regional disposable income, consumption preferences, saving rates and labour force participation behaviour. While the consumption–savings choice is parameterised differently between groups, it is dependent for all on group-specific real per capita disposable income and the regional real lending rate. Governments are assumed to balance their budgets while saving and borrowing are undertaken by the private sector. The baseline scenario is a 'business-as-usual' projection of the global economy to 2030, with 1997 as the base year. For validation experiments through 1997–2006, see Tyers and Golley (2008a).

Simulating the North American and Western European slow-down

We compare a baseline business-as-usual simulation to 2030, in which the Chinese economy continues to grow strongly,¹⁶ with one in which a financial contraction retards performance in North America and the European Union. We focus in this section on the characterisation of the downturn in those regions. The analysis is in no way a forecasting exercise; rather, it is to establish a representative pathway for the international economy on which we can superimpose some alternative Chinese policy responses. Recalling that investors in our model are represented as having adaptive expectations, we have not attempted to use it to construct a precise repetition of the events leading up to the US housing bubble and the bubble itself, since the latter arose from ill-formed expectations about future market performance, at least by some investors. Rather, we impose exogenous shocks that combine to represent the real effects of the resulting credit squeeze.

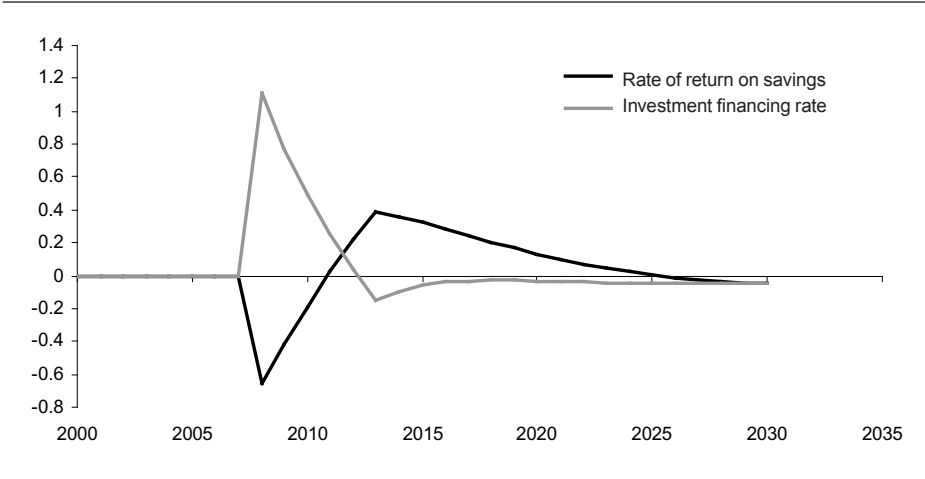
The shocks we use are all transitory, peaking in 2008 with a recovery in the subsequent five years. They apply to the two regions, 'North America' and 'Western Europe', and are weaker in the latter. The first is a rise in the investment interest premiums, π_i , over other regions of the world. This reflects the recent increase in gross returns required by investors in these regions to compensate for perceived increases in risk. The effect of this shock is to raise

the financing cost of investment in North America and Western Europe. Second, the productivity of investment in these regions is reduced through shocks to the technologies used in their capital-goods sectors. This is an indirect means of reflecting the recent declines in rates of return on installed capital, r_i^c , in both regions.¹⁷ In effect, this serves to widen the intermediation wedge between marginal investor earnings and financing costs.

Since the pathway to be simulated has only to be 'representative', and since clear data on OECD investment credit costs through 2007 are not yet available, the scale of these shocks is arbitrary. For North America, we raise the investment interest premium by 2 percentage points and capital-goods productivity is reduced by 5 per cent. The corresponding shocks for Western Europe are half the size of those for North America. All shocked variables then return to baseline benchmarks linearly during a recovery period of five years. The effects these shocks have on investment financing rates on the one hand and real rates of return on the other are illustrated in Figures 3.6 and 3.7, which show percentage departures from a baseline simulation in which all regions grow smoothly. Note that the global capital market clearing interest rate, r^w , reduces by 0.9 percentage points because of the contraction in investment demand in North America and Europe. The short-run effect on the domestic financing rate in North America is therefore a rise of 1.1 percentage points, while the corresponding net rise in Western Europe is just 0.1 percentage points.

The wedge between financing costs and the real rate of return is clear from the figures, which also show that the model's investment dynamics lead to some overshooting of rates late in the recovery period for North America and Western Europe.¹⁸ This occurs because the shocks curtail North American and European investment sharply in 2008 but raise investment in other regions, as shown in Figure 3.8. During the recovery, however, investment in North America and Western Europe expands quickly towards their benchmark levels. The 2008 collapse in North American and European investment, however, leaves these regions with capital stocks below baseline levels for many years, the pace of their recoveries notwithstanding. For this reason, real rates of return in these regions rise above baseline levels on the point of recovery and for some years beyond. For Western Europe, the initial shocks are smaller and their effects are muted by the larger North American shocks, which tend to lower financing costs for the rest of the world, including Western Europe.

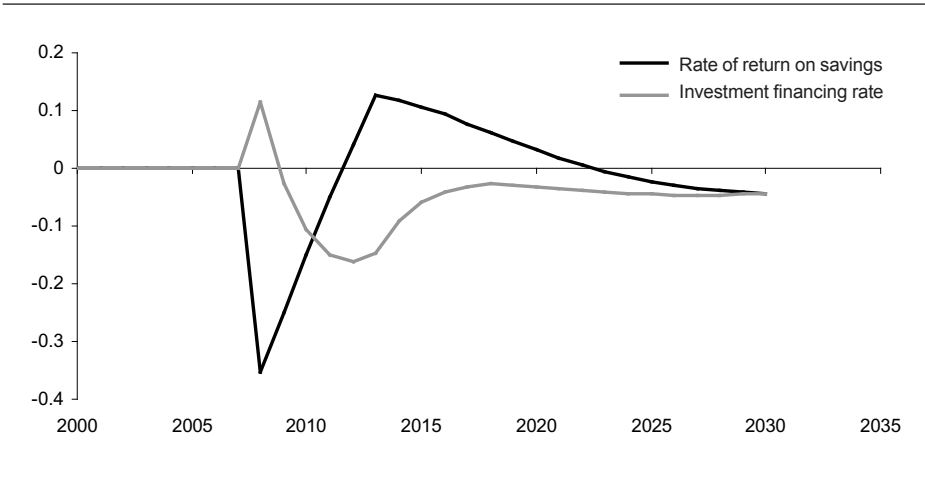
Figure 3.6 **Simulated effects of the financial contraction on real rates of return and investment financing rates, North America, 2000–2035**



Note: Percentage point departures from the baseline simulation.

Source: Simulations of the model described in the text.

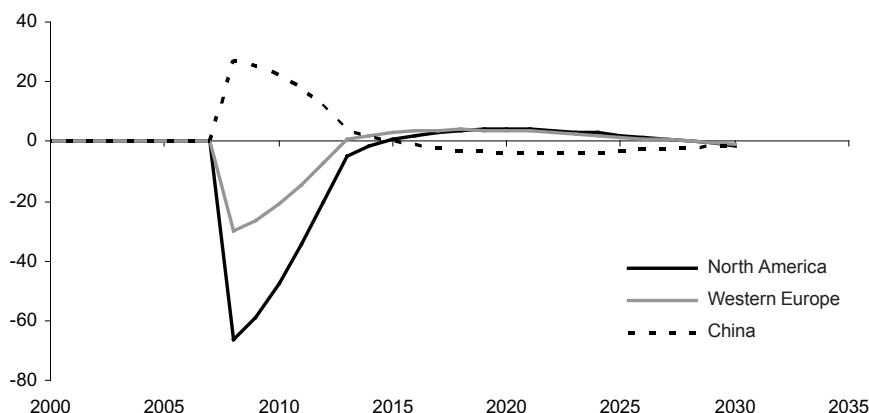
Figure 3.7 **Simulated effects of the financial contraction on real rates of return and investment financing rates, Western Europe, 2000–2035**



Note: Percentage point departures from the baseline simulation.

Source: Simulations of the model described in the text.

Figure 3.8 Simulated effects of the financial contraction on investment, 2000–2035



Note: Percentage point departures from the baseline simulation.

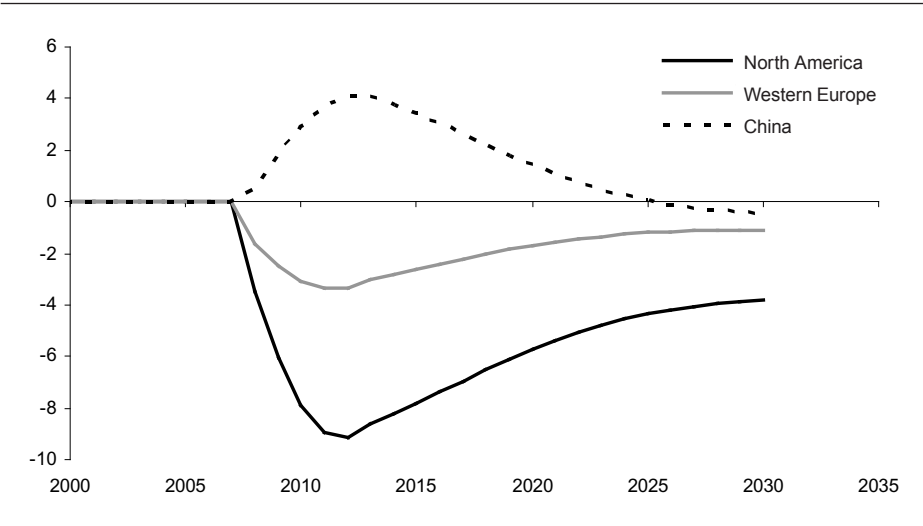
Source: Simulations of the model described in the text.

Effects on economic performance

The effects on economic activity in North America, Western Europe and China are indicated in Figure 3.9, which shows percentage departures from baseline GDP levels. The loss of output in North America and Western Europe is quite significant, though it must be clear that the chart measures the extent of their falling behind the baseline. There is no full year of negative growth in either North America or Western Europe, just a slow-down in both.¹⁹ The extent of their falling behind is made larger by the adoption of labour market closures in both shocked regions that maintain the path of real production wages at the baseline level and so cause unemployment. At its peak, 6 per cent of North America's and 2 per cent of Europe's production labour force are rendered unemployed.²⁰ Due to the flight of investment from North America and Western Europe, indicated in Figure 3.8, there is a surge in investment in China, leading to yet higher growth there in the short run. Since China already invests almost half of its GDP, its capacity to absorb these additional funds could be questioned. For this reason, we explore alternative Chinese scenarios in the next section.

Turning to effects on balances of payment, the North American current account deficit is large by industrial-country standards, although the baseline

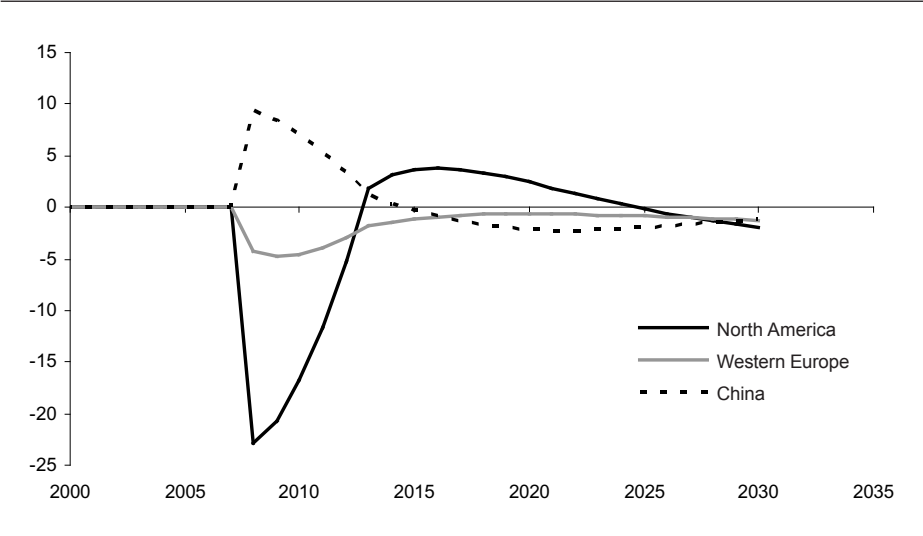
Figure 3.9 **Simulated effects of the financial contraction on GDP, 2000–2035**



Note: Percentage point departures from the baseline simulation.

Source: Simulations of the model described in the text.

Figure 3.10 **Simulated effects of the financial contraction on regional imports, 2000–2035**



Note: Import volume indices, percentage departures from the baseline.

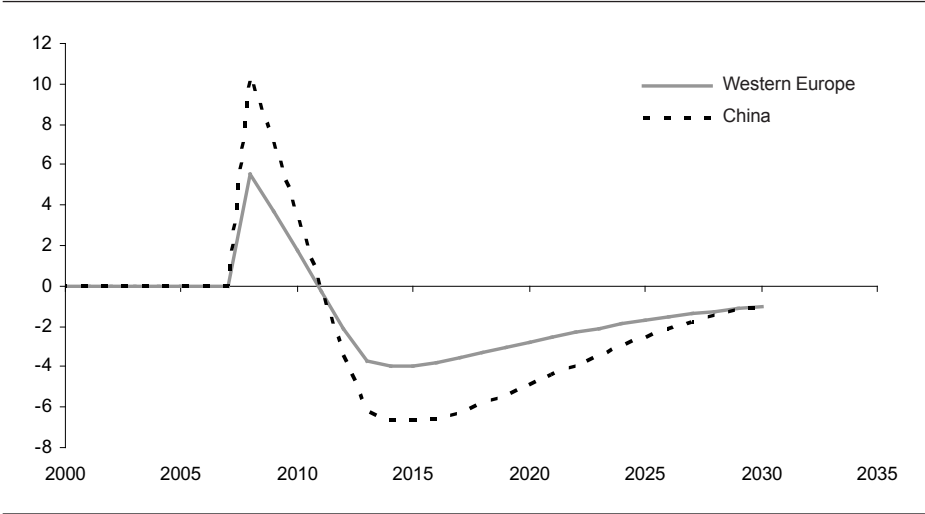
Source: Simulations of the model described in the text.

scenario has it following a declining trend.²¹ Western Europe as a whole exhibits a current account surplus that is smaller in magnitude than the North American deficit, while China's current account surplus is of extraordinary magnitude, exceeding one-tenth of its GDP, driven by its very high saving rate and the resulting surplus of saving over investment.²² In the baseline projection, this surplus is projected to decline as China's average saving rate falls due to the ageing of its population. After the financial shocks in North America and Western Europe and the resulting flight of investment from those regions, there are very large changes in the balances of payment in these regions. As simulated at least, the US current account deficit is temporarily reversed.

The surge in China's investment after the flight from North America and Western Europe greatly diminishes its current account surplus—however, again temporarily. This change in financial capital movements cushions the effects on China of declining imports in North America and Western Europe. While China's exports take a hit, the closing financial capital imbalance and the associated boost in China's GDP (Figure 3.9) ensures that import growth is more than sustained (Figure 3.10). For China's other trading partners, therefore, and particularly for those supplying it with raw materials and manufacturing components, the loss of markets in North America and Europe is cushioned by a Chinese market that is expanding rather than contracting.²³

The short-run substitution of investment for exports in contributing to China's GDP requires some difficult structural adjustment in response to relative price changes. The investment generates a surge in domestic demand that raises the prices of Chinese products and services relative to those in North America. It therefore appreciates China's real exchange rate relative to North America.²⁴ The simulated extent of this is shown in Figure 3.11 to be 10 per cent during 2008. If monetary policy is to emphasise the control of inflation in China, this foreshadows a further 10 per cent appreciation of the renminbi relative to the US dollar in just one year.²⁵ Otherwise, the rate of inflation must be allowed to accelerate. After four years, however, the path of China's real exchange rate against North America falls below the baseline path. This is because capital accumulation accelerates in China in the early years after the shock and decelerates in North America. Capital costs, and therefore prices, are lower in China in the long run relative to North America. The same pattern is followed by China's real effective exchange rate, except that in the short run China depreciates against some of its other trading partners, so that its short-run real effective appreciation is only small, as shown in Figure 3.12.

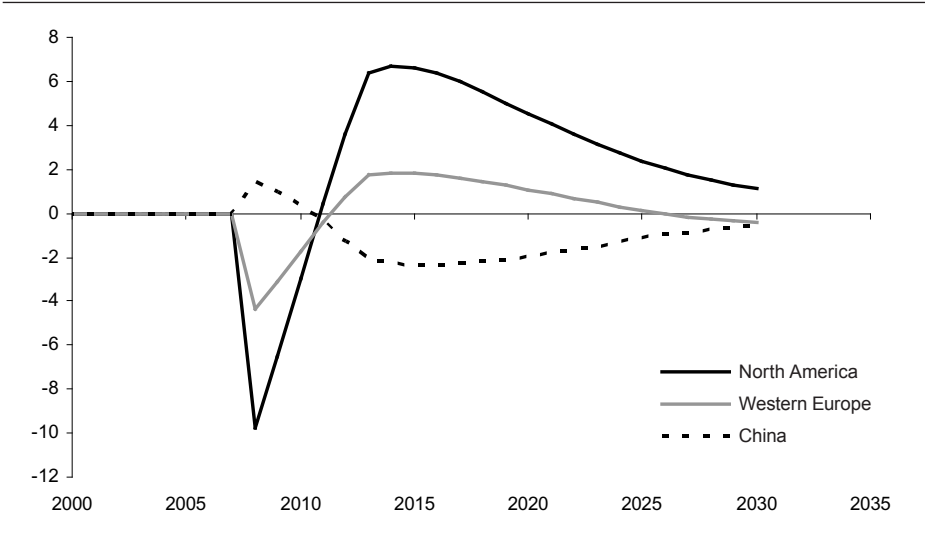
Figure 3.11 **Simulated effects of the financial contraction on bilateral real exchange rates relative to North America, 2000–2035**



Note: Ratios of the GDP prices of each region with that of North America, percentage departures from the baseline.

Source: Simulations of the model described in the text.

Figure 3.12 **Simulated effects of the financial contraction on real effective exchange rates, 2000–2035**



Note: Ratios of the GDP prices of each region with those of all trading partners, weighted by trade shares, percentage departures from the baseline.

Source: Simulations of the model described in the text.

Alternative Chinese policy scenarios

Our standard financial shock scenario might be thought to be optimistic from the perspective of the Chinese economy and its regional trading partners. This is for two reasons. First, it assumes that China is available to absorb additional investment, when it is already investing 45 per cent of its GDP annually and it is arguably already capital heavy.²⁶ Moreover, the Chinese government might regard the surge of financial inflows as footloose and therefore risky. Second, as seen in the previous section, the surge of funds leaving North America and Western Europe must inevitably drive up China's real exchange rate, causing either faster inflation or more rapid nominal appreciation. Neither of these developments will be palatable to the Chinese government. It might therefore choose a policy response that either retards the inflow of new investment (tighter controls on incoming financial capital) or matches the inflow with increased outflows in the form of reserve accumulation, for which the saving rate would need to be, albeit temporarily, further increased. These alternative policy responses foreshadow two new scenarios to be modelled.

Tighter capital controls that prevent the investment surge

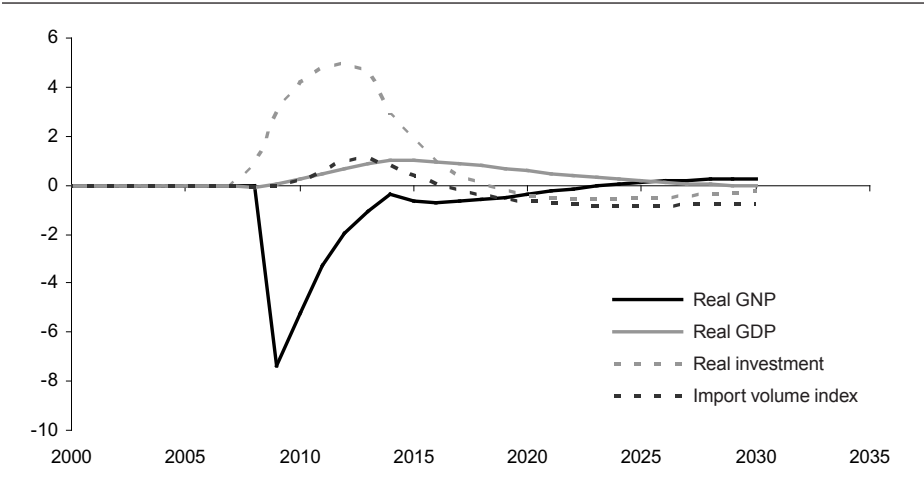
China already maintains effective controls over the inflow and the outflow of financial capital (see Ma and McCauley 2007). Legal inflows are primarily foreign direct investment (FDI), but they include some purchases of domestic assets, including 'B' shares on the Shanghai and Shenzhen exchanges. Illegal inflows have evidently increased in recent years as yields have risen in China relative to the United States and as the renminbi has been allowed to appreciate against the US dollar.²⁷ Illegal inflows notwithstanding, outflows of financial capital are substantially larger in China than inflows and they have mainly taken the form of official foreign reserve accumulation. The surplus of China's saving over its investment is, by definition, equivalent to the surplus of its exports, generally defined, over its imports. Denominated in foreign currencies, this surplus ends up in the hands of the People's Bank of China (PBC), since outward capital controls do not permit substantial foreign asset holdings by private individuals. In recent years, there has been some relaxation of controls in both directions but the PBC still finds it necessary to acquire foreign reserves in very large volumes each year. The recent surge of illegal inflows has, however, tended to restrain the magnitude of China's net capital account position, appreciating the real exchange rate. The result has been both accelerated inflation and upward flexibility of the renminbi during 2006–07 (Tyers and Bain 2007).

Here we assume that the Chinese government opposes the inflow of additional financial capital on the grounds that it is volatile and therefore risky and that it accelerates inflation.²⁸ The policy response is to tighten its inward capital controls so as to prevent any surge—maintaining the baseline path of China's capital account flows. Compared with the original (reference) financial shock scenario, this causes the domestic real interest rate to rise by almost 1 percentage point, though it eventually rejoins the baseline path. The simulated consequences of this are summarised for China in Figure 3.13; most important among them are the absence of a significant surge in Chinese investment (5 per cent compared with the 27 per cent indicated in Figure 3.8) and hence a much reduced increase in China's GDP (which peaks at about 1 per cent, compared with the 4 per cent in Figure 3.9) and imports (which peak at 1 per cent but fall below the baseline path thereafter, compared with the peak of 10 per cent in Figure 3.10).

Gross national product falls temporarily, mostly because China holds a substantial stock of foreign assets, the rate of return on which falls, as indicated in Figures 3.6 and 3.7.²⁹ This fall aside, in this experiment, we deny the Chinese economy the positive aspect of the shock: the increased investment. The prevailing logic would suggest that there would therefore be no compensation for the loss of exports to North America and Western Europe and hence that China's growth rate would fall measurably. The simulation shows, however, little impairment of China's economic performance. Nor is there any significant reduction in China's imports, which support many of its neighbouring economies. The resolution of this puzzle requires a return to the effects on the global capital market. There is a flight of saving from North America and Western Europe. In this experiment, it cannot go to China, so it raises investment in other (mostly developing) regions. In the short run, these investment surges cause real appreciations relative to North America and Western Europe,³⁰ and, significantly, since China does not participate, real appreciations against China.

Australia, for example—a key supplier of raw materials to China—suffers a short-run real appreciation of 15 per cent against North America and 9 per cent against China. As shown in Figure 3.14, even though China has a real appreciation against North America in the short run, its real effective exchange rate depreciates. This means that China becomes more competitive in other markets as a consequence of the financial shocks and that this is sufficient to allow it to weather the contraction in North American and Western European imports.

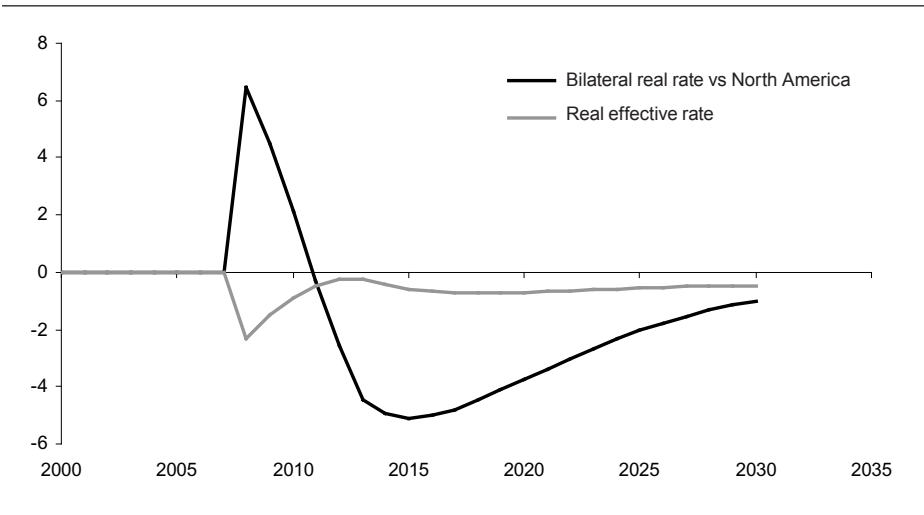
Figure 3.13 **Simulated effects of the financial contraction with tighter inward capital controls on Chinese GNP, GDP, investment and imports, 2000–2035**



Note: Percentage departures of volume indices from the baseline.

Source: Simulations of the model described in the text.

Figure 3.14 **Simulated effects of the financial contraction with tighter inward capital controls on Chinese real exchange rates, 2000–2035**



Note: Percentage departures from the baseline.

Source: Simulations of the model described in the text.

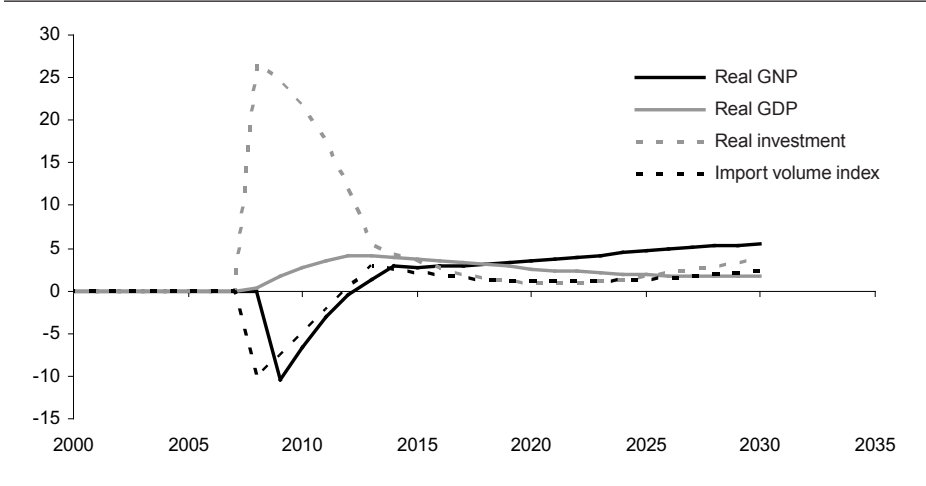
Overall, then, apart from a dip in foreign-sourced income, this scenario is neutral from China's standpoint. It maintains China's baseline growth path while insulating against any volatility that would stem from the temporary influx of global saving. Also, from the viewpoint of China's neighbours supplying it with raw materials and components, this scenario is neutral, with no disturbance to the path of China's imports. Its downside risk lies in the comparative tightness that is required in its domestic capital market. Aside from the problems of overcoming the resulting increased incentive for illegal financial inflows, this could place at increased risk debt-financed investments within China and therefore raise the potential for the global financial meltdown to migrate there.

Accelerated reserve accumulation (increased saving)

In this scenario, the Chinese government's inward capital controls are assumed to be ineffective in preventing the investment surge. The government is, however, able to raise the overall saving rate sufficiently to offset any net effect on the balance of payments. One possible mechanism could be through tighter fiscal policy, yielding increased fiscal surpluses that supplement gross saving. As in the past, the thus-expanded surplus of saving over investment would be mopped up by the PBC through the sale of 'sterilisation bonds'. The increased stock of these liabilities would then balance the additional foreign reserves that stem from the corresponding surplus of broadly defined export earnings over import costs, denominated in foreign currency.³¹ The particular assumption we make is that the path of China's capital account balance remains exactly as in the baseline scenario. The investment shock is balanced precisely by an increase in total Chinese saving, so that external flows increase in both directions during 2008, netting out at baseline levels.

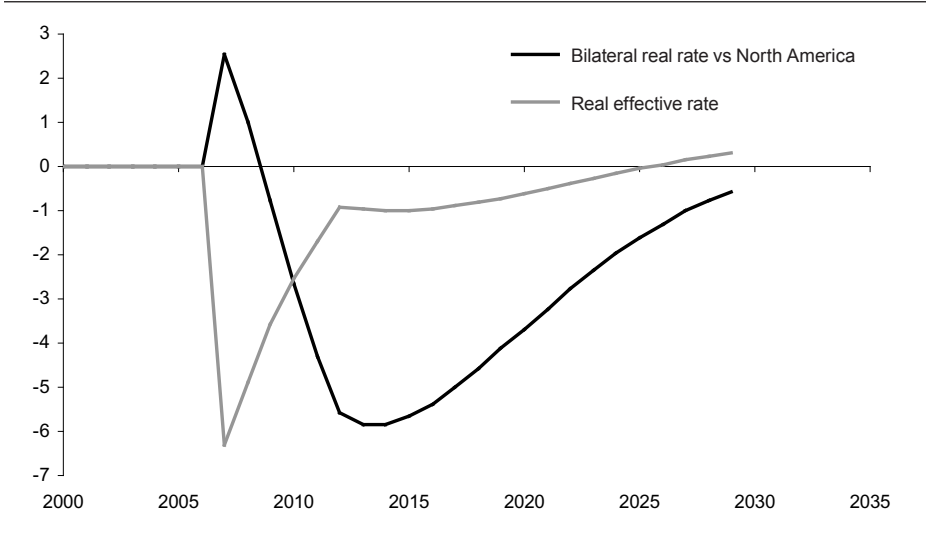
The results tell us, first, that this scenario would be impossible to achieve in practice if the financial shock is as large as that simulated, since a sudden and prodigious increase in the gross national saving rate—from 50 per cent to 72 per cent—would be required to completely neutralise the investment surge. Nonetheless, some blend of this scenario with the previous one is possible, so we persist with our description of its consequences. The key effects on the Chinese economy, measured as departures from the original baseline scenario, are indicated in Figure 3.15. The increases in investment and in saving in this scenario make the economic implications larger than the capital controls scenario considered previously, in which the principal effects were external, due to real exchange rate realignments. Because the rise in the saving rate robs the economy of consumption expenditure, however, the additional investment does

Figure 3.15 **Simulated effects of the financial contraction with compensating reserve accumulation (temporarily increased saving) on Chinese GNP, GDP, investment and imports, 2000–2035**



Note: Percentage departures from the baseline.
Source: Simulations of the model described in the text.

Figure 3.16 **Simulated effects of the financial contraction with compensating reserve accumulation (temporarily increased saving) on Chinese real exchange rates, 2000 – 2035**



Note: Percentage departures from the baseline.
Source: Simulations of the model described in the text.

not raise GDP any further. The short-run fall in GNP, due to reduced returns on foreign assets, is also of a similar order. What is different about this scenario is that China's exports rise temporarily (by one-fifth, compared with no change under tighter capital controls) and its imports fall, by about one-tenth (again, compared with no change under tighter capital controls).³²

Again, real exchange rate realignments are decisive here, as suggested by Figure 3.16. Comparing this figure with Figure 3.14, the short-run real appreciation against North America is a mere 2 per cent (compared with almost 7 per cent in the capital controls scenario) and the real effective depreciation is much larger (6 per cent compared with 2 per cent). Imports are very much more expensive in China under this scenario and so decline in the short run. As before, other regions absorb new investment after the flight of saving from the OECD countries and this appreciates their real exchange rates relative to North America. In China's case, however, while the new investment is also accommodated, the real exchange rate appreciates much less because domestic aggregate demand is sapped by the temporary increase in saving and the accelerated accumulation of foreign reserves. Overall, a temporary dip in foreign-sourced income and a substantial contraction in consumption should make this scenario unpalatable to the Chinese government. As for the mainly Asian and Pacific suppliers of China's raw materials and manufactured components, a temporary fall in the size of China's market is offset by increased investment.

Conclusion

Considering that exports make up almost half of China's GDP and most of these are directed to Europe and North America, negative financial shocks in those regions might be expected to retard China's growth. To confirm this quantitatively, shocks that widen the financial intermediation wedge are applied to North America and Western Europe in the context of a dynamic model of the global economy. Contrary to expectation, mitigating factors are also set in train by these shocks that lead to compensating benefits for China that insulate its economy, preserving its comparatively rapid growth path. These mitigating factors take the form of the temporary flight of savings from OECD countries into Chinese investment and real exchange rate realignments.

The mitigating factors are so strong that, as long as China receives a fair share of incremental investment due to the flight of OECD saving, it will be a net beneficiary of financial shocks in North America and Western Europe—at least as measured by its GDP. There are, however, good reasons why the Chinese government might seek to moderate the effects of this investment

surge, through tighter inward capital controls, or offset them with increased reserve accumulation. It might, for example, view these additional funds as footloose portfolio capital that could be withdrawn suddenly in the future and therefore increase financial risk at the national level. And whatever form the inflow were to take, it would raise China's domestic aggregate demand and therefore appreciate its real exchange rate, placing pressure on its central bank to either appreciate the renminbi more quickly or allow faster inflation.

The results show that tighter capital controls could eliminate the investment surge but that this would cause other regions' real exchange rates to appreciate relative to China, making exports more competitive and trade diversification easier. If the Chinese government were, instead, to allow the investment boom to take place but to raise the home saving rate so as to offset it with yet faster reserve accumulation, the real depreciation of China relative to its other trading partners would be even larger. Although its import growth would slow temporarily, its GDP would maintain its original growth path, and, while its suppliers of raw materials and manufacturing components would temporarily export less to China, they would also enjoy increased investment sufficient to maintain their own levels of economic activity. The results therefore suggest that, as long as the financial shocks are restricted to North America and Western Europe, China's growth and the imports on which its trading partners rely are unlikely to be hindered significantly.

A key proviso is that the financial shocks do not spread beyond North America and Western Europe. We regard such a spread as unlikely, so do not consider it here. Clearly, if the crisis of financial confidence goes global, financial wealth will diminish in all regions, leading to declines in consumption and employment that could take many years to resolve. The potential for global growth remains considerable, however, and it is difficult to believe that pessimism about the future could become so widespread as to permanently under-price assets essential to that growth.

Finally, while we show that China's continued growth might not depend as closely as had previously been thought on markets for exports in North America and Western Europe, we would do well to remind ourselves on what that growth must depend. The key is continued accumulation and renewal of physical capital. Of course, the transformation of the labour force into skilled workers and professionals is also essential but this occurs in response to wage incentives that depend on capital accumulation. Productivity growth is also important, but this depends on capital accumulation and renewal. So what are the threats to capital accumulation and renewal in China? The main one is a rise in political risk. Should the Chinese government be destabilised, FDI would be

repelled and there would be illegal capital flight. Output growth and imports from other regions would slow. The lesson is that continued Chinese growth is not primarily about export markets. It requires that China's government is stable and charts a steady and sensible policy course.

Notes

- 1 The short-term financial literature on this point is vast: see, for example, Wolf (2007), McKibbin and Stoekel (2007a, 2007b).
- 2 More so since it appears that these financial shocks have caused a speculative retreat to commodities, which has, at least temporarily, shifted the international terms of trade against China.
- 3 For evidence supporting the prominence of the components trade in other Asian economies, see Athukorala (2005).
- 4 It might well be considered to have begun with the US tech boom of the 1990s, however, and its subsequent bust, nonetheless leaving in its wake continued strong US productivity growth, which retarded domestic inflation and made the monetary expansions possible; see Pennings and Tyers (forthcoming) and Oliner et al. (2008).
- 5 The import surge did not raise US unemployment, although low-skilled workers were less favourably affected (Woo and Xiao 2007).
- 6 See Oliner et al. (2008). Significantly, they conclude that IT innovations were the strongest contributor to US productivity growth in both periods, but mostly before 2000, when the IT production sectors played key roles. Thereafter, however, while IT continued to be important, the gains came largely from services and were bolstered by one-off industry restructuring, which was unlikely to offer sustained productivity growth in the future.
- 7 The prices of wheat and iron ore showed extreme behaviour in 2007. Although the growth in demand in the economies in transition was supporting the rising trend in both, the extreme spikes were most likely caused by speculation after falls in OECD equity prices. The consequence was to exacerbate the adverse shift in China's terms of trade.
- 8 China's current account surplus in that period, and its associated accumulation of US assets, has been the subject of an already large range of literature. The authors' perspectives on this are detailed in Tyers and Bain (2007).
- 9 The model has its origins in *GTAP-Dynamic*, the standard version of which is a derivative of its comparative static progenitor, *GTAP* (Hertel 1997). The dynamics embodied in the original are described in Ianchovichina and McDougall (2000). Tyers et al. (2008) describe extensions to these dynamics, which emphasise endogenous skill levels.
- 10 Money is not represented explicitly, necessitating our focus on real effects. Although no focus on China is offered, a similar application using a more complete representation of the global macro-economy is provided by McKibbin and Stoekel (2007).
- 11 Baseline productivity in the agricultural sectors of developing regions grows more rapidly than that in services. This allows continued shedding of labour by agriculture. In the case of China, Wang and Ding (2006) estimated that there were 40 million surplus workers in China's agricultural sector. While underemployment is not explicit in our model, the assumption of high labour productivity growth in agriculture implies that agriculture is capable of shedding

labour without consequences for its output, as workers are drawn away by urban capital accumulation.

- 12 See Ianchovichina and McDougall (2000) for details.
- 13 For further details on the implementation and calibration of the investment interest premium, see Tyers and Golley (2008b).
- 14 The subdivision between production workers and professionals and para-professionals accords with the International Labour Organisation's occupation-based classification and is consistent with the labour division adopted in the *GTAP Database*; see Liu et al. (1998).
- 15 China's skill share is projected to rise through time while that in North America remains static. The contrast is due to North America's higher initial skill share, its high rate of unskilled immigration and the higher fertility rate of its low-skilled families.
- 16 It grows at a rate that is declining through time, mainly because low fertility causes China's labour force to fall after about a decade; see Tyers and Golley (2008b).
- 17 It acts to raise the region-specific price of capital goods, P_i^k , in Equation 1. Both shocks offer indirect means of representing events in financial markets in the past year. The rises in interest premiums and the declines in expected (and ultimately real) returns are due to weakening optimism about the future, most particularly in the United States, and therefore declining asset prices.
- 18 Consumption/savings choices by regional collective households are adaptive, responding to changes in real per capita incomes and real returns on saving. We experimented with alternative behavioural assumptions for North America, in one case forcing all the income adjustment on saving and in the other on consumption in that region. The effects of these differences on the global economy were small, so for simplicity we discuss results only from the model's standard specification.
- 19 This is not the case for gross national product (GNP), which does fall in the short run due to the loss of returns from home and foreign-sourced capital income in North America and Western Europe. In China, in contrast with its GDP, GNP slows (though does not fall absolutely), again due to the loss of foreign-sourced income.
- 20 The corresponding increments to unemployment rates in both regions are much smaller given their large shares of professional labour, the wages of which remain flexible.
- 21 The model is not constrained to approach any particular steady state, although all global capital market imbalances do tend to moderate over three decades in the baseline projection.
- 22 The role of China's very high saving rate in its broad economic behaviour is discussed by Kuijs (2006).
- 23 This point has already been made by McKibbin and Stoeckel (2007b) and more forcefully by McKibbin (2008).
- 24 See Tyers et al. (2008) and Tyers and Golley (2008b) for a discussion of China's real exchange rate, its measurement and its determinants.
- 25 This is a crude interpretation of the results since the simulated appreciation is relative to North America as a whole.
- 26 That China is arguably already capital-heavy emerges from the discussions in Kuijs and He (2007), Azziz and Cui (2007) and Rosen and Hauser (2007).
- 27 Illegal inflows enter through legal loopholes, acquisitions in Hong Kong and Macau and via transfer pricing; see Walter and Howie (2006).

- 28 Or, alternatively, if inflation is to be controlled it requires a politically inexpedient appreciation of the renminbi.
- 29 As modelled, these assets are held in a global trust that delivers an average global rate of return. Bilateral holdings are not identified. Nonetheless, given the size of the North American and Western European economies, the financial shocks cause a substantial reduction in the rate of return earned.
- 30 These real appreciations stem from the associated rise in aggregate demand, which tends to raise the prices of home goods more than comparatively elastically supplied foreign goods; see Tyers et al. (2008).
- 31 During 2007, a portion of the PBC's foreign assets was swapped for renminbi-denominated government debt and placed with China's sovereign wealth fund, the CIC. This was to reduce the currency mismatch on the PBC's balance sheet, a problem that would be exacerbated by a sudden and substantial fiscal surplus; see Tyers and Bain (2007).
- 32 Imports recover, however, to be larger than the baseline in the long run, once the saving rate is restored to its original declining path.

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