Contents

Scharfstein, D.S. and J.C. Stein (1992). "Herd on the Street: Informational Inefficiencies in a Market with Short-term Speculation", *Journal of Finance* 47(4): 1461-84.

Schiller, R.J. (2008). *The Sub-prime Solution: How Today's Global Financial Crisis happened and what to do about it*. Princeton University Press. September.

Stevans, L. and D. Sessions (2008). "Speculation, Futures Prices and the US Real Price of Crude Oil", *Munich Personal RePEc Archive Paper* No. 9456.

Svensson, L.E.O. (1999). "Inflation Targeting as a Monetary Policy Rule", *Journal of Monetary Economics* 43(3): 607-654.

Tilton, A. (2007). "The Sub-prime Slump and the Housing Market", Goldman Sachs, February 23, pp. 4-6.

Tong, H. and S.J. Wei (2008). "Real Effects of the Sub-prime Mortgage Crisis: Is it a Demand or a Finance Shock?", *International Monetary Fund–Working Paper* No. WP/08/186.

Woodford, M. (2007). "The Case for Forecast Targeting as a Monetary Policy Strategy", *Journal of Economic Perspectives* 21(4): 3-24.

16 | The Potential Impact of the Global Financial Crisis on World Trade

Warwick J. McKibbin and
Andrew Stoeckel

What this Study is About?

The September 2008 collapse of Lehman Brothers, a mid-size 'Wall Street' investment bank, sent a wave of fear around world financial markets. Banks virtually stopped lending to each other. The risk premium on interbank borrowing shot up to 5 per cent, whereas typically it was close to zero. Although authorities scrambled to inject liquidity into financial markets, the damage was done. The risk premium on corporate bonds shot up even more to over 6 per cent. Large capital expenditure (CAPEX) projects were shelved, the corporate sector virtually stopped borrowing, trade credit was hard to get and, with falling demand, particularly for investment goods and manufacturing durables like cars, trade volumes collapsed.

The result is that the global financial crisis (GFC) has seen the largest and the sharpest drop in global economic activity of the modern era. In 2009, most major developed economies found themselves in a deep recession. The fallout for global trade, both for volumes and the pattern of trade has been dramatic. The Organisation for Economic Co-operation and Development (OECD) predicts that world trade volumes could shrink by 13 per cent in 2009 from 2008 levels.[1]

The contraction in trade has several interrelated causes comprising both price and income effects as global financial flows readjust, real exchange rates realign, terms of trade change and domestic savings rise with a concomitant drop in domestic demand. That is, financial problems

have had devastating real effects. Each of these effects reverberates around the world, some compounding and some offsetting each other.

Governments have responded with an easing of monetary and fiscal policy that in turn have their own effects on activity and financial and trade flows. The downturn in activity is causing unemployment to rise sharply and, with it, a political response to protect domestic industries through various combinations of domestic subsidies and border protection. There is potential for protectionism to rise further.

Both the causes of the crisis and the policy responses are reshaping the level and pattern of world trade. The objective of this study is to disentangle the various direct and indirect effects of the crisis on international trade and how events might unravel. To do this, a dynamic, intertemporal general equilibrium model that fully integrates the financial and real sectors of the economy is used to unravel and understand the mechanisms at work. The model incorporates wealth effects, expectations and financial markets for bonds, equities and foreign exchange as well as trade and financial flows. It is a suitable tool to analyse the impact of the crisis and policy responses on global trade and financial flows.

The paper is organised as follows. In Section II, the main linkages and mechanisms by which the financial crisis affects trade is given. This is necessary on two counts: it sets up the modelling approach and it also serves as a basis for developing the shocks to be imposed on the model that represent the financial crisis. The main features of the G-Cubed model that is used in this analysis are described briefly as the model is documented in full elsewhere.

In Section III, the simulations to represent the financial crisis are described and the justification for the size of the shocks chosen. It turns out six shocks which are needed: three for the crisis itself and three for the subsequent policy responses which cover monetary and fiscal stimulus as well as the trade protectionism that has emerged.

Results are then discussed in two separate parts to disentangle the various macroeconomic influences on world economies including trade. In Section IV, the effects of the crisis on world economies without the fiscal policy responses, that is the first three simulations, are described. Then in

Section V, the results from the three policy responses are described on their own to gauge their relative impacts. Finally, in Section VI, some of the main insights are highlighted and discussed.

How the Financial Crisis has Affected Trade Outcomes

The Mechanisms at Work

The financial crisis has affected trade outcomes through several channels, some obvious, some less so. One obvious one is the slowdown in demand both by business and households. As households spend less, imports will fall and hence someone else's exports will fall. But other effects are more complicated as set out in Figure 16.1.

A financial crisis causes a sharp reappraisal of risk by households and business. With any loss of confidence, banks are no longer happy to lend at the same rates as before, if they lend at all. Trade credit under these circumstances is harder to come by. Such upward reappraisals of risk cause the cost of capital to rise and, with widespread uncertainty, countries become reluctant to lend to other countries. Therefore, capital flows shrink and this means current account deficits and surpluses will contract. Such changes in current account balances affect trade balances and hence exports and imports. Facilitating all these adjustments will be changes in real exchange rates that affects the relative price of tradeables and non-tradeables and hence the supply and demand of exports and imports.

Falling output, trade and employment leads to unpleasant social consequences and so causes policymakers to counteract the effects and stimulate the economy. There are three ways in which policymakers look after their constituents. One is to ease monetary policy. Another is to stimulate domestic demand through expansionary fiscal policy. This can occur through handouts to households via tax breaks or direct payments, by extra government spending, often on infrastructure, or subsidies to producers, such as car makers. Extra spending by governments means extra borrowing in the first instance and this affects capital flows and trade once again. The third way is where governments sometimes choose to 'look after their own' by protection: either by overt border measures such as tariff increases or more subtle ones such as 'buy local' programmes. Financial

protection, for example where banks or firms are directed to lend at home, can also occur. Financial protection will affect relative rates of return and hence capital flows and trade.

All of the above mechanisms affect trade. Some will compound each other, others will be offsetting. The only way to understand some of the key drivers is by the use of a model as set out below:

Figure 16.1

The Main Mechanisms Affecting Trade Outcomes
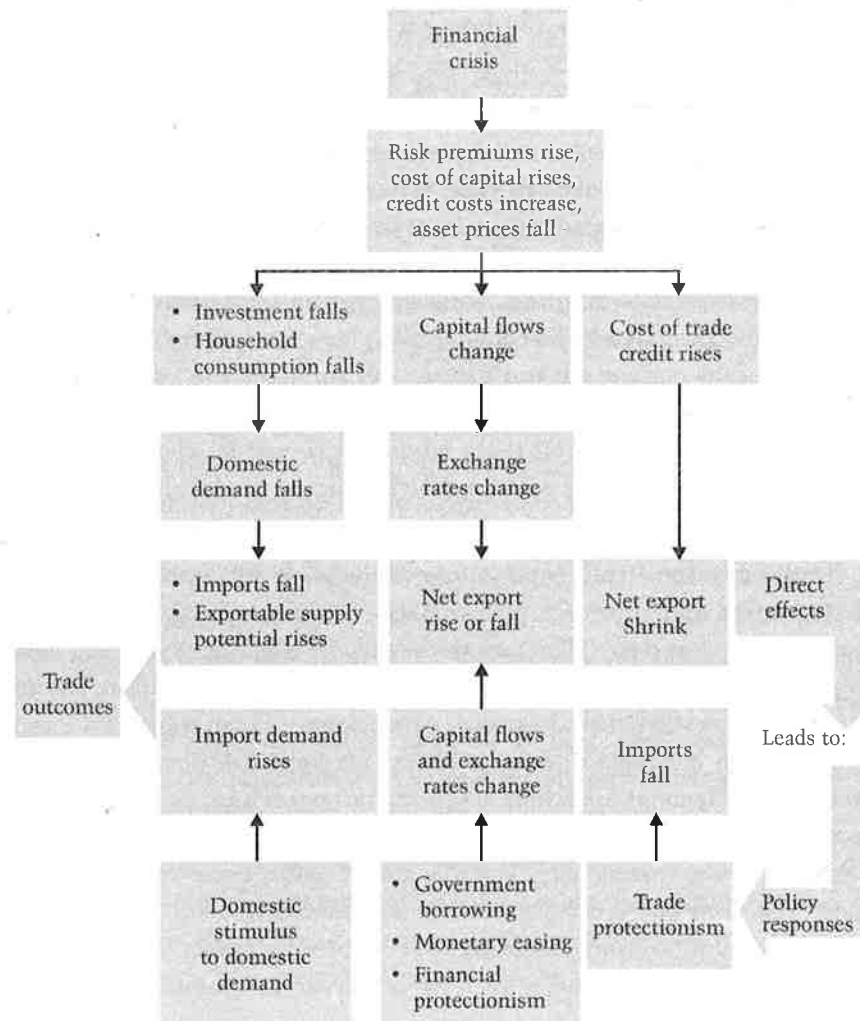
The Model

The G-Cubed model is an intertemporal general equilibrium model of the world economy. The theoretical structure is outlined in McKibbin and Wilcoxen (1998).[2] A number of studies—summarised in McKibbin and Vines (2000)—show that the G-Cubed modelling approach has been useful in assessing a range of issues across a number of countries since the mid-1980s.[3] Some of the principal features of the model are as follows:

- The model is based on explicit intertemporal optimisation by the agents (consumers and firms) in each economy (Blanchard and Fischer, 1989; Obstfeld and Rogoff, 1996). In contrast to static CGE models, time and dynamics are of fundamental importance in the G-Cubed model. The MSG-Cubed model is known as a dynamic stochastic general equilibrium (DSGE) model in the macroeconomics literature and a dynamic intertemporal general equilibrium (DIGE) model in the computable general equilibrium literature.

- In order to track the macro time series, the behaviour of agents is modified to allow for short-run deviations from optimal behaviour either due to myopia or to restrictions on the ability of households and firms to borrow at the risk-free bond rate on government debt. For both households and firms, deviations from inter-temporal optimising behaviour take the form of rules-of-thumb, which are consistent with an optimising agent that does not update predictions based on new information about future events. These rules-of-thumb are chosen to generate the same steady state behaviour as optimising agents so that in the long run there is only a single intertemporal optimising equilibrium of the model. In the short run, actual behaviour is assumed to be a weighted average of the optimising and the rule-of-thumb assumptions. Thus, aggregate consumption is a weighted average of consumption-based on wealth (current asset valuation and expected future after tax labour income) and consumption based on current disposable income. Similarly, aggregate investment is a weighted average of investment based on Tobin's q (a market valuation of the expected future change in the marginal product of capital relative to the cost) and investment based on a backward looking version of Q.

- There is an explicit treatment of the holding of financial assets, including money. Money is introduced into the model through a restriction that households require money to purchase goods.

- The model also allows for short-run nominal wage rigidity (by different degrees in different countries) and, therefore, allows for significant periods of unemployment depending on the labour market institutions in each country. This assumption, when taken together with the explicit role for money, is what gives the model its 'macroeconomic' characteristics. (Here again the model's assumptions differ from the standard market clearing assumption in most CGE models.)

- The model distinguishes between the stickiness of physical capital within sectors and within countries and the flexibility of financial capital, which immediately flows to where expected returns are highest. This important distinction leads to a critical difference between the quantity of physical capital that is available at any time to produce goods and services, and the valuation of that capital as a result of decisions about the allocation of financial capital.

As a result of this structure, the G-Cubed model contains rich dynamic behaviour, driven on the one hand by asset accumulation and, on the other, by wage adjustment to a neoclassical steady state. It embodies a wide range of assumptions about individual behaviour and empirical regularities in a general equilibrium framework. The interdependencies are solved out using a computer algorithm that solves for the rational expectations equilibrium of the global economy. It is important to stress that the term 'general equilibrium' is used to signify that as many interactions as possible are captured, not that all economies are in a full market clearing equilibrium at each point in time. Although it is assumed that market forces eventually drive the world economy to neoclassical steady state growth equilibrium, unemployment does emerge for long periods due to wage stickiness, to an extent that differs between countries due to differences in labour market institutions.

In the version of the model used here there are 6 sectors (energy, mining, agriculture, manufacturing durables, manufacturing non-durables and services) and 15 countries/regions as set out in Table 16.1.

Table 16.1

Countries/Regions

The US	China
Japan	India
The United Kingdom	Other Asia
Germany	Latin America
The Euro Area	Other LDC
Canada	East Europe & Former Soviet Union
Australia	OPEC
Rest of OECD	

Simulating the Effects of the Crisis

Events Leading up to the Crisis in 2008: The Baseline

The focus of this study is on disentangling the many influences of the financial crisis on trade outcomes. The 'crisis' is defined here as the bursting of the housing market bubble in late 2007, the ensuing collapse in the sub-prime mortgage market and related financial markets and the subsequent collapse of Lehman Brothers in 2008 which resulted in a sharp increase in risk premia around the world. The effect of the financial crisis on global trade is, therefore, the difference between a world where there was no crisis and one where there is. That is, to assess the effects of the crisis on trade, a baseline, or 'business as usual', view of a world without a crisis has to be produced.

There are two aspects to this baseline. One, is the exogeneous productivity and population trends going forward and the other is the underlying imbalances brewing in the world economy prior to the financial crisis itself. We assume that tax rates and the shares of government spending devoted to each commodity remain unchanged. In the G-Cubed model, projections are usually made based on a range of input assumptions. There are two key inputs into the growth rate of each sector in the model. The first is the economy-wide population projection which differs by country according to the UN mid-projection. The second is the sectoral productivity growth rates. How the sectoral productivity growth rates are calculated is detailed in Appendix A-16.1. In the long run, we take

the underlying long-run rate of world population growth plus productivity growth to be 1.8 per cent per annum, and take the long-run real interest rate to be 4 per cent.

The second aspect of a baseline is some of the prior events to the crisis. The problem is that some of the seeds of the financial crisis were sown in the decade before the crisis. A series of large global events, such as the bursting of the dotcom bubble in 2001 and the rapid growth of China, were already reshaping the pattern and level of world trade before the 2007-2008 financial crisis hit. Some of these events, like the large disparities between savings and investment in China (a surplus) and in the US (a deficit) led to large differences between exports and imports for each nation so that large current account surpluses were accumulating in China and large deficits in America. Some people (Corden, 2009; Wolf, 2008) attribute these growing global imbalances as contributing causes of the crisis and there is some truth in that. But the focus of this study is on the impact of the crisis itself on world trade and not on trying to disentangle the various contributing factors to the crisis, as important as that issue is.

Therefore, besides population and productivity trends shaping the baseline for the world, some of the key events over the last decade influencing the baseline would be:

- First, there was the Asian financial crisis of 1997-98, which saw Asian economies generate large current account surpluses that had to be invested offshore to keep their nominal exchange rates low. Capital flowed out of Asia into the US dotcom stocks driving up equity prices.
- Next was the bursting of the dotcom bubble, which saw the booming NASDAQ over 1998–2000 burst in 2001.
- Fearing a downturn and possible deflation, the US Federal Reserve eased monetary policy in 2001 in a series of steps to 2004. Some argue that they eased too much for too long (See Taylor, 2008).
- But, with easy credit and a rising housing market, a boom in house prices followed and a period of high growth in credit and leveraged loans. Risk premia hit low levels and leveraged deals became common as investors chased yields in an environment of lax regulatory oversight.

- Rising demands from China (and, to some extent, India), plus a booming world economy saw commodity prices rise across oil, minerals and food from late 2004 to late 2007. The shock to the global economy from this commodity price boom was as big as the first oil shock in the 1970s.
- Rising prices and inflation caused monetary authorities to tighten policy from mid-2004 to June 2006.

Each of these major events set up their own dynamics for the course of the world economy and helped shape the underlying baseline. Some of these events such as the easing and tightening of monetary policy are endogeneous to the model and already incorporated in the baseline. It is important to appreciate that the results reported here are deviations from baseline from the financial crisis, as defined here. What is important is the relative contribution of different effects and to disentangle the impacts of the financial crisis on trade outcomes.

The Six Shocks to Represent the Crisis and the Policy Responses

The above events have led to the now well-known global downturn. All official forecasting agencies, such as the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD), have described this downturn and so will not be expanded here. As the IMF (2009) notes 'Global Gross Domestic Product (GDP) is estimated to have fallen by an unprecedented 5 per cent in the fourth quarter (annualized), led by advanced economies, which contracted by around 7 per cent'. Japan has been particularly hard hit with a fourth quarter GDP (2008) plummeting by 13 per cent. Demand for durable goods has been particularly hard hit. With the downturn there has been a sharp upturn in savings by households (and commensurate reduction in consumption), driven by a reappraisal of risk by households and a loss of net worth with falling house prices and equity prices. So shocks need to be devised to account for three things:

- The bursting of the housing bubble and loss in asset prices and household wealth with consumers cutting back on spending and lifting savings.

- A sharp reappraisal of risk with a spike in bond spreads on corporate loans and interbank lending rates with the cost of credit, including trade credit, rising with a commensurate collapse of stock markets around the world.

- A massive policy response including a monetary policy easing, bailouts of financial institutions and fiscal stimulus. Also, signs of emerging trade and financial protectionism appear.

These three outcomes can be represented by six shocks—three for the crisis itself and three for the policy response.

Three main shocks capture the onset of the global financial crisis:

1. The bursting of the housing bubble causing a reallocation of capital and a loss of household wealth and drop in consumption.

2. A sharp rise in the equity risk premium (the risk premium of equities over bonds) causing the cost of capital to rise, private investment to fall and demand for durable goods to collapse.

3. A reappraisal of risk by households causing them to discount their future labour income and increase savings and decrease consumption.

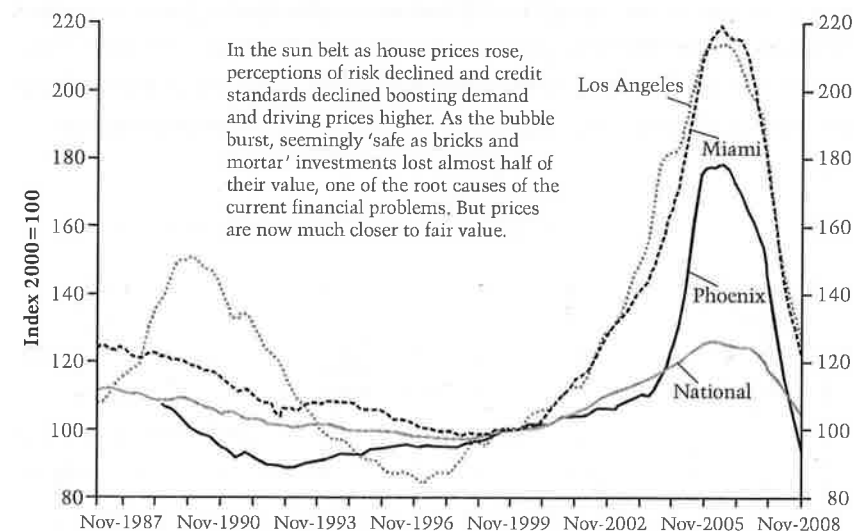### Shock 1: The Bursting of the Housing Bubble

Falling house prices had a major effect on household wealth, spending and defaults on loans held by financial institutions. Events in the US typify a global phenomenon. From 2000 to 2006, house prices in some areas doubled to subsequently collapse (Figure 16.2). These changes in some areas have generated dramatic news headlines but, overall the US index of house prices has fallen by 6.2 per cent in real terms from the first quarter 2008 to the same quarter in 2009.[4]

While house prices were rising so strongly, credit was supplied liberally to meet the demand as perceptions of risk fell. The rising wealth boosted confidence and spending. The housing bubble was a global phenomenon centred mainly in the Anglo-Saxon world.

The housing bubble was the result of a long period of low interest rates by the US Federal Reserve. The Federal Reserve cut interest rates by a total of 550 basis points in a series of steps between 2001 and 2004. The

Figure 16.2

US House Prices Relative to Per Capita Household Income

In the sun belt as house prices rose, perceptions of risk declined and credit standards declined boosting demand and driving prices higher. As the bubble burst, seemingly 'safe as bricks and mortar' investments lost almost half of their value, one of the root causes of the current financial problems. But prices are now much closer to fair value.

Notes: Series shown are house prices over per capita household income. For comparison series are indexed to a common base 2000=100. Individual cities are from the S&P Case Schiller index. National prices are from the OFHEO. OFHEO data has a complete coverage of the US while the Case Schiller index only covers the largest 20 cities. OFHEO and Case Schiller data for individual cities indicate similar movements – i.e. differences in the series largely reflect the coverage differences. (The widely reported Case Schiller index shows much larger falls than the OFHEO index.)

Source: Standard and Poors, Office of Housing Enterprise Oversight, *OECD Economic Outlook Database.*

easing, subsequent tightening and current easing are shown in Figure 16.2. Some believe (for example the 'Austrian school' and Taylor, 2008: 2), that monetary policy was too loose for too long and this is what gave rise to the asset price bubble and commodity price spike. Taylor argues that had the Federal Reserve followed the Taylor rule (actually the Henderson-McKibbin-Taylor rule), interest rates would have risen much sooner and the bubbles would not have appeared to the same extent (Figure 16.2).

The low interest rates were due to fears of deflation (Greenspan, 2007) and led to a boom in US housing, low interest rates were not just the result of the Fed's actions. US bond yields were also low because of low world rates (with Japanese bond yields at a little over 1 per cent and short-term interest rates at zero). There was also an international aspect to low US interest rates with Japan and Europe only recovering very slowly from the 2000-01 downturn and in turn placing pressure on the US to keep interest

rates low. In Japan there were fears of re-emergent deflation. That is the principal reason why interest rates were kept low in the US for an unusually long term—until mid-2004 when the Fed began a very sharp tightening cycle.[5] The low interest rates through 2003-04—besides fuelling a boom in bank lending, rising asset prices and rising demand in China and other developing countries—also fuelled a commodity price boom.

Figure 16.3

Federal Funds Rate Actual and Counterfactual
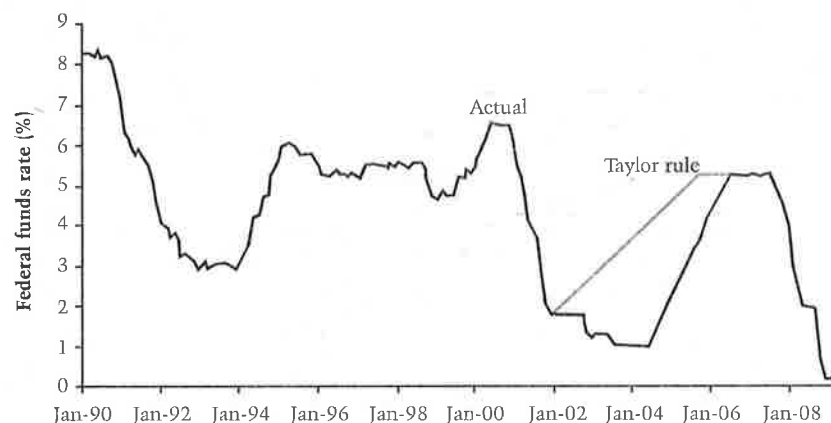
Note: The daily effective federal funds rate is a weighted average of rates on brokered trades. Weekly figures are averages of 7 calendar days ending on Wednesday of the current week; monthly figures include each calendar day in the month. Annualised using a 360-day year or bank interest.

Source: US Federal Reserve Statistical Release, *http://www.federalreserve.gov/releases/h15/data/Monthly/H15_FF_O.txt*, Accessed 5 March 2009.

However, only a part of the dwelling boom and the commodity boom can be attributed to the actions of the Fed. The up-trend in US house prices was evident as early as 2000. As small investors abandoned the stock market in 2001, they dived into the housing market, driving up and sustaining the price rises. Similarly, the surge in commodity prices through 2005 to 2008, which took most analysts by surprise, had as much to do with developments in China, and the lagged response of supply, as they did with an increase in demand in North America. Where the real problem lay was in the combination of the two.

The bursting of the housing bubble is modelled as a surprise fall in the expected flow of services from housing investment—larger in the US, the UK and Europe but still significant throughout the world. In the model, the household in each economy is modelled as solving an intertemporal consumption problem subject to an intertemporal budget constraint. The result is a time profile for the consumer in each country of consumption of goods from all countries based on expected future income and expected relative goods prices. The household also chooses investment in a capital good. The household capital stock combines housing and other durable goods. For simplicity of exposition we will refer to this capital good as 'housing' from here on.

The investment decision by households is modelled analogously to how we model the investment decisions of firms within an intertemporal framework subject to adjustment costs for capital accumulation. The household invests in housing to maximise consumption from the stream of future service flows that housing provides. This stream of services is analogous to a production function based on inputs of capital and a productivity term. We model the housing part of the crisis as a fall in the productivity of the service flow from the housing stock. This fall in expected future productivity of housing means that the Tobin's q for housing drops when the shock occurs. The drop in housing productivity in the US is assumed to be 10 per cent lower in 2009 and is calibrated to give, along with the other shocks, a drop in house prices in the US of the order of 6 per cent, roughly what has been observed for the last year.[6] A plausible scenario is where productivity returns to 'normal' by 2013.

Shock 2: Rising Equity Risk Premia

The surprise upswing in commodity prices from 2003 but most noticeable during 2006 and 2007 led to concerns about inflation leading to the sharp reversal in monetary policy in the US. This tightening in the US policy also implied a tightening of monetary policy in economies that pegged to the US dollar. It was the sharpness of this reversal as much as the fall in the US house prices and the failures of financial regulation (for example, the mortgage underwriters Fannie Mae and Freddie Mac) that led to the financial problems for 2008-09.[7] Lehman Brothers' failure was primarily due to the large losses they sustained in the US sub-prime mortgage market. Lehman held large positions in the sub-prime and other lower-rated mortgage markets. But mortgage delinquencies rose after the

US housing price bubble burst in 2006-07. In the second fiscal quarter 2008, Lehman reported losses of $2.8 billion. It was forced to sell off $6 billion in assets.[8] The failure of Lehman Brothers in September 2008 and effect on risk premiums across markets can be seen clearly in Figure 16.4.

Figure 16.4

The Lehman Brothers' Bankruptcy and Risk Premia
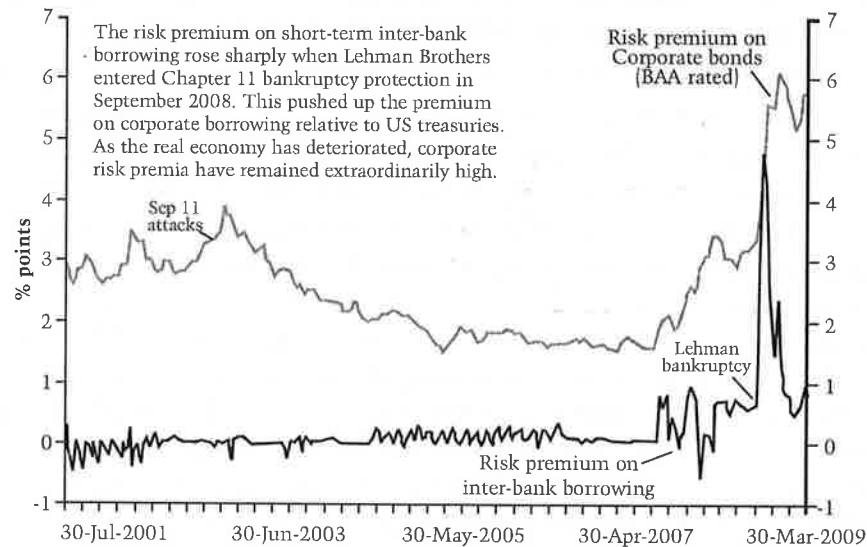
Notes: Weekly data. Risk premium on inter-bank borrowing approximated by the rate on one month
         Euro-dollar deposits less the Federal funds rate. Risk premium on corporate bonds measured as
         the yield on BAA rated corporate bonds less the 10 year Treasury bond yield.

Source: Federal Reserve Board.

The rise in the equity risk premium since the collapse of Lehman Brothers has been of the order of eight percentage points. A plausible scenario where confidence is gradually restored so things are back to 'normal' by 2013 is, therefore, assumed.

— Under this scenario, balance sheets of financial institutions are gradually restored through existing and new programmes to address distressed assets. Combined with new capital raising, confidence and lending returns. Also, investors learn to live with the 'new world' and economic recovery encourages new investment and a virtuous circle of further improvements in confidence.

— This scenario is plausible in the opinion of the authors. The world will recover but the size and speed of the drop in economic activity has been a salutary lesson for investors who are not likely to forget that quickly. So, to capture the collapse of commodity prices and the financial sector, an initial rise in the equity risk premium of eight percentage points for the US is taken for the six sectors in the model: the energy, mining, agriculture, durable and non-durable manufacturing and services sectors in 2009 and then dissipates in equal steps over the next four years but staying permanently higher by two per cent from 2012. The permanent rise in the risk premium reflects the baseline risk premium which is assumed to be close to zero in the projection based on the experience from 2003. Thus, there is an overshoot in the return to 'normal'.

Shock 3: A Rise in Household Risk

The reappraisal of risk by firms as a result of the crisis also applies to households. As households view the future as being more risky, so they discount their future earnings and that affects their savings and spending decisions. The increase in household risk in the US is assumed to be three percentage points in the 'plausible' scenario in 2009, half that in 2010 and back to 'normal' in 2011 and thereafter. The three shocks by sector in the US are shown in Table 16.2.

Table 16.2

*Equity Risk Premium, Household Risk and Housing Productivity
for the US under the Plausible Scenario*

Plausible Scenario	2009	2010	2011	2012	2013	...beyond 2014
Equity risk premium by sector:						
– Energy	8	6	4	2	2	2
– Mining	8	6	4	2	2	2
– Agriculture	8	6	4	2	2	2
– Durable manufacturing	8	6	4	2	2	2
– Non-durable manufacturing	8	6	4	2	2	2
– Services	8	6	4	2	2	2
Household risk	3	1.5	0	0	0	0
Housing productivity	-10	-8	-6	-4	-4	-4

Source: Authors' calculations.

The shocks in Table 16.2 are for the US—the 'epicentre' of the crisis. But not all countries have been equally affected by the crisis. For example, durable manufacturing in Japan would be hit harder by the risk reappraisal given the collapse of their durable exports (dominated by cars) as a result of the combination of the global downturn and the appreciation of the Yen that resulted from the collapse in commodity prices and improvement in their terms of trade.

Also, Japan had their housing bubble a decade earlier than did the US, so over the last few years they never experienced a property bubble as in America. So, the shock to their economy from the bursting of the housing bubble would be less than for the US. Therefore, the shocks for equity risk, the housing bubble bursting and household risk are scaled off the US. Taking the US as 1, a series of weights for other sectors and economies appears in Table 16.3.

Table 16.3

Weight for Country and Sector Shocks

	USA	JPN	GBR	DEU	EUR	CAN	AUS	OEC	CHI	IND	OAS	LAM	LDC	EEB	OPC
Equity risk by sector															
-- Energy	1	1	1	1	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8
– Mining	1	1	1	1	1	1.2	1.2	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8
– Agriculture	1	1	1	1	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8
– Durable manufacturing	1	1.2	1	1.2	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8
– Non-durable manufacturing	1	1	1	1	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8
– Services	1	1	1.2	1	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Household risk	1	0.3	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Household productivity	1	0.1	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Note: Three main shocks capture the policy responses.

On top of the above three financial crisis shocks, there has been an unprecedented policy response comprising three more elements:

1. An easing of monetary policy to near zero official rates of interest in major developed economies.

2. An easing of fiscal policy across countries and large run-up in government deficits.

3. A rise in trade and financial protectionism.

Shock 4: Monetary Easing

There is an endogeneous monetary response in the model for each economy where each economy follows a Henderson-McKibbin-Taylor rule as shown in equation (1) with different weights on inflation (π) relative to target, output growth (y) relative to potential and the change in the exchange rate (e) relative to target.

$$i_t = i_{t-1} + \beta_1(\pi_t - \pi_t^T) + \beta_2(\Delta y_t - \Delta y_t^T) + \beta_3(\Delta e_t - \Delta e_t^T) \qquad (1)$$

Table 16.4

Coefficients in Henderson-McKibbin-Taylor Rule in Each Country

	Inflation ($\beta 1$)	Output Growth ($\beta 2$)	$US Exchange Rate ($\beta 3$)
USA	0.5	0.5	0
JPN	0.5	0.5	0
GBR	0.5	0.5	0
DEU (*)	0.5	0.5	0
EUR (*)	0.5	0.5	0
CAN	0.5	0.5	0
AUS	0.5	0.5	0
OEC	0.5	0.5	0
CHI	0.5	0.5	-1
IND	0.5	0.5	0
OAS	0.5	0.5	-1
LAM	0.5	0.5	-1
LDC	0.5	0.5	-1
EEB	0.5	0.5	-1
OPC	0.5	0.5	-10

Note: (*) that Germany (DEU) and the rest of the Euro Zone (EUR) have a common interest rate with a weight on European-wide inflation and output gap.

The assumed parameter values are set out in Table 16.4. Note that China and most developing economies have a non-zero weight on the change in the $US exchange rate. The monetary easing that has occurred is close to the endogeneous monetary policy response already built into the model so any extra monetary stimulus is not required. Of course it is possible that authorities, being fearful of raising interest rates too early and pricking the nascent recovery, could end up easing too much for too long and would be an interesting simulation, especially if different countries chose different amounts of 'over-easing' which would set up capital flow changes and hence trade flow changes.

Shock 5: Fiscal Easing

There is an endogeneous fiscal policy response in the model but the rule is targetting of fiscal deficits as a per cent of GDP. The easing of fiscal policy announced by most economies has been an extra unprecedented stimulus in the modern era and expansion of fiscal deficits, has to be simulated.

Table 16.5

The Assumed Fiscal Policy Response (Per cent of GDP)

Country/Region	2009	2010	2012	2013	Cumulative
US	2.07	1.55	1.04	0.52	5.18
Japan	1.46	1.10	0.73	0.37	3.65
The United Kingdom	1.32	0.99	0.66	0.33	3.29
Germany	1.38	1.04	0.69	0.35	3.45
Euro area	1.30	0.98	0.65	0.33	3.25
Canada	1.68	1.26	0.84	0.42	4.20
Australia	2.48	1.86	1.24	0.62	6.21
Rest of OECD	1.00	0.75	0.50	0.25	2.50
China	4.80	3.60	2.40	1.20	12.00
India	0.50	0.38	0.25	0.13	1.25
Other Asia	2.00	1.50	1.00	0.50	5.00
Latin America	0.50	0.38	0.25	0.13	1.25
Other LDC	0.50	0.38	0.25	0.13	1.25
EEFSU	1.70	1.28	0.85	0.43	4.25
OPEC	3.00	2.25	1.50	0.75	7.50

Source: OECD (2009) and authors' calculations.

The discretionary stimulus packages announced by each country has mainly occurred over 2009 and 2010 and is usefully summarised by the OECD (2009). For the US, the cumulative stimulus is nearly 5 per cent of GDP and for China it is over 11 per cent of GDP. It is unlikely that such a stimulus will suddenly end in 2010 for two reasons: it is hard to crank up government spending on things like infrastructure quickly and governments usually find it hard to reign in spending quickly once programmes are announced. Therefore, whilst assuming the same cumulative fiscal response as outlined by the OECD and other studies, the fiscal response has been assumed to taper off quickly after 2010 but finishing in 2012. The assumed fiscal response is outlined in Table 16.5.

Shock 6: Rise in Trade and Financial Protectionism

Rising trade protectionism is a real threat. It occurred during the Great Depression and is attributed with making matters far worse. The main driver for this protectionism was to protect jobs. The Smoot-Hawley (1930) legislation in the US at the time of the Great Depression saw tariffs increase and help trigger the beggar-thy-neighbour round of tariff increases by other countries. Could it happen again?

The answer is that it has already started, *albeit* on a small scale so far. At the G-20 meeting in November last year, leaders affirmed their commitment to open trade and declared they would not put up more barriers. Yet within 36 hours, India and Russia, two attendees at the summit had put up some trade barriers.[9] Just about every major and minor car producer for that matter, has given its domestic industry various concoctions of subsidies, grants and soft loans. President Obama was implored to weed out the 'buy American' provisions in his fiscal stimulus package. Although 'softened', it got through.

It is worth remembering that at the time of the introduction of the Smoot-Hawley tariff during the Great Depression, over 1,000 economists petitioned about the harm the legislation would cause. Smoot-Hawley was nevertheless signed into law. Such is the power of politics! Actually, there are two political problems. One is the obvious loss of jobs and ability of narrow vested interest groups to look after themselves in times of crisis at the expense of the common good.

The other political problem is the free rider one. It goes as follows. When all countries are affected by the downturn, monetary policy is far less effective because all countries cannot devalue against each other. And with the drastic loss of confidence, business is reluctant to borrow and invest irrespective of the level of interest rates. Hence, countries have to rely on fiscal stimulus to encourage a recovery. But it is tempting for countries to free ride on others like the US, who need to implement big fiscal stimulus packages, part of which will spill over to imports. Taxpayers, bearing the future burden of the fiscal stimulus, naturally want to get the 'biggest bang for their buck' but wrongly think that is achieved by keeping the spending at home. Hence, the 'buy American' provisions in their stimulus bill. Other countries, most recently China, have followed suit.[10] But if there is global coordination of proportionally similar stimulus packages, most of the leakage washes out as gains elsewhere. Some of the protectionist sentiment is a result of a lack of global coordination of policy.

WTO members are only legally required to not increase tariffs above their 'bound' rates. However, there can be special exemptions invoked and there are ways to impose protection that raise effective rather than observed tariff rates.

Rising financial protectionism is a real threat as well and has already been observed. For example, some countries, faced with undercapitalised banks unwilling to lend on the same basis as before the crisis and with taxpayers shoring up bank reserves, have directed their banks to lend locally. Other restrictions on foreign bank operations are bound to emerge in the regulatory aftermath that is now bound to emerge in the regulatory aftermath that is now following the crisis. All of these actions have the effect of widening disparities between rates of return and therefore affect global capital flows and, in turn, trade. But modelling this effect requires estimates of how big this effect might be and, as none are readily available, the effect of financial protectionism has not been included in this analysis. The result is: trade impacts from the crisis are likely to be understated.

Two Potential Effects not Specifically Covered by the Six Shocks

There are two other potential effects on trade not specifically covered by the simulations. First is that the model is an annual one and while it allows for stock-adjustment dynamics across years, there can be important

within-year effects, particularly on trade. The second is the effect of rising interest rates on trade credit. Again while the data in the model has embedded in it the cost of credit on all transactions, trade credit might involve relatively higher costs and has a depressing effect on international trade.

Inventory Cycle and Trade

Over the last 20 years, the globalisation of manufacturing production chains and the large increase in global trade has meant that a much greater proportion of inventories in any individual country are imported. Hence, a sharp down shift in the inventory cycle from the month of December 2008 onwards has probably been a significant factor behind the sharp downturn in world trade over the first quarter of 2009. It also appears to be a significant factor behind the downward revision of the OECD's forecasts for the global economy since November.

Figure 16.5

Japanese Manufacturing Stocks to Sales Ratio

Source: OECD Main Economic Indicators and CIE calculation.

The sharp drop in global sales in December 2008 led to a sharp increase in the stock-to-sales ratio, particularly for OECD economies. Typical of the pattern in the stock-to-sales ratio is highlighted by Japan (Figure 16.5). This pattern was repeated internationally with particularly

large increases in most major OECD economies. In the Euro area and Japan, in the December 2008 quarter, retailers and manufacturers built up stocks, as the drop in sales caught them by surprise. The opposite was true in countries like the UK, Korea and Australia where inventories were run down relatively quickly.

The large increases in stock-to-sales ratios in Japan, the Euro area and the rest of the world, will mean that there were significant rundowns in stocks in the first half of 2009. These added to the impact of the falls in sales on production.

The key feature about the inventory cycle for this study is that it will account for some of the large monthly drops in trade volumes that have generated headline grabbing attention. Year-on-year effects, the focus of this model, are likely to be much less.

Trade Credit

At the time of the onset of the financial crisis in September 2008, there was much publicity given to the shortage of credit as banks stopped lending. For example, Auboin (2009) from the WTO Secretariat described a $25 billion shortfall in trade credit in November 2008. A shortage of trade credit would impact on world trade on the supply side but it also seems much of the contraction was a collapse on the demand side as orders were cancelled once business realised they were holding excess inventories as described above. A study by the World Bank estimates the shortfall in trade finance accounting for 10-15 per cent of the fall in world trade.[11] Being of small magnitude, this effect is omitted from this study.

Effects of Crisis without a Fiscal Policy Response

Mechanisms at Work

To appreciate the mechanisms at work from the three shocks, an illustrative scenario where shocks affect the US alone is shown in Figure 16.6. The bursting of the housing bubble has the biggest negative impact on real consumption, which being roughly 70 per cent of the domestic economy, has the biggest negative impact on real GDP. The permanent loss in wealth causes consumption to fall sharply and because the housing shock is assumed to be permanent, consumption is permanently lower in all periods as shown on Figure 16.6.

Figure 16.6

Impact of a US only Financial Crisis on the United States
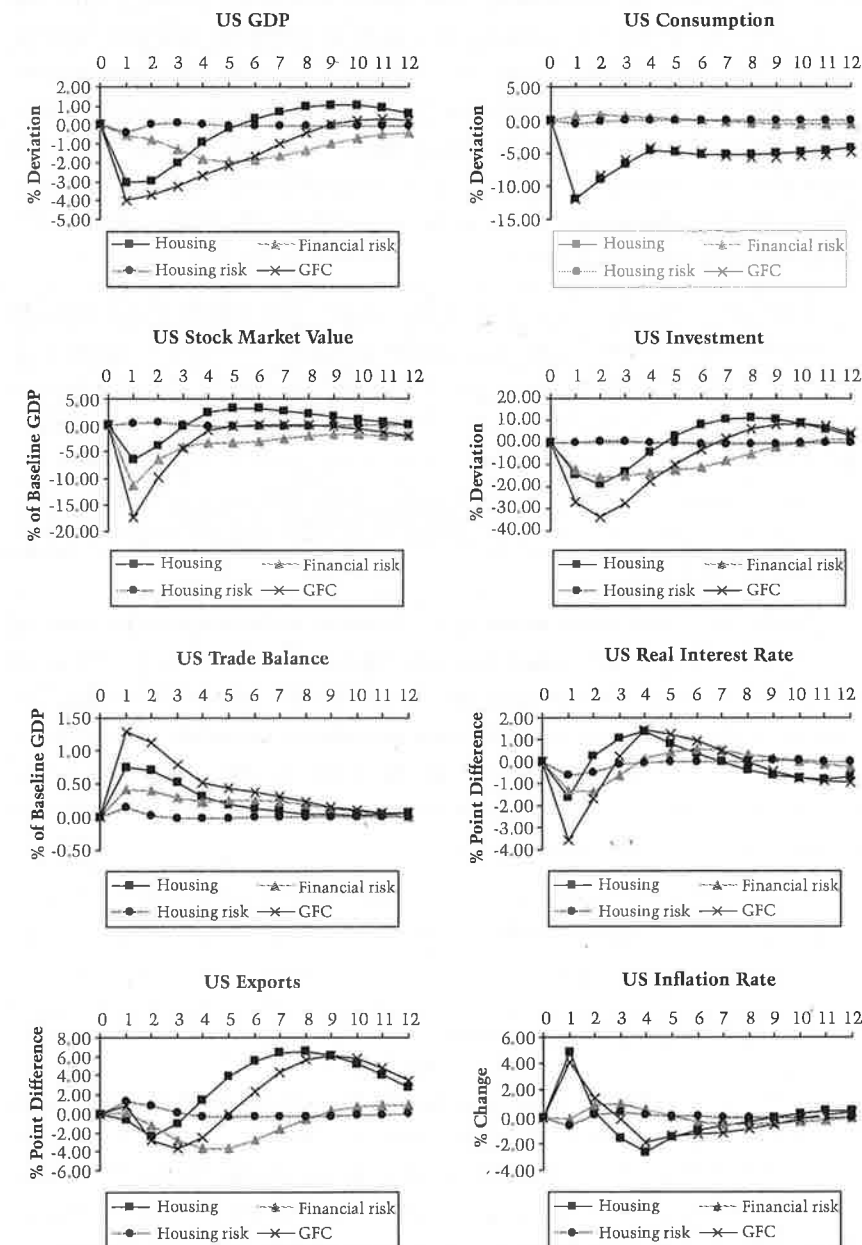
Source: G-Cubed model simulations.

The financial shock has the largest negative impact on stock market values from baseline in 2009 and an equally large impact as the bursting of the housing bubble on investment. The equity risk shock causes a shift out of equities into other domestic assets, such as housing and government bonds as well as to asset purchases overseas. The shift into government bonds drives up their prices and pushes down real interest rates substantially. This surprisingly raises human wealth because expected future after tax income is discounted at a much lower real interest rate. Thus in the US, the equity shock alone is positive rather than negative for consumption in the short run.

Investment on the other hand falls sharply. The equity shock reduces US investment by about 15 per cent below baseline. The rise in equity risk implies a sharp sell-off of shares due to a large rise in the required rate of return to capital. The higher equity risk premium implies that the existing capital stock is too high to generate the marginal product required from the financial arbitrage condition and investment falls and, over time, due to the existence of adjustment costs, the capital stock falls and potential output is permanently reduced.

Under this simulation where the US alone is assumed to be affected by the crisis, there is little impact on US exports (bottom left hand panel of Figure 16.6) because there is little net impact on the rest of the world. The negative trade effects are offset by positive effects from US capital going elsewhere as elaborated below. But as the drop in US consumption hits imports, the trade balance improves over baseline especially in 2009 and remains that way until 2013.

Each of the three shocks has a negative effect on the US and, combined, has the effect of lowering real GDP by 4 per cent below baseline in 2009 and real GDP does not return to baseline until 2017, nearly a decade later. That is sufficient to put the US into recession in 2009 (baseline growth is 3.4 per cent) but will allow positive growth in 2010.[12]
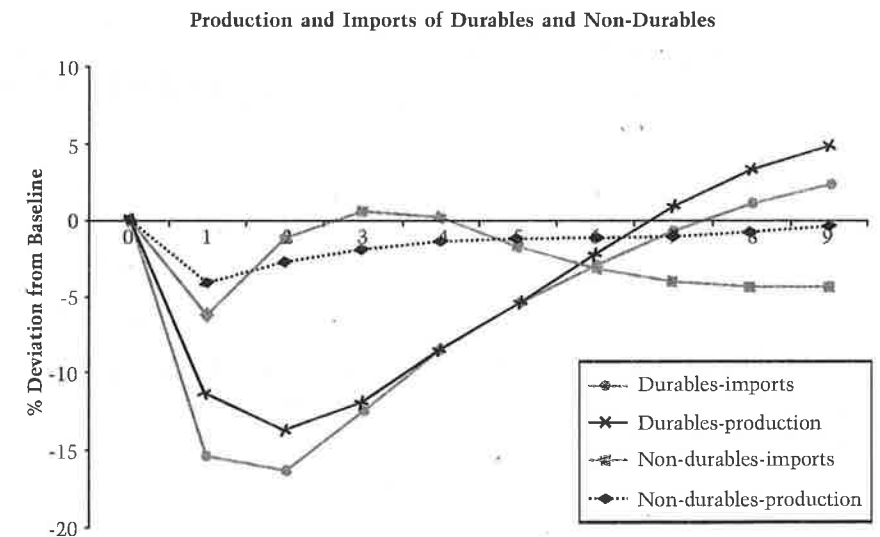
A key compositional effect also occurs when household discount rates and risk premia generally rise. The effect is a much sharper fall in the demand for durable goods relative to other goods in the economy. This is shown clearly in Figure 16.7. Imports and domestic production of durable goods fall more than non-durable goods. The differences are substantial.

The high risk adjusted cost leads to a reduction in the flow of services from durables and, therefore, the demand for these goods drops sharply. This compositional effect is critical for the trade outcomes. Countries that export durable goods are particularly affected by a crisis of the type modelled.

The recession in the US has two main effects on the world economy. One is the negative knock-on effect from the loss in activity with those economies most dependent on the US market most affected. The second effect runs counter to the first. As prospects dim in the US, so the returns on investment look better elsewhere. Money flows out of the US (or strictly in the case of the US, less inflow than otherwise) and into other economies where it stimulates investment and economic activity. This is illustrated by the effect on China (see Figure 16.7). The US is a large importer from China. As US imports fall, China's exports fall (see bottom left hand panel of Figure 16.8), with a combined effect from the three shocks of a drop in exports of 5 per cent below baseline in 2009. China's trade balance worsens, but note how small the effect is: barely 1 per cent below baseline (as a per cent of GDP).
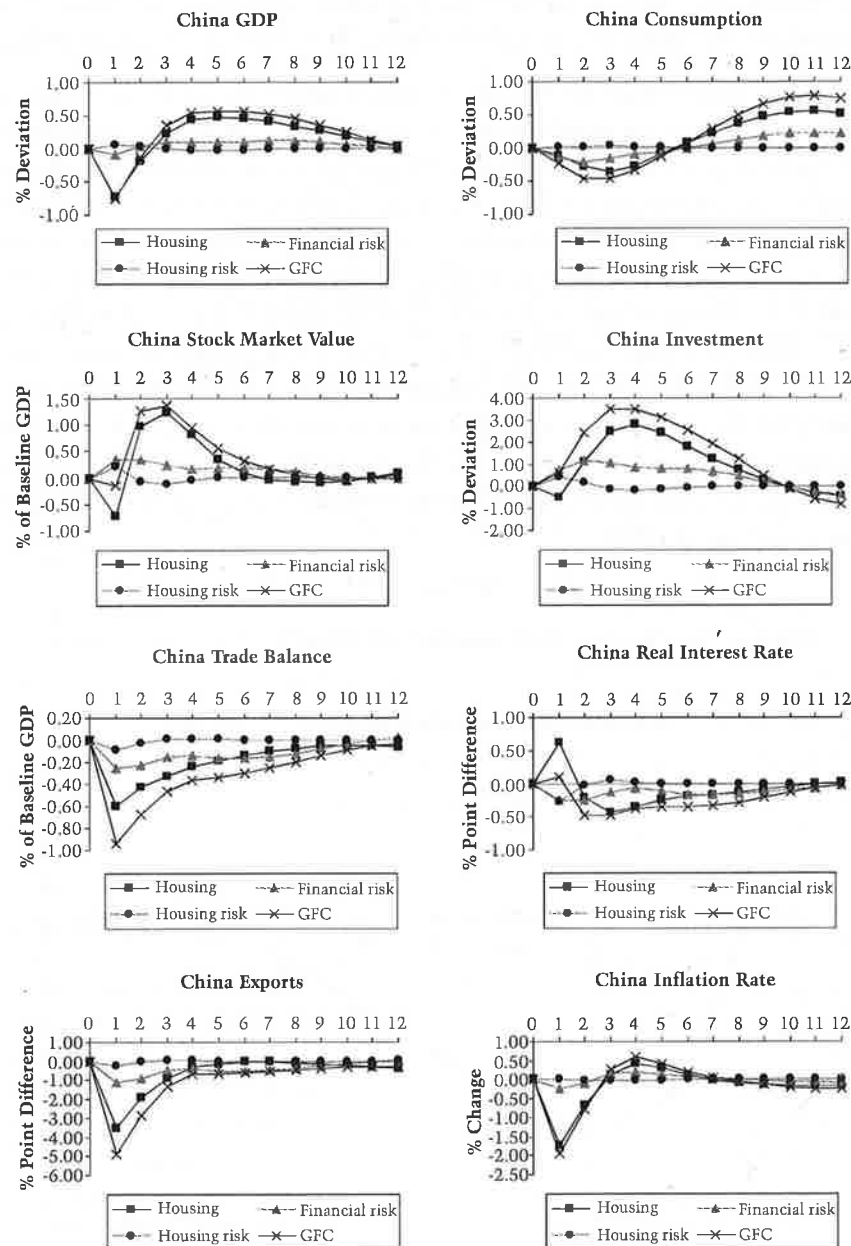
Figure 16.7

Impact of a US only Financial Crisis on Durable versus Non-Durable Goods in the United States

Production and Imports of Durables and Non-Durables

Legend:
- Durables-imports
- Durables-production
- Non-durables-imports
- Non-durables-production

Source: G-Cubed model simulations.

Figure 16.8

Impact of a US only Financial Crisis on China

Source: G-Cubed model simulations.

Note also the net small effect on China's real GDP even though China's exports are a large proportion of their GDP. When the US alone is affected by the crisis, there is a small combined effect on China of a reduction in real GDP of 0.75 per cent below the baseline in 2009 and a positive effect from 2011 onwards. Looking at China's real investment provides the answer. Because investment prospects in the US are now dire under the combined scenario, money flows elsewhere, one recipient of which is China. China's real investment could be 3.5 per cent above baseline in 2011 and 2012, in response to the relatively better investment prospects. China gains at the US' expense. The favourable stimulus from extra investment largely offsets and eventually outweighs the negative effects from the loss of exports to the US.
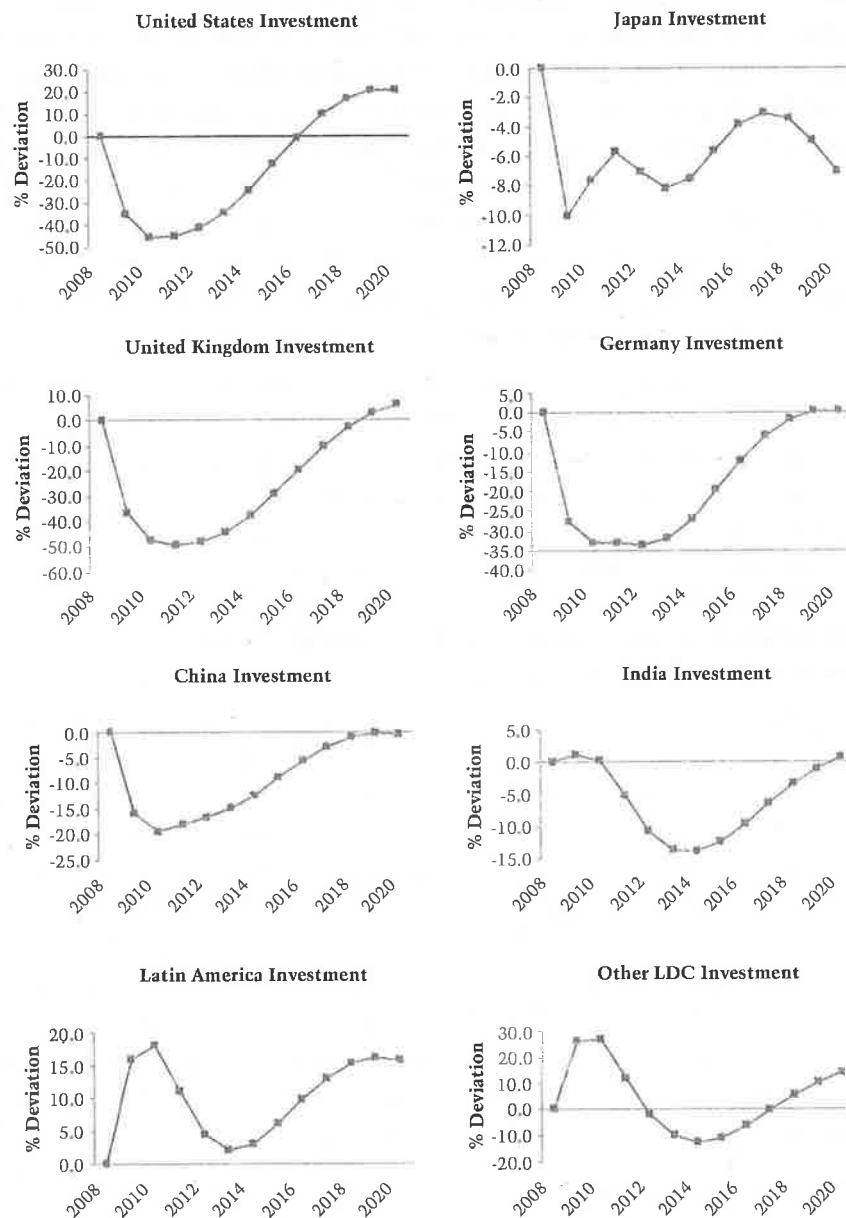
The conclusion is that the financial crisis which started in the US, had it been confined to the US alone, would not have had dire consequences for the world economy. Of course the real story is different. Contagion and rising risk premiums everywhere have caused a different scenario. When everyone is affected, the consequences for the US also depends on who and how other countries are affected.

Projected Outlook from the Global Financial Crisis without Fiscal Stimulus

When all the economies are affected by the GFC through global changes in risk premia and loss of consumer confidence, other countries like China are adversely affected. When other economies are also adversely affected by the reappraisal of risk, the cost of capital for them also rises and, in effect, causes the existing capital stock to be too large. Investment plummets, but not everywhere because it is relative effects that matter. The impact on investment is shown in Figure 16.9. Whereas Chinese investment rose when just the US was assumed to be affected by the crisis, now Chinese investment falls to a low of over 8 per cent below baseline in 2010. Real interest rates fall everywhere by over 400 basis points both reflecting a long-run decline in marginal product of capital but also reflecting a response of monetary authorities in lowering nominal interest rates.

Under the assumptions of the smaller rise in risk premia across Latin America and less developed countries (LDCs), these regions gain relatively

Figure 16.9

Investment Effects of GFC

United States Investment

Japan Investment

United Kingdom Investment

Germany Investment

China Investment

India Investment

Latin America Investment

Other LDC Investment

Source: G-Cubed model simulations.

from the global reallocation of investment. Investment in Latin America could be over 15 per cent higher over baseline in 2009 and 2010 and well over 20 per cent for LDCs for the same years. Latin America and other LDCs do not go into recession (see Figure 16.10) as a result of the GFC as represented by the three shocks used in this study. In fact, those two regions experience a slight boost to real GDP. While some Latin American economies such as Argentina are not faring well at the moment, there are other forces at work such as drought and the impact of taxes on their exports. The results in the Appendix Graphs do show that exports from Latin America and LDCs to be hit hard, however. They could be 30 per cent below baseline in both 2009 and 2010.

One of the key features of the crisis is reflected in the results in Figure 16.10. There is a substantially larger contraction in exports relative to the contraction in GDP in all economies. This massive shift in the relationship between trade and GDP is not the result of an assumption about the income elasticity of imports. It reflects some key characteristics of the model. First, imports are modelled on a bilateral basis between countries where imports are partly for final demand by households and government and partly for intermediate inputs across the six sectors. In addition, investment is undertaken by a capital sector that uses domestic and imported goods from domestic production and imported sources. As consumption and investment collapse more than GDP, imports will contract more than GDP. One country's imports are another country's exports, thus exports will contract more than GDP unless there is a change in the trade position of a particular country. The assumption that all risk premia rise and the results that all real interest rates falls everywhere implies small changes in trade balances—a finding consistent with actual outcomes.

Effects of Policy Responses

The results so far have built in a monetary reaction function in the form of a Henderson-McKibbin-Taylor rule for each economy with the short-term nominal interest rate adjusting to a variety of factors in each economy. The rules assumed in the model have generated an endogenous monetary response which is similar to that observed so far. The assumption of an unchanged fiscal deficit is very different from what has

Figure 16.10

GDP and Trade Effects of GFC
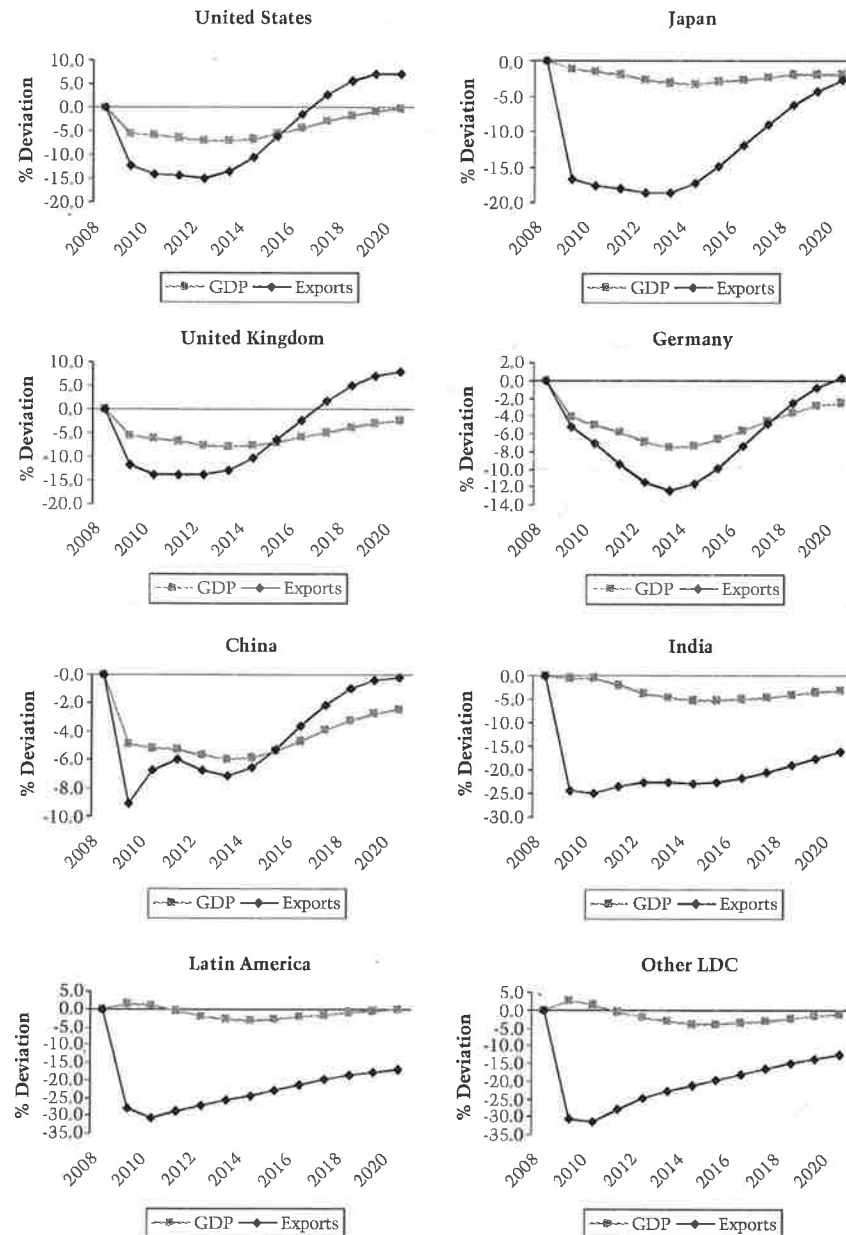
Source: G-Cubed model simulations.

---

been observed. In this Section we focus on announced fiscal responses. The esimated fiscal policy changes were given earlier in Table 16.5. Note that we do not have infrastructure spending in the model so that the fiscal responses here are assumed to be spending on goods and services and not government investment in physical capital. Expenditure on infrastructure would likely also stimulate medium to long-run supply in the model and, therefore, change the extent to which there is crowding out over time. However, to the extent that even infrastructure spending is a demand stimulus for the first few years before the projects begin to deliver medium-run supply responses, the initial results in this study can be used to understand the short-run impacts of the packages.
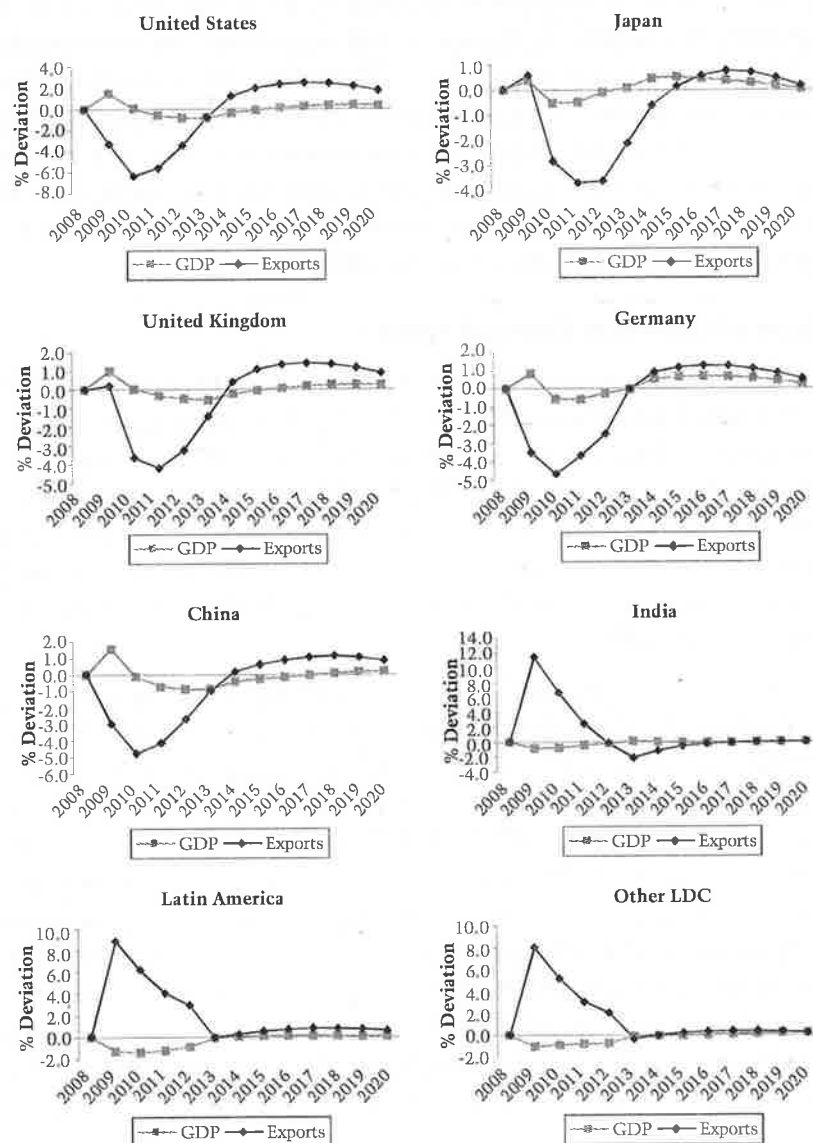
Effects of the Fiscal Stimulus Alone

To see the mechanisms at work, the effects of the fiscal stimulus alone are shown in Figure 16.11. These results should be added to the financial crisis results to get a picture of the financial crisis with fiscal response. In discussing these results we will talk about them relative to baseline which can also be interpreted as relative to what would be seen post crisis. It is important to stress that the scenario assumes a reasonably responsive financial sector response to the policy packages. As discussed below other scenarios are possible.

The fiscal stimulus gives a boost to real GDP above baseline for all major economies and China in 2009, the first year of the fiscal packages. The effects are illustrated by referring to China. China's real GDP could be 1.6 per cent above what otherwise would be the case in 2009, but little different from baseline in 2010. Real GDP would be below baseline in 2011 in China as the effects of higher real interest rates kick in. Real interest rates could be over 3 percentage points above baseline in 2009 and 2010 (see Appendix A-16.3) offsetting much of the decline in real interest rates from the global financial shock and monetary policy responses. Real private investment is 9 per cent below baseline in 2010. Considering the massive 11.4 per cent cumulative fiscal stimulus in China, the effect of the fiscal stimulus alone is quite small and transitory.

Note that the fiscal stimulus in the first year raises GDP but for all countries this effect only lasts for a year and is much smaller than many commentators assume (the fiscal multiplier is less than one). Indeed when

Figure 16.11

GDP and Export Effects of Fiscal Response

added to the results for the full GFC simulation this fiscal stimulus is not sufficient to completely neutralise the impact of the crisis on GDP. The main reason involves the real interest rate implications of the fiscal stimulus as shown in Appendix A-16.3, Figure 6. The global nature of the stimulus implies an increase in real interest rates which partly offset the spike down in the first year of the shocks. Note, however, that higher real interest rates persist for up to six years after the stimulus. This result points to some serious potential problems to be faced by policymakers during the recovery period from 2010 onwards.

It should be stressed that there might be some delay in the responsiveness of real interest rates in practice, relative to the assumptions in the model. To the extent that central banks hold policy rates at very low levels for a long period because banking systems do not function in a way assumed in the model, there is likely to be less upward pressure of real interest rates and very different story could emerge to the scenario modelled here.[13] With a totally unresponsive private sector, it is possible that the fiscal package might displace private spending in a worst case scenario with no change in real interest rates. In this case, the fiscal spending multiplier may be higher because of a lack of crowding out or it might be lower because the private sector is dormant. Neither case can be completely ruled out.

However, if the major economies respond as modelled in this paper, the fiscal packages also have significant impacts on global trade. In the model the effect of fiscal policy on trade comes in a number of forms operating both through income and relative price effects. If an economy increased government spending, private consumption tends to rise and short-term income increases. However, the increased borrowing tends to increase real interest rates, which reduces private investment.[14] These two responses have opposite effects on trade. In particular, durable good consumption falls because of the rise in real interest rates, while non-durable good consumption rises due to the income increase. The effect is that imports of durable goods fall and non-durables rise. In addition, the higher real interest rate tends to attract foreign capital, which appreciates the real exchange rate and tends to crowd out exports and stimulates income through relative price changes. A country acting alone has a substantial change in the mix of the components of final demand and the

real exchange rate dampening on trade tends to dominate the income effect on trade. If there is a global fiscal stimulus, the real exchange rate (or relative price) effects are muted but still present to the extent that the fiscal packages are not symmetric across countries. However, because all countries are acting, the real interest rate effects are accentuated because the call on global savings is much larger than the outcome of any one country acting alone.

Figure 16.11 shows an interesting story where exports of the industrial economies tend to fall as a result of the fiscal package. This occurs for several reasons. Firstly, because the OECD economies have relatively larger fiscal packages (apart from China), their real exchange rate will tend to appreciate relative to the non-OECD economies, crowding out exports. Secondly, these economies tend to export more durable goods whose demand is reduced by a rise in global interest rates. This effect was also present in the GFC simulation where the risk adjusted discount rise rose sharply (even though real interest rates fell) and the demand for durable goods collapsed. Global trade (see Figure 16.13) does not contract in 2009 but falls for several years as growth slows after the fiscal stimulus. By 2014 world trade is above baseline.

Trade Protectionism

The unfortunate tendency to trade protection was noted earlier. So far there has not been an all-out trade war, possibly due to the hard lessons learned during the Great Depression when such a trade war did break out with disastrous consequences. While industrial economies are in theory able to apply tariff rates up to bound tariffs, as they are legally entitled to do under WTO rules, it is possible to go further by invoking special circumstances and by creating no tariff impediments to trade.

To try and capture a plausible change in protection, the actual shock assumed is a rise in all tariff rates by 10 percentage points (i.e., if a tariff was 5 per cent it becomes 15 per cent). The impacts on real GDP from countries increasing tariff rates are shown in Figure 16.12. The overall impacts on global trade are shown in Figure 16.13.
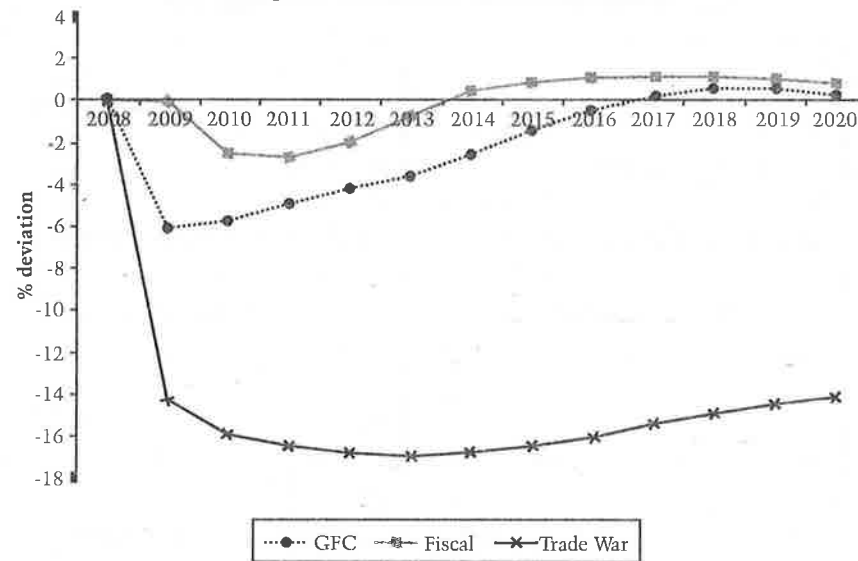
Figure 16.12

GDP Effects of Tariff Rise
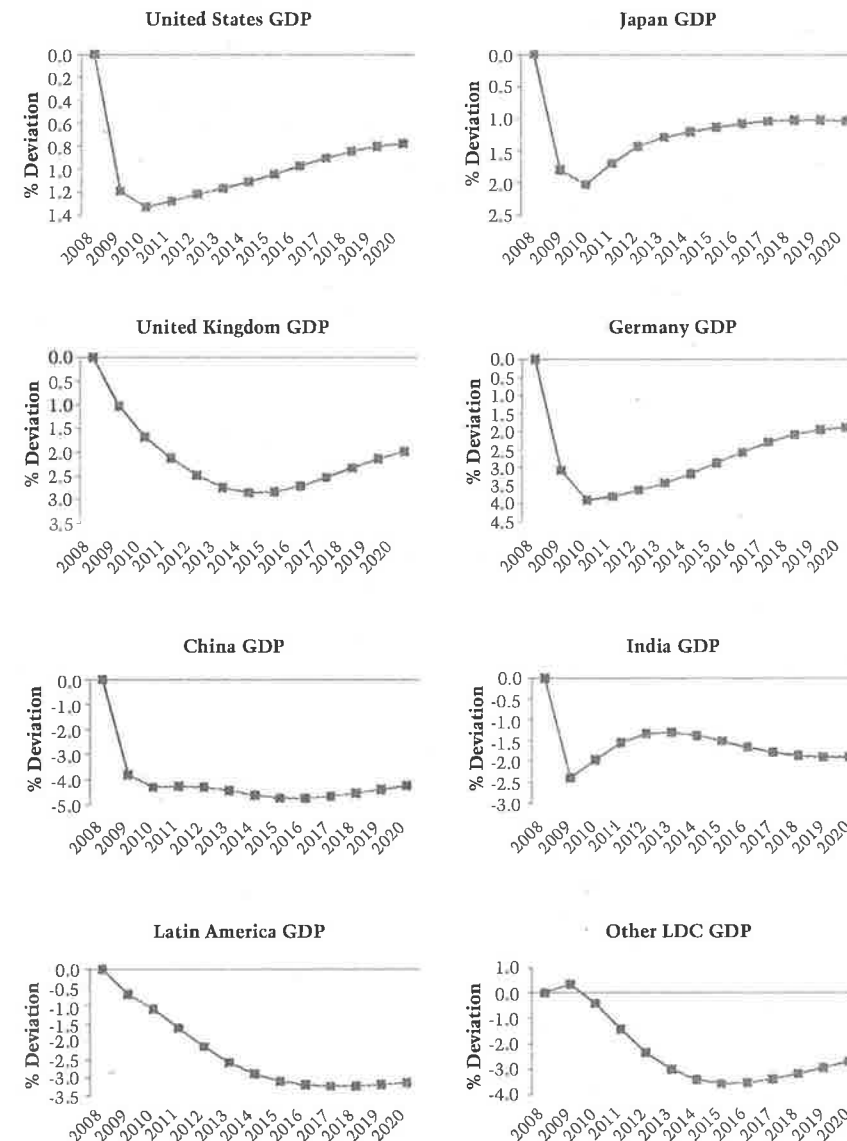
Source: G-Cubed model simulations.

Figure 16.13

Impact of the GFC, Fiscal Response and Trade War on Global Trade

Change in World Trade under 3 Scenarios

Source: G-Cubed model simulations.

The rise in tariffs by 10 percentage points has a significant negative impact on GDP. The decline in real GDP relative to baseline varies in 2009 between 1.4 per cent for the US and the UK to 4.0 per cent for Germany. The outcomes reflect the relative openness of the economies and the trade linkages between economies. Overall the effects of a rise in tariffs by 10 percentage points, is to reduce trade by nearly 17 per cent by 2012 (see Figure 16.13).

As tariffs rise, the input costs of industries increase which tends to raise costs and reduce demand in the economy. The rise in relative prices of imports also causes import demand to fall which reduces incomes of the exporting countries. This contraction in global trade and contraction in global incomes is self-reinforcing and, hence, the world economy contracts. There is a reallocation of global capital away from sectors in which tariffs have risen because the return to capital in those sectors is expected to fall because demand for those goods that have become more expensive is expected to fall. There is also a rise in the imported price of capital goods

which are traded and, therefore, the physical amount of capital created from a constant expenditure on investment is less in all economies. This further contracts potential output.

Table 16.6 decomposes the effects of a change in global tariffs into the effects from the change in tariffs from each country or region listed across the columns on each country. Thus, in 2011 the tariff scenario reduces US GDP by 1.28 per cent below baseline. The impact of the US tariff increase alone on the US is 0.28 per cent in 2011. The US tariff reduces Canadian GDP by 1.76 per cent in 2011 which is the major part of the total loss to Canada of 2.2 per cent of GDP. Most countries are too small to gain from a rise in tariffs although several regions do initially experience a small rise in GDP from their own tariff increased but a fall in GDP on balance when the whole world raises tariffs.

Table 16.6

GDP Consequences of Tariff Changes by 2011:
Per cent Deviation from Baseline

| | Source of Traiff Change | | | | | | | | |
	Global	USA	Japan	Europe[1]	OOECD[2]	China	India	EEFSU	ODCs
United States	-1.28	-0.28	-0.05	-0.25	-0.33	-0.04	-0.01	0.01	-0.33
Japan	-1.69	-0.36	-0.66	-0.15	-0.02	-0.12	0.00	0.02	-0.41
United Kingdom	-2.12	-0.25	-0.02	-1.48	-0.18	-0.02	-0.01	-0.06	-0.09
Germany	-3.80	-0.33	-0.04	-2.64	-0.26	-0.04	-0.01	-0.39	-0.08
Euro Area	-2.93	-0.30	-0.05	-1.84	-0.18	-0.03	-0.01	-0.24	-0.26
Canada	-2.20	-1.76	-0.04	-0.27	-0.21	-0,02	-0.01	0.02	0.08
Australia	-1.36	-0.34	-0.15	-0.32	-0.17	-0.09	-0.02	0.03	-0.30
ROECD	-3.74	-0.37	-0.06	-1.74	-1.21	-0.03	-0.01	-0.19	-0.11
China	-4.26	-0.93	-0.29	-0.29	0.05	-1.12	-0.01	-0.09	-1.58
India	-1.55	-0.20	-0.03	-0.22	0.01	-0.03	-0.61	0.01	-0.47
Other Asia	-3.86	-0.98	-0.18	-0.32	-0.03	-0.42	-0.02	-0.02	-1.88
Latin America	-1.63	-1.32	-0.03	-0.026	0.12	-0.03	-0.01	-0.04	-0.15
Other LDC	-1.43	-0.54	-0.02	-0.60	0.05	-0.04	-0.04	-0.15	-0.09
EEFSU	-3.54	-0.61	-0.05	-2.02	-0.08	-0.07	-0.01	-0.62	-0.08
OPEC	-4.45	-0.90	-0.37	-1.00	-0.20	-0.16	-0.06	-0.12	-1.63

Note: 1. Europe is UK, Germany and Euro Area;
2. OOECD is Canada Australia and ROECD;
3. ODCs is other Asia, Latin America, Other LDC and OPEC.

Source: G-Cubed Model.

For many countries, the effect of a tariff increase alone is to reduce its own GDP. Acting together reduces GDP even more. The favourable demand-side impact of diverting demand from imports to domestic goods is found to be outweighed by the increase in the costs of production. This is a very important result from this paper. Tariff increases are not just beggar-thy-neighbour policies but are beggar-thyself. The reason is because the usual expenditure switching benefits of a rise in tariffs by a country is more than offset by a fall in investment due to rise in the price in imported capital goods and a fall in the return to capital in sectors where protection rises. These two supply contracting effect dominate any demand stimulus in the model. Most simple analytical models take aggregate supply as given and, therefore, the demand switching issue dominates. The supply impact of tariff changes found in the current model is supported by the experience of several decades of substantial expansion in output from countries that unilaterally liberalised trade. In a model with endogenous capital accumulation and international trade in durable capital goods, aggregate output is not fixed either nationally or globally.

Insights Gained

To represent the effects of the financial crisis on the world economy and trade flows, six elements are needed. For the crisis itself, three shocks are needed to capture the observed drop in asset prices and reduction in demand and trade. It is necessary to simulate the bursting of the housing bubble centred in the US and Europe, but extending elsewhere, rising perceptions of risk by business as reflected in the equity risk premium over bonds and rising perceptions of risk by households.

The policy response has been dramatic. So the analysis has included a monetary easing across the globe and a fiscal stimulus of varying proportions across countries and regions. Also, some trade protectionism has emerged, so far in terms of some tariff increases, some support for industry, such as automobile manufacturers and other effects such as 'buy local' programmes and directives. So a third policy response has been included in the analysis, namely a rise in protectionism. There has also been a rise in financial protectionism, such as directives to banks to lend locally, but minus any estimate of how big this effect is, has not been formally included in this analysis. But financial protection affects capital flows and so would affect trade flows.

Simulating the effect of the crisis itself (that is ignoring the policy responses not already built into the model such as endogeneous monetary policy rule) on the US alone (the 'epicentre' of the crisis) shows several things. Had there not been the contagion across other countries in terms of risk reappraisal, the effects would not have been as dramatic. The adverse trade effects from the US downturn would have been offset to some degree by positive effects from a global reallocation of capital. Were the US alone affected by the crisis, Chinese investment could have actually risen. The world could have escaped recession. When there is a reappraisal of risk everywhere including China, investment falls sharply—in a sense there is nowhere for the capital to go in a global crisis of confidence. The implication is that if markets, forecasters and policymakers misunderstand the effects of the crisis and mechanisms at work, they can inadvertently fuel fears of a 'meltdown' and make matters far worse.

When there is a global reappraisal of risk, there is a large contraction in output and trade. The bursting of the housing bubble has a bigger effect on falling consumption and imports than does the reappraisal of risk, but the re-appraisal of risk has the biggest effect on investment. Rising risk causes several effects. The cost of capital is now higher and leads to a contraction in the desired capital stock. Hence, there is disinvestment by business and this can go on for several years—a deleveraging in the popular business media. The higher perception of risk by households causes them to discount future labour incomes and leads to higher savings and less consumption, fuelling the disinvestment process by business.

The fiscal policy response initially has the desired effect of increasing domestic demand and, hence, real GDP. While the boost to domestic demand on its own boosts trade, there are other effects going on that have an adverse effect on trade. The fiscal stimulus and accompanying borrowing, causes real interest rates to rise over what they would otherwise be. This effect would be diluted if the global economy remained in recession for a long period. However, the natural recovery from the shocks as shown in the results implies that there will be competition by government and the private sector over scarce funds for either private investment or to finance fiscal deficits. The rise in real interest rates

(relative to what they would have been) and fall in investment and durable good demand implies that exports fall and do not get back to baseline for several years. For the US, this takes until 2013 and exports are 6 per cent below baseline in 2010. The fiscal stimulus does not apparently help trade largely because of the impact of higher real interest rates on durable goods demand and investment.

So far, cases of rising trade protection have been sporadic as mostly governments have resisted protection to bow to political pressure and protect narrow vested interests. Policymakers are right to be worried about trade protection as a resort to widespread protection would make matters much worse. For example, if countries raise tariffs by 10 percentage points, additional falls of real GDP of between 1 and 4.5 per cent below baseline could occur and exports could variously fall by between 5 and 20 per cent below baseline for major economies. One of the conclusions of this study is that the crisis and trade protection, all work to discourage exports. The asymmetric fiscal expansions redistribute global trade initially with a small impact overall but have a medium-term negative impact on world trade after the first year as the aftermath of the fiscal responses crowd out global demand and slow the recovery.

The need to avoid a rise in protection as a response to the crisis is a key result of this paper. Because the model used has endogeneous capital accumulation and trade in capital goods, a rise in tariffs by one country reduces that country's GDP as well as reducing GDP in other economies. A global tariff war accentuates the losses. Although it is tempting for countries to raise tariffs as a way to switch expenditure from foreign to domestic goods to support domestic demand, this paper finds that the negative supply consequences on investment and more expensive imported durable goods far outweighs any benefit of expenditure switching.

Notes

1. OECD (2009). *http://www.oecd.org/document/12/ 0,3343,en_2649_37431_ 42788172_1 1_1_1_1,00.html*

2. Full details of the model including a list of equations and parameters can be found online at: *www.gcubed.com*

3. These issues include: Reaganomics in the 1980s; German Unification in the early 1990s; fiscal consolidation in Europe in the mid-1990s; the formation of NAFTA; the Asian crisis; and the productivity boom in the US.

4. Federal Housing Finance Agency May 2009, *http://www.fhfa.gov/webfiles/2406/ 1q09hpi.pdf*

5. The sharpest, in fact, since the Volker deflation of the early 1980s.

6. A 10 per cent permanent drop in housing productivity in the United States alone gives a 5.4 per cent drop in housing values one year later. See Mckibbin and Stoeckel (2006).

7. Similarly, the tightening cycle of the mid-1980s was one factor leading to the Savings and Loan crisis.

8. *New York Times*, Thursday, 26 February 2009.

9. Although Russia is not yet a member of the WTO and bound by their laws, they still declared, along with the other G-20 participants, not to increase tariffs.

10. For example see news report in the Financial times. *http://www.ft.com/cms/s/0/ 66454774-5a7c-11de-8c14-00144feabdc0.html*

11. Reported in *International Economics Weekly*, "What's happening to World Trade?" Part II, 24 April 2009.

12. Note that all results are presented as deviations from a baseline projection. A fall in GDP of 4 per cent in year 1, relative to baseline, where the baseline growth rate was 3 per cent is a new growth rate in the first year of negative 1 per cent (i.e., a recession). If the level of GDP remains 4 per cent lower forever, the growth rate of GDP in year 2 is back at baseline growth. Thus in growth rate terms, the crisis is resolved after the first year in many countries although the level of GDP remains below baseline for many years.

13. This argument that monetary authorities may not raise interest rates is made in Christiano et al. (2009).

14. To the extent that there is a substantial supply response through infrastructure, the need for interest rates to rise for a given constrained capacity would be reduced.

References

Auboin, M. (2009). *The Collapse of Global Trade, Murky Protectionism, and the Crisis: Recommendations for the G20*. London: Centre for Economic Policy Research.

Christiano, Eichenbaum and S. Rebelo (2009). "When is the Government Spending Multiplier Large?", *NBER Working Paper* 15394. Cambrdige MA: National Bureau of Economic Research.

Corden, W. Max (2009). *The World Credit Crisis: Understanding It and What to Do*. http://www.melbourneinstitute.com/wp/wp2008n25.pdf

Greenspan, A. (2007). *The Age of Turbulence: Adventures in a New World*. Sydney: Allen Lane.

Henderson, D.W. and W. McKibbin (1993). "A Comparison of Some Basic Monetary Policy Regimes for Open Economies: Implications of Different Degrees of Instrument Adjustment and Wage Persistence", *Carnegie-Rochester Conference Series on Public Policy* 39: 221-17.

Holmes, J. (2008). Opening remarks by Sir John Holmes, Under-Secretary General for Humanitarian Affairs and Emergency Relief Coordinator at the DIHAD 2008. Conference, 8 April 2008. *http://www.reliefweb.int/rw/RWB.NSF/db900SID/YSAR7DHL88?OpenDocument*

IMF (2009). *Group of Twenty, Meeting of the Ministers and Central Bank Governors*, March 13-14. London, UK. p.4.

McKibbin, W. and A. Stoeckel (2006). "Bursting of the US Housing Bubble", *Economic Scenarios* No. 14. www.economicscenarios.com

McKibbin, W.J. and A. Stoeckel (2009a). "The Global Financial Crisis: Causes and Consequences", *Lowy Institute for International Policy Working Paper in International Economics.*

————. (2009b). "Modeling the Global Financial Crisis", Paper prepared for VII Colloquium on Financial Collapse: *How are the Biggest Nations and Organizations Managing the Crisis?*, Jointly organised by the Associazione Luiss-Guido Carli & Fondazione Cesifin "Alberto Predieri" in collaboration with the editors of the Journal of Financial Stability, October 2.

McKibbin, W., D. Pearce and A. Stegman (2007). "Long-term Projections of Carbon Emissions", *International Journal of Forecasting* 23: 637-53.

McKibbin, W.J. and D. Vines (2000). "Modeling Reality: The Need for Both Intertemporal Optimization and Stickiness in Models for Policy-making", *Oxford Review of Economic Policy* 16(4).

McKibbin, W. and P. Wilcoxen (1998). "The Theoretical and Empirical Structure of the G-Cubed Model", *Economic Modelling* 16(1): 123-48, Elsevier, January.

Obstfeld, M. and K. Rogoff (1996). *Foundations of International Macroeconomics.* Cambridge MA: MIT Press.

OECD (2009). *Fiscal Packages across OECD Countries: Overview and Country Details.* Paris, 31 March.

————. (2008). *Main Economic Indicators.* Paris: OECD.

————. (2007a). *OECD-FAO Agricultural Outlook-Database (1970-2016).* www.oecd.org/document/53/0,3343,en_2825_494504_39550901_1_1_1_1,00.html. Accessed May 2008.

————. (2007b). *Producer and Consumer Support Estimates, OECD Database 1986-2005.* http://www.oecd.org/agr/support/psecse. Accessed in May 2008.

Taylor, J.B. (1993). "Discretion Versus Policy Rules in Practice", *Carnegie-Rochester Conference Series on Public Policy* 39(1): 195-214. North Holland, December.

————. (2008). *The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong.*

————. (2009). "The Financial Crisis and the Policy Responses: An Empirical Analysis of what went wrong", *NBER Working Paper* 14631. Accessed in May 2008.

Wolf, Martin (2008). "How Imbalances led to Credit Crunch and Inflation", *Financial Times*, June 17, 2008.

Appendix A-16.1

Sectoral Growth Rates underlying the Baseline

Following the approach in McKibbin, Pearce and Stegman (2007), the energy sector in the US is assumed to have a rate of productivity growth of 0.1 per cent over the next century. Each non-energy sector has an initial productivity growth rate close to historical experience but gradually converging to 1.8 per cent per year in the long run. We then assume that each equivalent sector in each other country will catch up to the US sector in terms of productivity, closing the gap by 2 per cent per year except for the developing country region which is assumed to close the gap by 1 per cent per year. The initial gaps are, therefore, critical for the subsequent sectoral productivity growth rate. We follow a two step process in determining the initial size of the gap. The first step is to specify the gap between all sectors and the US sectors equal to the gap between aggregate PPP GDP per capita between each country and the US. We cannot easily use sectoral PPP gap measures because these are difficult to get in a consistent manner and with a wide enough coverage for our purposes. Thus, the initial benchmark is based on the same gap for each sector as the initial gap for the economy as a whole. If we then have evidence that a particular sector is likely to be closer to or further away from the US sectors than the aggregate numbers suggest, we adjust the initial sectoral gaps attempting to keep the aggregate gaps consistent with the GDP per capita gaps. We then assume that productivity growth in each sector closes the gap between that sector and the equivalent US sector by 2 per cent per year. The productivity growth is calculated exogenously to the model. We then overlay this productivity growth model with exogenous assumptions about population growth for each country to generate two of the main sources of economic growth.

Given these exogenous inputs for sectoral productivity growth and population growth, we then solve the model with the other drivers of growth, capital accumulation, sectoral demand for other inputs of energy and materials, all endogenously determined. Critical to the nature and scale of growth across countries are these assumptions plus the underlying assumptions that financial capital flows to where the return is highest,

physical capital is sector specific in the short run, labour can flow freely across sectors within a country but not between countries and that international trade in goods and financial capital is possible subject to existing tax structures and trade restrictions.

Thus, the economic growth of any particular country is not completely determined by the exogenous inputs in that country since all countries are linked through goods and asset markets. In the analysis in this paper, we start with a projection of the model from 2007 assuming no shocks to relative prices apart from those built into the productivity projections. We then imposed each shock on this baseline to generate results as deviation from the baseline. While the emergence of major developing countries is already partly built into the baseline, we focus on the marginal changes as specified in the scenarios described in the body text.

Appendix A-16.2

Classification of Fiscal Measures for 2009–10[a]

	Rescue Package as a Percentage of GDP		I. Public Spending on Goods and Services	II. Fiscal Stimulus Aimed at Customers	III. Fiscal Stimulus Aimed at Firms
	Fiscal Package[b] (US$b)	(%)			
Australia[c]	22.0	1.8	Funding for schools and hospitals, transportation projects (railway and highway) and middle income families; help to first time home buyers — total spending in this category adds up to approximately $10 billion.	Help to 4 million pensioners, carers and seniors; carer	Supporting car manufacturers; investment allowance
Brazil	3.6	0.2		Extension of Bolsa (CCT programme) to include 5 million more citizens; increase in minimum wage by 12 per cent as of 1 February; tax cuts on consumer loans and personal income to boost car sales	Tax cuts to help auto manufacturers
China	586.0	6.9	Speeding up rural infrastructure construction; accelerating the expansion of railways; airport construction in Western province; upgrading power grids; greater spending on health and education in rural areas; enhancing the construction of sewage and waste treatment facilities (total spending in this category is approximately 3 trillion RMB)	Low rent housing (0.28 trillion RMB); raising minimum grain purchases and farm subsidies; subsidies for low income urban residents; increasing the number of pension funds	Direct tax cuts for nine-industries (steel, telecommunications, automotive, etc.); support and development of high-tech and service industries; remove loan quotas on commercial lenders

...contd...

	Fiscal Package[b] (US$b)	Rescue Package as a Percentage of GDP (%)	I. Public Spending on Goods and Services	II. Fiscal Stimulus Aimed at Customers	III. Fiscal Stimulus Aimed at Firms
France	33.0	1.3	Increasing investments in infrastructure projects	€ 200 payment for 3.8 million impoverished households	Protection for the auto sector; support for business investing in housing and construcion; social tax exemption for employers (with less than 10 workers) who have new employees in 2009
Germany[a]	103.3	1.6	Infrastucture investment (schools and roads) worth €18 billion	Income tax cuts (€ 9 billion); reduction in health insurance contributions (€9 billion taking into account employes as well); €2,500 payment for drivers who buy a low emission car; € 100 cheques per child	Reduction in health insurance contributions
Italy	6.3	0.3	Stepped up public works spending	€2.4 billion cash payments to low income families; mortgage relief; additional welfare spending	Corporate tax breaks

contd...

...contd...

	Fiscal Package[b] (US$b)	Rescue Package as a Percentage of GDP (%)	I. Public Spending on Goods and Services	II. Fiscal Stimulus . Aimed at Customers	III. Fiscal Stimulus Aimed at Firms
Japan	110.0	2.3	Funds to local governments to invest in infrastructure projects accelerated introduction of energy saving technologies; tax incentives for energy saving technologies	Aid to unemployed workers; housing assistance; UE insurance extension; cash transfers regardless of income	Increased wage subsidies for SME employers; subsidise employers who hire temporary workers as regular employees; inject funds into domestic banks to support small and medium-sized businesses
Russia	20.0	1.1		Tax cuts	Tax cuts
Spain	113.4	8.1	New public work projects; creation of fund for local entities and the special fund for employment and economic reactivation	Tax support measures for families; increase in social welfare; delay in mortgage payments for families with unemployed breadwinners	Tax cuts, increased access to credit for SMEs
United Kingdom	36.4	0.9	Infrastructure spending (£ 3 million)	VAT reduction from 17.5 to 15 per cent (£ 12.5 billion); permanent increase in personal income tax allowance for basic rate taxpayers (£3.19 billion)	Subsidies for employers (upto £ 2,500) who hire workers that have been unemployed for more than six months; other employment measures (£ 1.3 billion)

contd...

...contd...

	Rescue Package as a Percentage of GDP (%)	Fiscal Package[b] (US$b)	I. Public Spending on Goods and Services	II. Fiscal Stimulus Aimed at Customers	III. Fiscal Stimulus Aimed at Firms
United States	5.5	787.0	Infrastructure spending; production of energy from renewable resources; aid to science facilities and research; broadband service in rural areas; aid to school districts and public colleges; additional aid to schools serving low income areas; increase in the side of Pell grants (education grants)	Tax relief for low wage and middle income workers of roughly US$ 300 billion; extended jobless benefits and retraining; health coverage for the unemployed; temporary increase in food stamps	Help to car makers and other distressed sectors in need of credit

Rest of world   149.2
Total   1958.2
World GDP in 2008   62054.1
Total fiscal package as a percentage of world GDP   3.16

Note: a- Announced measures by each country. The time period of spending is not clear for most countries.

     b- GDP in 2008, IMF.

     c- Australia works on a fiscal year basis 2009-10.

     d- The timeframe is two years, hence the package was divided by two.

Source: ILS, based on Bloomberg, CNBC and national newspapers.

Appendix A-16.3

Detailed Results

A. Consumption Effects of GFC
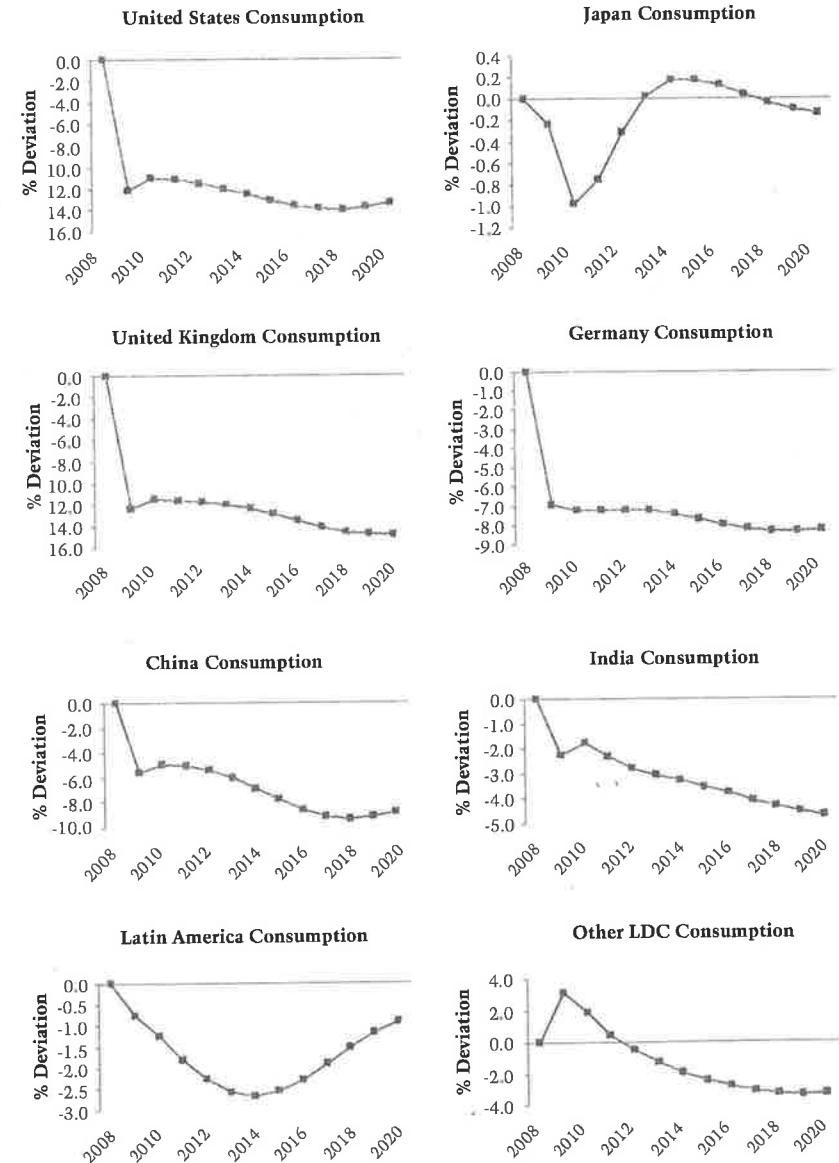
Source: G-Cubed model simulations.

B. Trade Balance Effects of GFC

United States Trade Balance

Japan Trade Balance

United Kingdom Trade Balance

Germany Trade Balance

China Trade Balance

India Trade Balance

Latin America Trade Balance

Other LDC Trade Balance
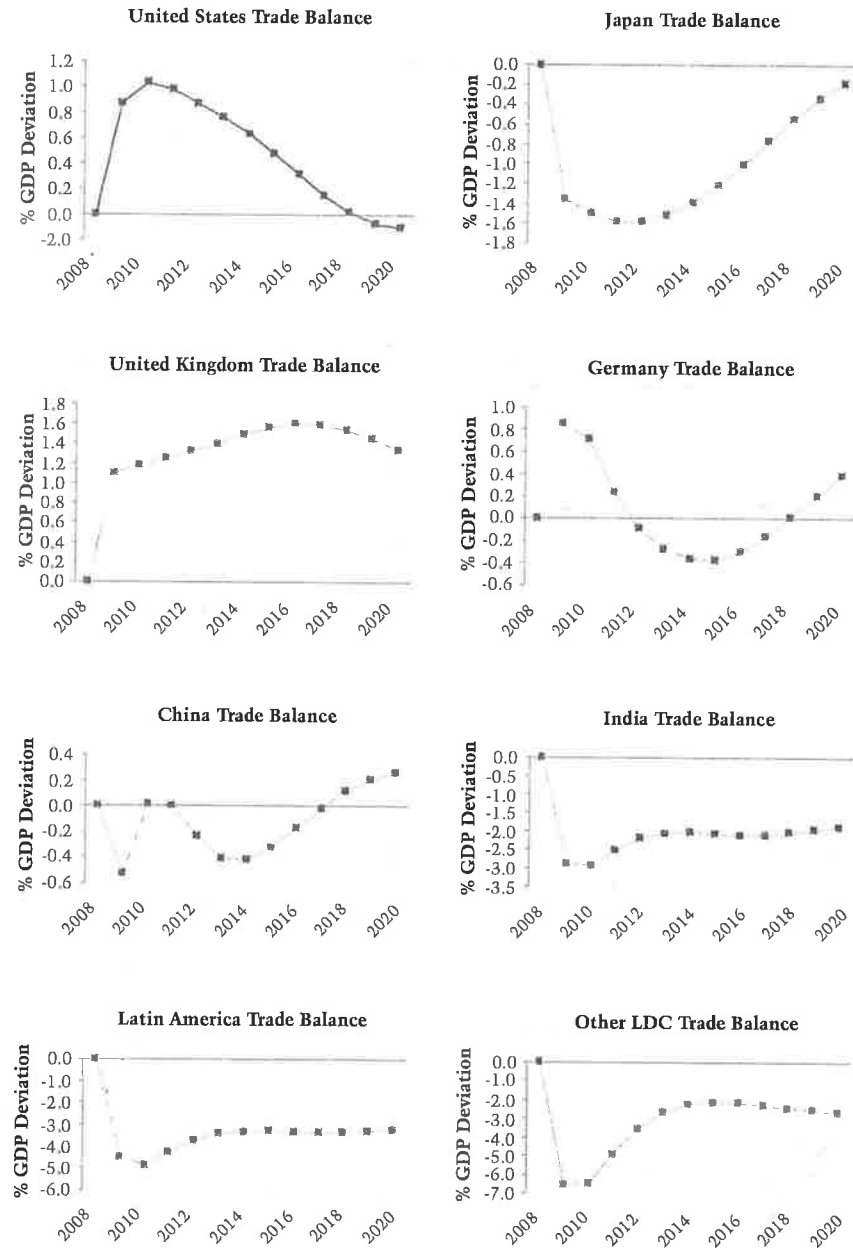
Source: G-Cubed model simulations.

C. Real Interest Rate Effects of GFC

United States Real Interest Rate

Japan Real Interest Rate

United Kingdom Real Interest Rate

Germany Real Interest Rate

China Real Interest Rate

India Real Interest Rate

Latin America Real Interest Rate

Other LDC Real Interest Rate
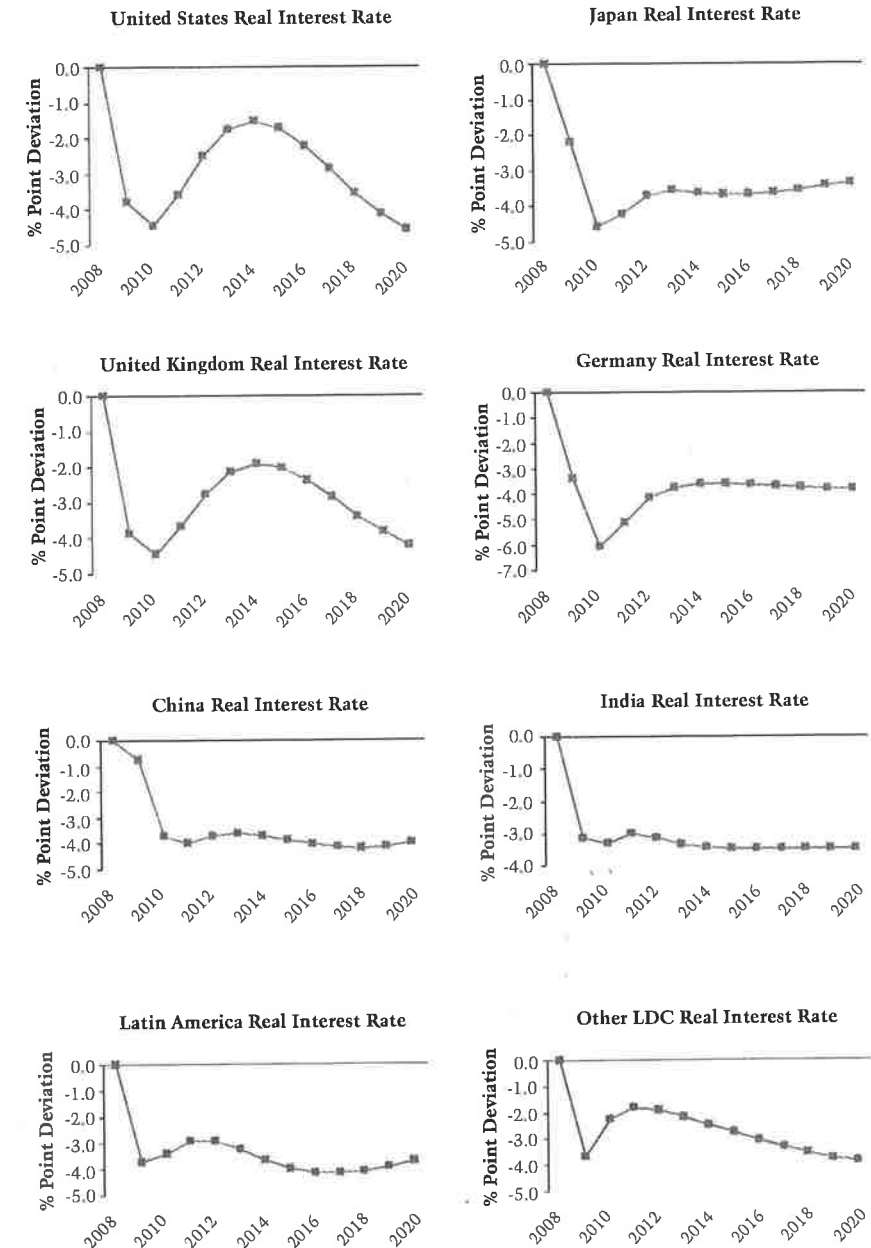
Source: G-Cubed model simulations.

D. Real Effective Exchange Rate Effects of GFC

United States Real Effective Exchange Rate

Japan Real Effective Exchange Rate

United Kingdom Real Effective Exchange Rate

Germany Real Effective Exchange Rate

China Real Effective Exchange Rate

India Real Effective Exchange Rate

Latin America Real Effective Exchange Rate

Other LDC Real Effective Exchange Rate
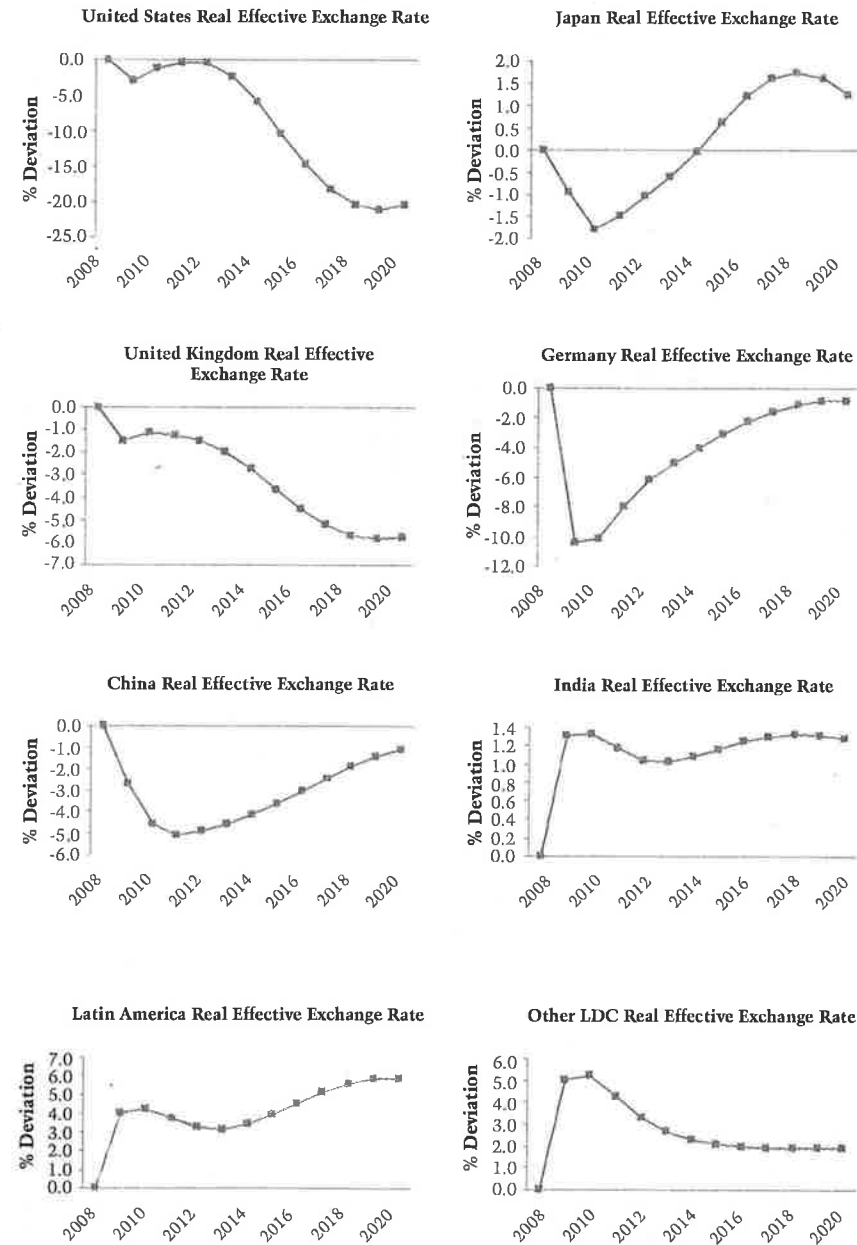
Source: G-Cubed model simulations.

E. Investment Effective of Fiscal Response

United States Investment

Japan Investment

United Kingdom Investment

Germany Investment

China Investment

India Investment

Latin America Investment

Other LDC Investment
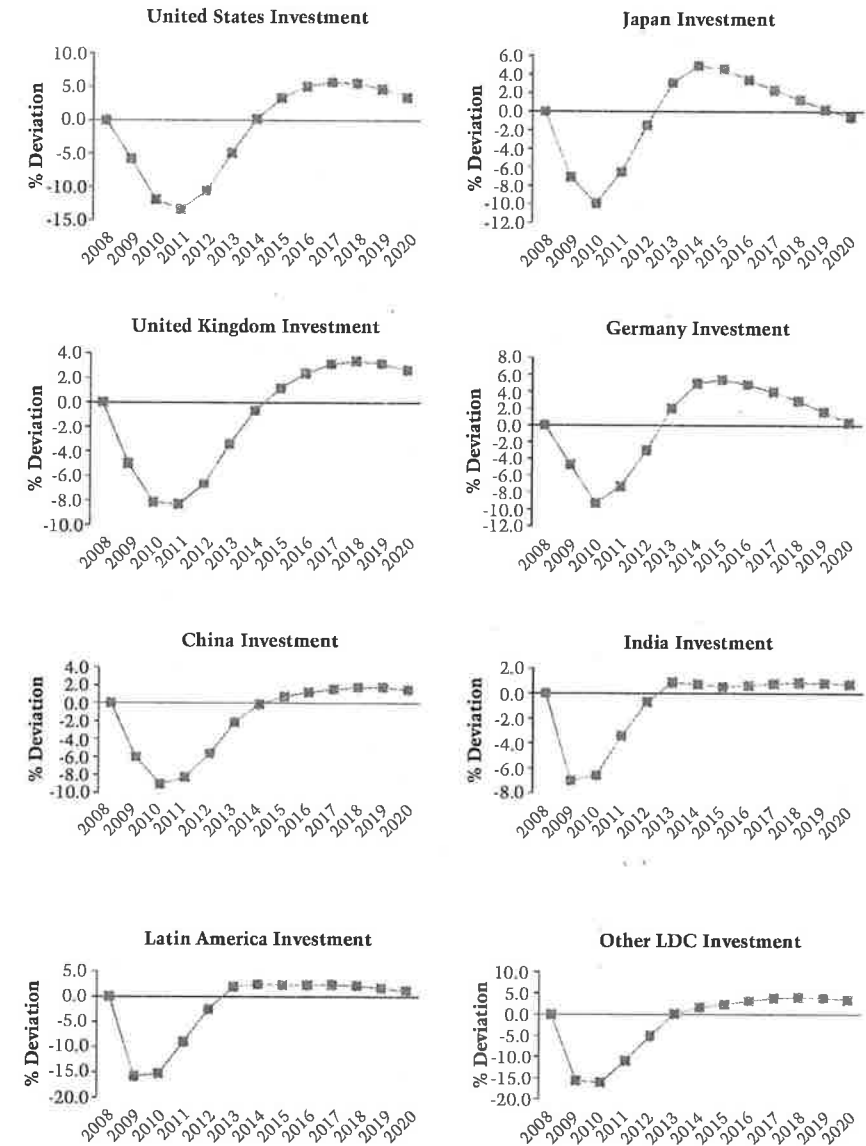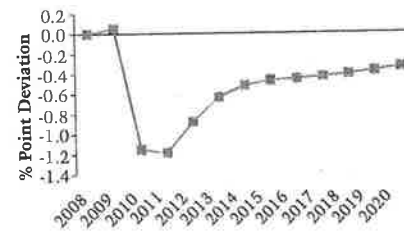
Source: G-Cubed model simulations.

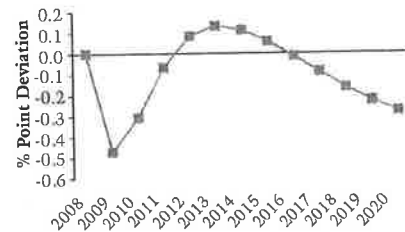## F. Real Interest Rate Effects of Fiscal Response
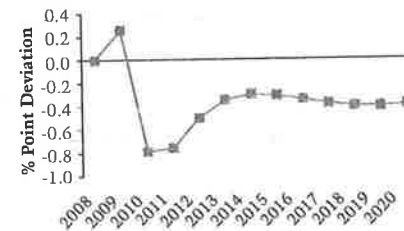

United States Real Interest Rate
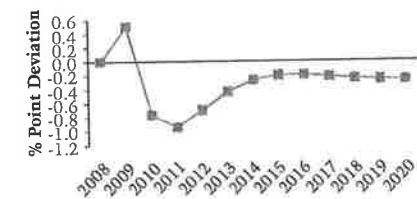
Japan Real Interest Rate

United Kingdom Real Interest Rate

Germany Real Interest Rate

China Real Interest Rate

India Real Interest Rate

Latin America Real Interest Rate

Other LDC Real Interest Rate
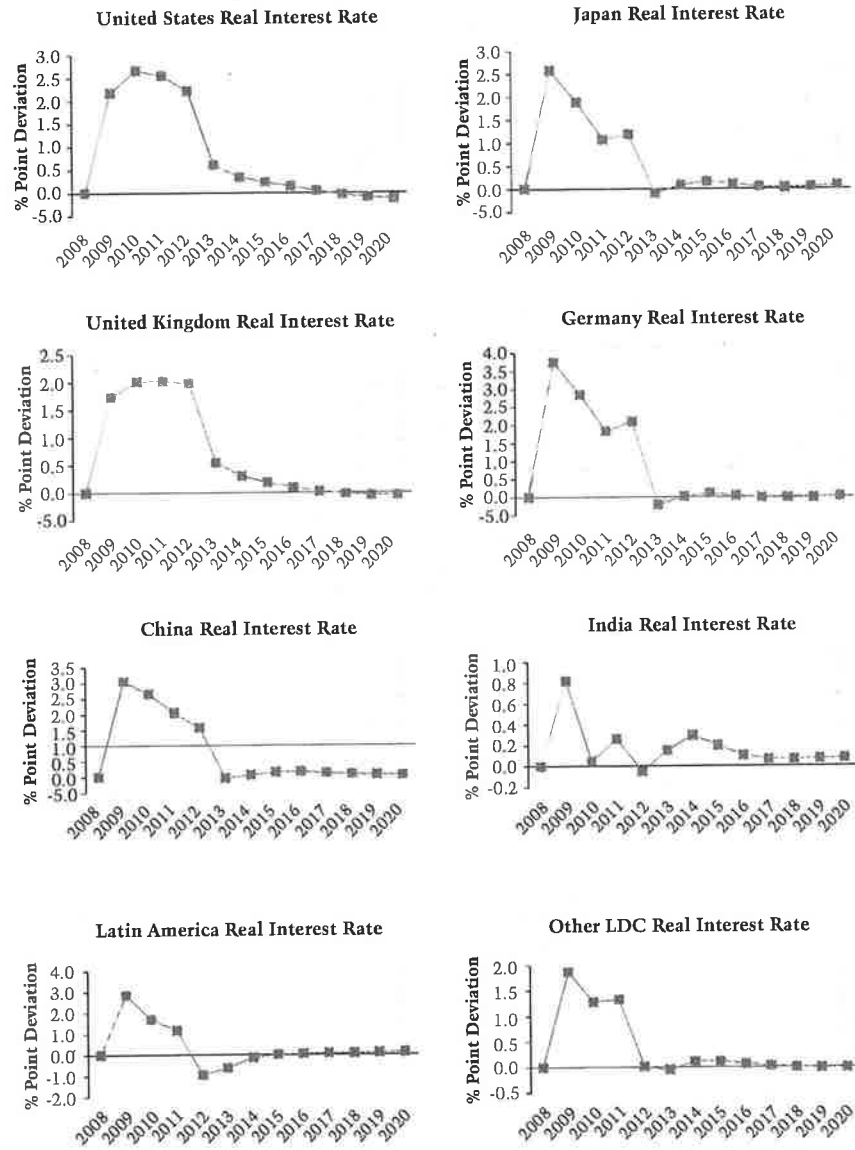
Source: G-Cubed model simulations.

G. Trade Balance Effects of Fiscal Response

United States Trade Balance

Japan Trade Balance

United Kingdom Trade Balance

Germany Trade Balance

China Trade Balance

India Trade Balance

Latin America Trade Balance

Other LDC Trade Balance
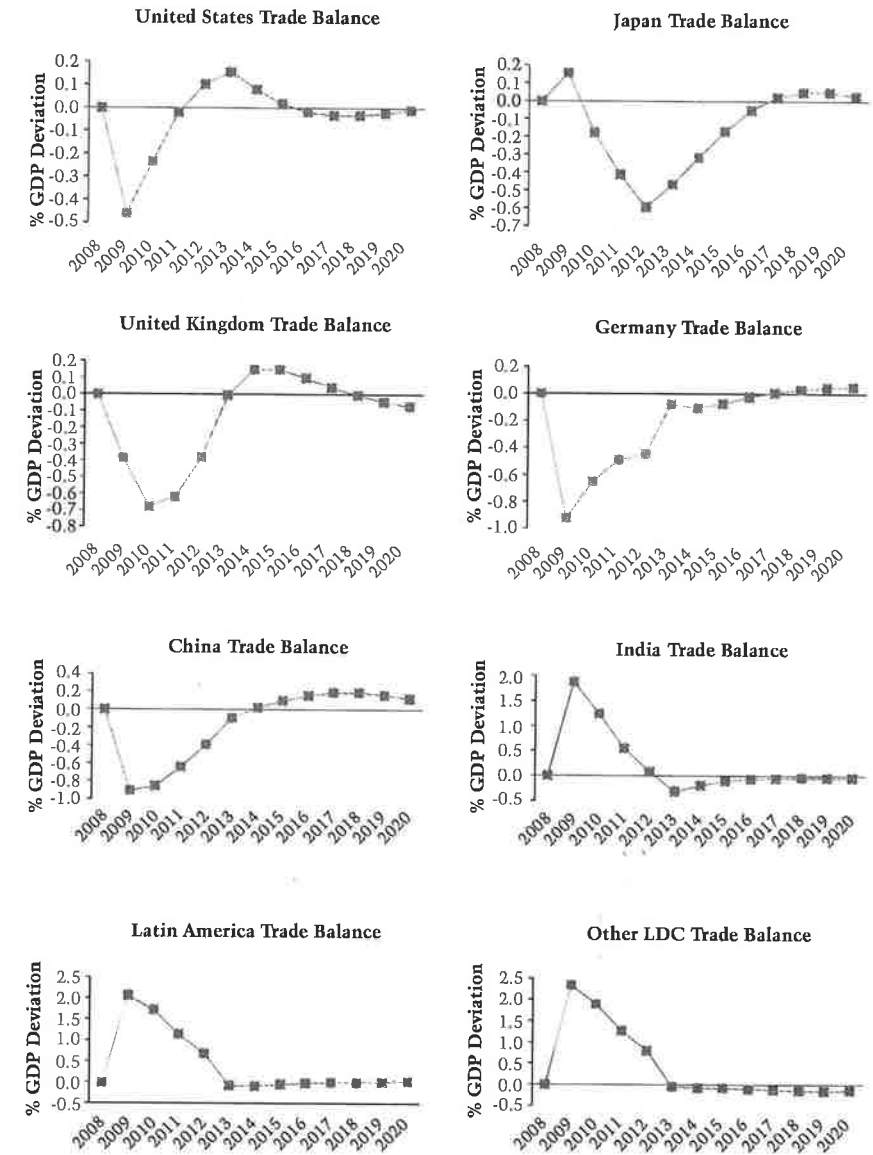
Source: G-Cubed model simulations.

H. Real Effective Exchange Rate Effects of Fiscal Response
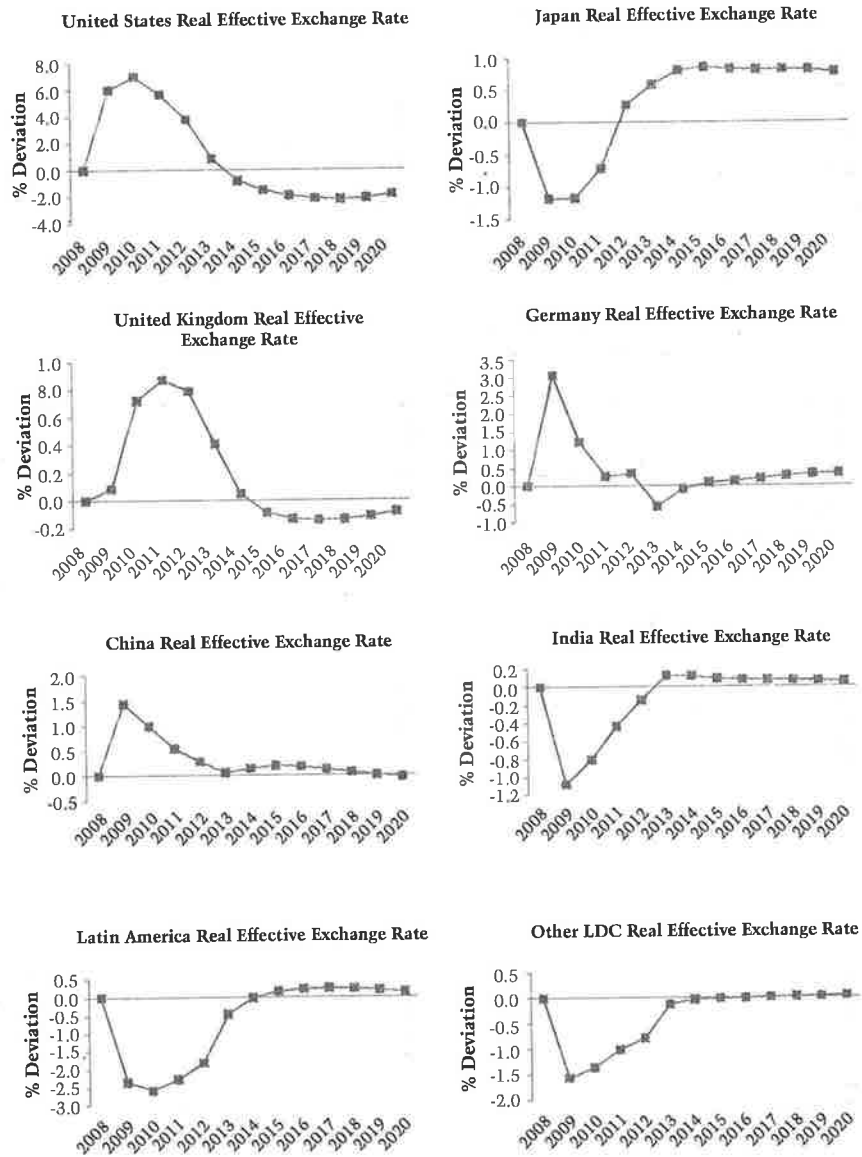
Source: G-Cubed model simulations.

I. Trade Effects of Tariff Rise
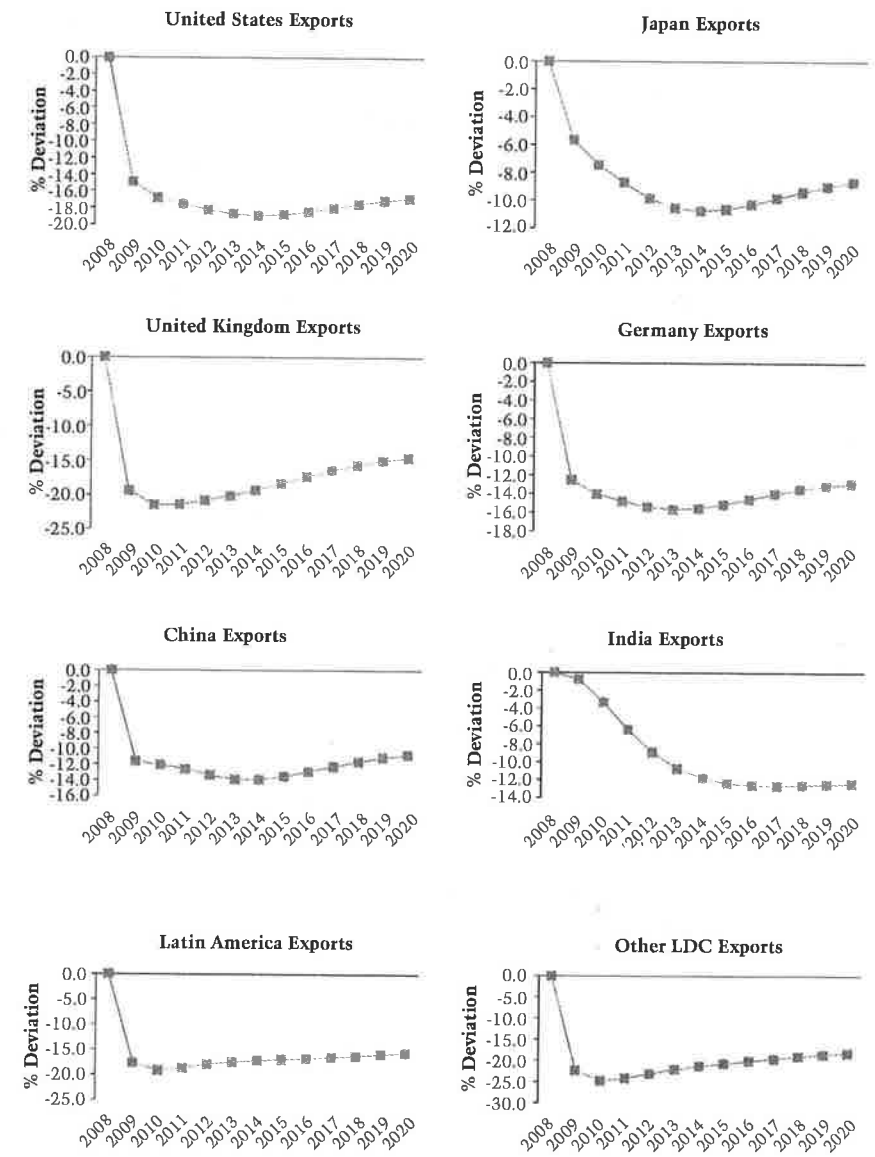
Source: G-Cubed model simulations.

J. Trade Balance Effects of Tariff Rise
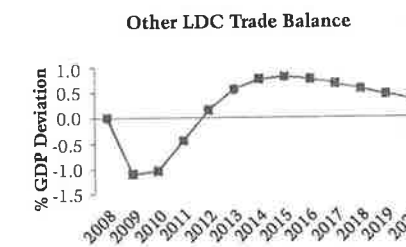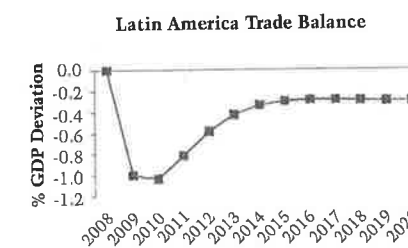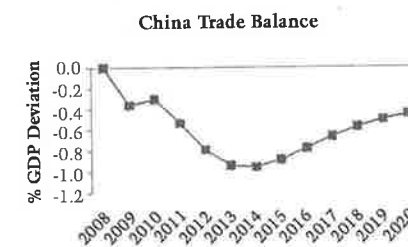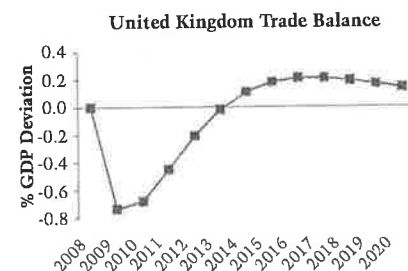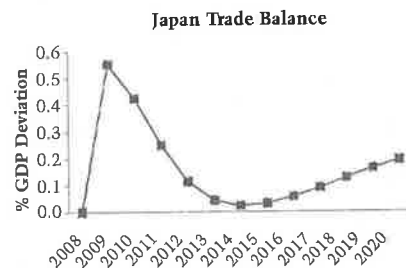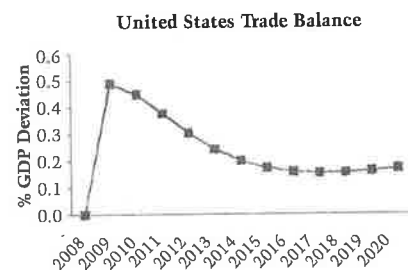
Source: G-Cubed model simulations.

K. Investment Effects of Tariff Rise
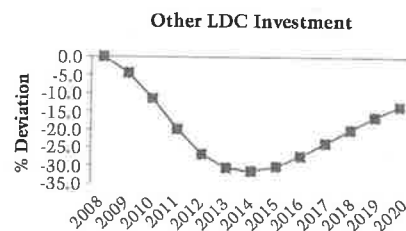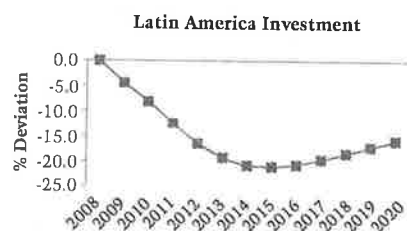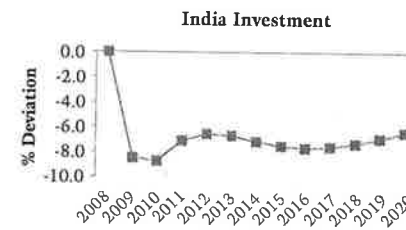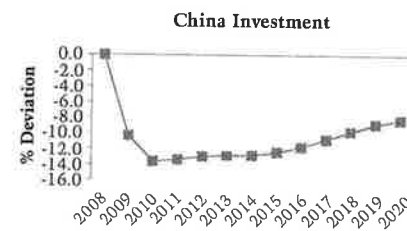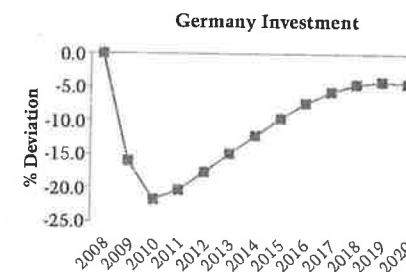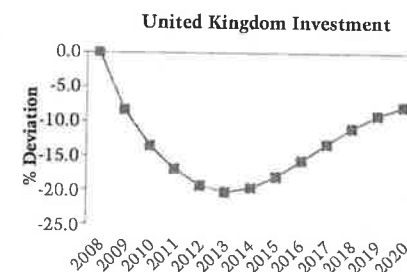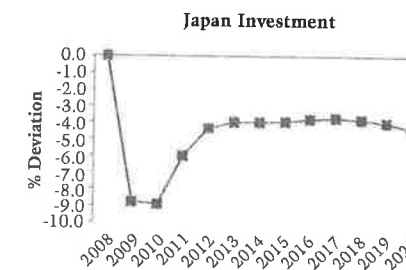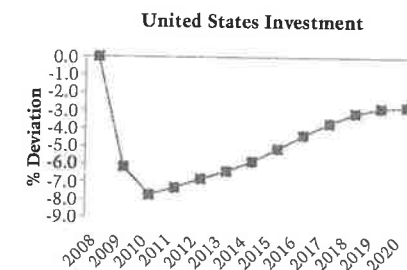
Source: G-Cubed model simulations.

L. Real Interest Rate Effects of Tariff Rise
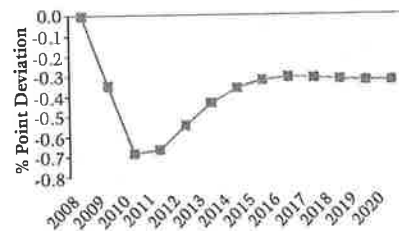
United States Real Interest Rate

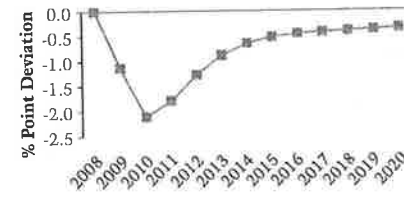### Japan Real Interest Rate

United Kingdom Real Interest Rate
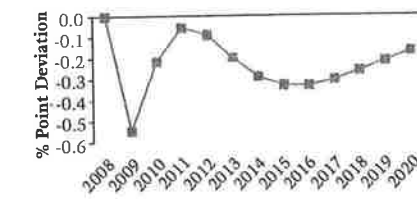

Germany Real Interest Rate

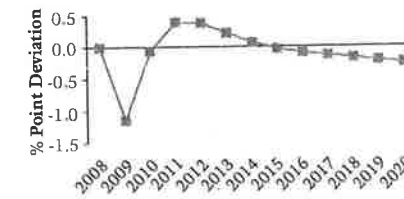### China Real Interest Rate

India Real Interest Rate

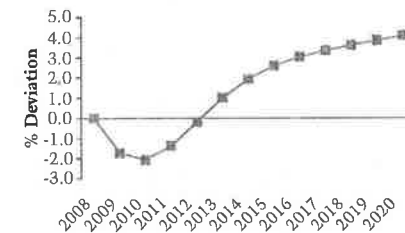### Latin America Real Interest Rate
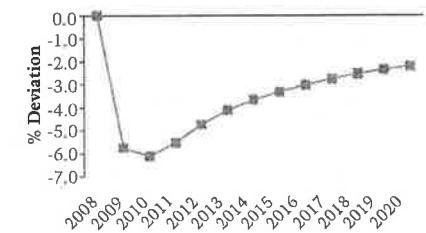

Other LDC Real Interest Rate

Source: G-Cubed model simulations.

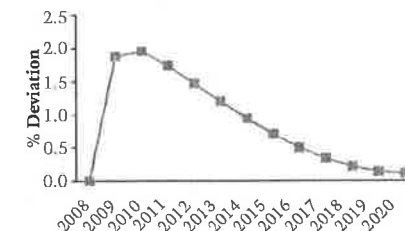## M. Real Effective Exchange Rate Effects of Tariff Rise

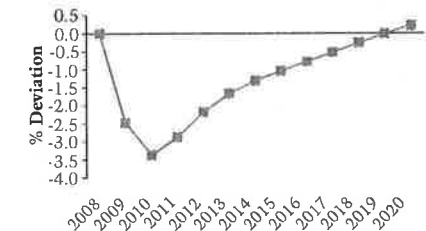### United States Real Effective Exchange Rate

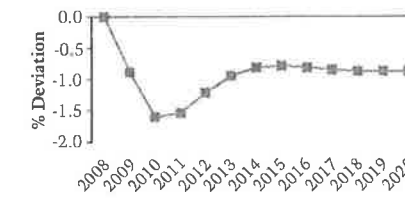### Japan Real Effective Exchange Rate

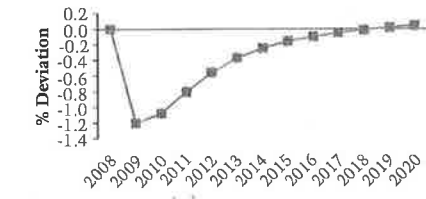### United Kingdom Real Effective Exchange Rate

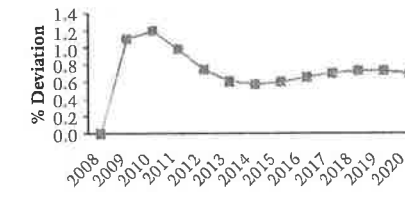### Germany Real Effective Exchange Rate

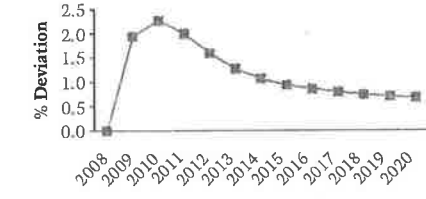
China Real Effective Exchange Rate

India Real Effective Exchange Rate

Latin America Real Effective Exchange Rate

Other LDC Real Effective Exchange Rate

Source: G-Cubed model simulations.

N. Additional Variables for GFC

(% deviation from baseline)	Gross Domestic Prod		Total Employment	
	2009	2010	2009	2010
United States	-3.51	-3.24	-7.19	-5.64
Japan	-1.63	-1.36	-3.59	-1.56
United Kingdom	-4.02	-3.35	-7.72	-5.41
Germany	-3.71	-2.96	-7.92	-4.16
Euro Area	-3.35	-3.05	-7.20	-5.17
Canada	-2.17	-1.94	-5.23	-3.64
Australia	-0.67	-0.82	-3.70	-2.57
ROECD	-2.87	-2.62	-5.67	-3.67
China	-4.39	-3.50	-9.63	-5.33
India	-1.06	-0.87	-4.64	-2.29
Other Asia	-1.29	-1.22	-5.84	-3.02
Latin America	0.27	-0.34	-2.86	-2.15
Other LDC	1.36	0.36	-0.64	-1.21
EEFSU	-1.75	-1.31	-6.69	-3.20
OPEC	-3.57	-2.37	-11.47	-3.75

O. Additional Sectors Variables

Output Prices (% deviation from baseline)	Energy		Mining		Agriculture		Durable Manufacture		Non-Durable Manufacture		Services	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
United States	-8.80	-5.30	-8.99	-6.66	-6.51	-4.28	-10.05	-7.46	-5.98	-3.57	-6.45	-3.42
Japan	-3.95	-2.86	-4.49	-3.71	-2.28	-2.71	-5.45	-4.28	-2.42	-2.68	-3.26	-3.14
United Kingdom	-9.66	-6.20	-9.39	-6.79	-5.63	-4.15	-9.38	-7.15	-6.19	-4.25	-7.14	-4.29
Germany	-7.85	-6.33	-7.51	-6.48	-5.79	-5.89	-7.06	-6.83	-6.34	-5.81	-10.97	-7.48
Euro Area	-8.31	-5.52	-7.18	-5.67	-5.38	-4.06	-9.12	-7.26	-6.19	-4.39	-10.02	-6.20
Canada	-5.16	-2.52	-6.58	-4.45	-3.38	-2.37	-7.18	-5.52	-3.32	-2.07	-3.92	-2.23
Australia	-7.28	-3.72	-7.87	-4.89	-3.20	-1.18	-7.62	-5.05	-3.78	-1.48	-3.55	-0.98
ROECD	-7.03	-4.41	-5.84	-4.67	-4.58	-3.62	-6.83	-5.79	-4.07	-3.31	-5.55	-3.96
China	-10.05	-8.55	-9.09	-8.90	-4.93	-6.81	-11.50	-10.07	-6.70	-7.22	-9.93	-8.69
India	-6.68	-4.05	-8.13	-5.88	-3.39	-2.13	-9.06	-6.08	-4.89	-3.08	-6.66	-3.59
Other Asia	-10.45	-7.47	-10.29	-8.26	-5.69	-5.39	-11.77	-9.24	-7.06	-5.93	-8.28	-6.20
Latin America	-6.85	-4.27	-8.51	-6.10	-4.15	-2.86	-10.48	-7.65	-4.58	-3.06	-4.15	-2.61
Other LDC	-7.50	-4.29	-6.76	-4.06	-1.33	0.10	-6.99	-4.58	-3.46	-1.56	-2.13	-0.54
EEFSU	-9.36	-7.21	-9.28	-7.67	-6.54	-6.18	-9.77	-7.98	-7.45	-6.48	-8.33	-6.54
OPEC	-14.34	-10.59	-14.73	-12.20	-10.05	-11.16	-17.53	-13.31	-12.73	-11.00	-17.69	-12.53

cond...

...contd...

Production (% deviation from baseline)	Energy		Mining		Agriculture		Durable Manufacture		Non-Durable Manufacture		Services	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
United States	-3.25	-3.01	-10.95	-11.16	-6.01	-5.63	-11.74	-12.66	-3.99	-2.74	-3.85	-3.10
Japan	-1.42	-0.65	-5.27	-3.30	-2.33	-1.09	-6.11	-4.56	-2.03	-0.68	-2.16	-1.17
United Kingdom	-4.25	-3.32	-12.12	-12.24	-6.79	-4.99	-12.40	-12.03	-5.21	-3.10	-4.63	-3.34
Germany	-3.46	-1.65	-5.86	-5.19	-5.63	-3.01	-9.85	-8.12	-3.90	-1.59	-2.75	-1.92
Euro Area	-2.51	-1.97	-5.60	-5.65	-4.86	-3.24	-8.69	-9.53	-4.27	-2.61	-3.28	-2.69
Canada	-1.40	-0.98	-8.16	-8.68	-3.71	-3.06	-9.59	-10.21	-2.68	-1.60	-2.88	-1.89
Australia	-1.98	-2.34	-5.60	-6.35	-1.66	-1.17	-5.78	-7.23	-1.27	-0.23	-1.54	-0.82
ROECD	-2.10	-1.43	-5.58	-4.95	-3.62	-2.30	-9.04	-8.75	-3.74	-1.79	-3.34	-2.18
China	-2.79	-1.85	-7.88	-6.45	-3.73	-2.21	-7.90	-6.85	-4.09	-1.98	-4.36	-3.05
India	-1.48	-1.28	-4.89	-5.02	-1.33	-0.32	-3.58	-4.16	-2.36	-1.26	-1.82	-1.35
Other Asia	-1.59	-1.30	-4.84	-4.36	-2.07	-1.00	-6.56	-6.21	-2.44	-1.09	-2.52	-1.55
Latin America	-1.86	-1.74	-7.16	-6.91	-2.03	-1.82	-4.71	-5.60	-0.42	-0.49	-0.80	-0.88
Other LDC	-1.95	-2.43	-2.76	-3.61	2.09	1.09	-1.36	-3.02	0.58	-0.02	0.53	-0.08
EEFSU	-2.87	-1.77	-6.28	-4.91	-2.37	-1.33	-6.85	-5.58	-2.47	-1.17	-2.25	-1.29
OPEC	-1.08	0.20	-7.20	-3.50	-9.54	-3.82	-8.03	-5.38	-7.59	-2.72	-4.53	-2.23

17

Liquidity Risk and Banks' Bidding Behaviour

Evidence from the Global Financial Crisis

Adam Geršl and Zlatuše Komárková*

Introduction

The concept of liquidity has received a renewed attention during the global financial crisis (GFC) that started in summer 2007 in the US sub-prime mortgage market. Before the crisis, economists and policymakers concentrated on causes and consequences of the global excess liquidity, a macroeconomic concept reflecting a sharp rise in credit and the money stock in period: 2003-2007. After the turmoil started, the focus shifted to microeconomic and structural concepts of both market liquidity of relevant financial markets and funding liquidity of financial institutions, mainly banks.

In this paper, we focus on two key dimensions of liquidity: market liquidity and funding liquidity. Markets are liquid if a market participant can trade assets without significantly changing the market price. Funding liquidity denotes a situation where an institution can meet outstanding obligations and is able to raise cash if needed. While conceptually different, the two notions of liquidity are interlinked, a hypothesis corroborated by the evidence from the GFC. Especially, in developed financial markets, such as those in the United States (US), the United Kingdom (UK) and the Euro area, there were occasions when liquidity in certain market segments dried out completely and, simultaneously, some financial institutions experienced problems with settling obligations in timely manner.

Financial Crises (GFC) seems to have been more
than many other previous crises. Every segment
l financial markets experienced tremors of the
isis, though at varying degrees. Interbank markets
economies were the first to be affected with severe
ssures as banks became reluctant to lend to
on fear of counterparty risks. The crisis evoked
ted policy responses, both domestically and
ally. Monetary authorities all over the world went
their customary roles and resorted to aggressive
asing. The forceful and coordinated policy actions
nave been successful in preventing a catastrophe.
l not remain unscathed and the global develop-
cted the financial and real activities in the second
-09. The present book focusses on how the GFC
ed the outlook of the investment community
rious industry sectors in developed as well as
countries. For this purpose, the book examines:
rends in various macroeconomic indicators and
otions; (ii) foreign investment in emerging markets;
onomy's response to an emerging post-crisis
t landscape. Given the changing shape of the
nomy, the book pays particular attention to the
le of emerging developing economies like India
ng global cross-border investment flows.

The Global Financial Crisis

CHALLENGES AND OPPORTUNITIES

Editors
R K Mishra
K Trivikram

CONTRIBUTORS

Ray Barrell • **Hans-H. Bleuel** • **Massimiliano Cali** • **Shaohua Chen**
Adam Geršl • **Leo F. Goodstadt** • **Dawn Holland** • **Srinivas Kolluru**
Zlatuše Komárková • **Isabella Massa** • **Ani Matei** • **Lucica Matei**
Anna McCord • **R.K. Mishra** • **Warwick J. McKibbin** • **Wayne M. Morrison**
Maurice Odle • **Lucjan T. Orlowski** • **Martin Ravallion** • **Andrew Stoeckel**
K. Trivikram • **Milo Vandemoortele** • **Paul Vandenberg**
Dirk Willem te Velde • **Yingbin Xiao**

AF
ACADEMIC FOUNDATION

Editors **R K Mishra** and **K Trivikram**