CHAPTER II

THE GLOBAL IMPLICATIONS OF THE U.S. FISCAL DEFICIT AND OF CHINA'S GROWTH

This chapter consists of two essays: the first examines the global implications of the U.S. fiscal deficit, while the second analyzes the impact on the world economy of China's emergence.

Specifically, the first essay investigates the potential medium-term impact of the U.S. budget deficit on economic activity in the rest of the world, global long-term interest rates, and the U.S. dollar. The essay finds that the U.S. fiscal expansion has so far provided important support to the global recovery without apparent adverse effects on long-term interest rates, but that there are reasons to be concerned that this cannot last. At some point, as U.S. government debt rises, the beneficial effects will almost certainly be eroded through some combination of withdrawal of fiscal stimulus and higher long-term interest rates. The latter concerns are particularly important for emerging market economies with high levels of foreign currency–denominated debt, as such countries are particularly sensitive to higher global real interest rates. The results presented in the essay suggest that, with growth in both the United States and global economies accelerating, a phased withdrawal of fiscal stimulus over the next few years, in a manner that pays due attention to incentives to work and invest in the United States, would be a sensible and prudent way to balance short- and long-term economic goals.

The second essay evaluates the global impact of China's rapid growth and continuing integration into the world economy. Although China's experience so far is broadly in line with previous historical episodes of rapid integration, including the post–World War II experiences of Japan, the Asian newly industrialized economies (NIEs), and ASEAN-4 countries, in the long run China is likely to play a much larger role in the global economy as its per capita income levels catch up with other emerging market economies in the region. While China itself clearly stands to gain the most from its growth, the impact on the rest of the world as a whole will also be beneficial, although likely smaller than the impact of other prospective global changes, such as multilateral trade liberalization, over the next decade or two. In particular, advanced economies will benefit from cheaper labor-intensive imports and greater demand for skill-intensive exports, while developing countries will see increased opportunities for exports to China, both of primary commodities and of manufactures for re-processing and re-export. However, countries whose factor endowments are similar to China's, and which compete most closely with it in world markets, will need to undertake sizable adjustments and display flexibility in product and labor markets, in order to avoid significant losses. In general, to maximize the gains from China's emergence, countries will have to increase the flexibility of their economies through structural reforms and speed up their own integration into the global economy. The advanced economies could significantly help any countries affected adversely by removing constraints on world trade, for instance in agricultural products.

How Will the U.S. Budget Deficit Affect the Rest of the World?

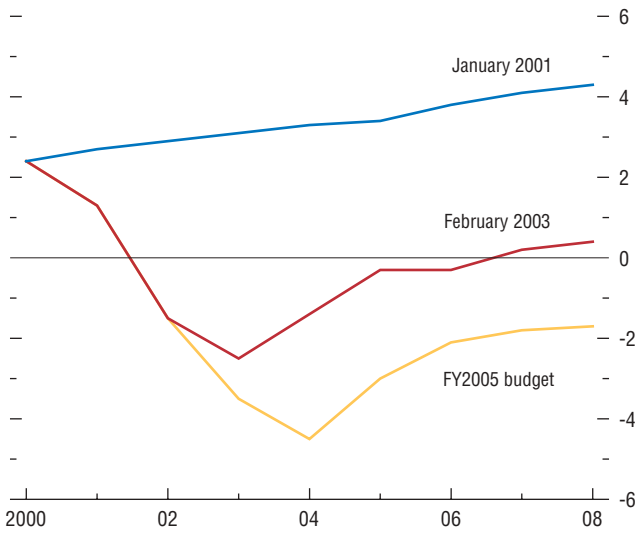
The main author of this essay is Nicoletta Batini. Ercument Tulun and Sarma Jayanthi provided research assistance.

Between 1992 and 2000, U.S. real output and aggregate demand grew rapidly, propelling the global economy. The favorable cyclical position and prudent fiscal policies led to a strong fiscal outlook, while higher productivity growth and a rapidly advancing stock market resulted in an investment boom and an expansion of the U.S. external deficit. From mid-2000, however, the

Figure 2.1. United States: Fiscal Balance

(Percent of GDP; fiscal years)

From an extremely strong position in FY2000, the U.S. fiscal outlook has deteriorated rapidly.



Sources: FY2001, FY2003, and FY2005 budgets of the U.S. government.

U.S. and global economy weakened significantly, following one of the largest stock market declines in the postwar period, the terrorist attacks of September 11, 2001, major corporate failures, and the war in Iraq. Active fiscal policies by the federal government to help restart the U.S. economy, together with extraordinary military and security-related spending linked to the war on terror, as well as the cyclical move from high to low growth, have resulted in a 7 percentage point deterioration in the U.S. ratio of budget deficit to GDP relative to FY2000—the largest such deterioration over such a short time span since World War II and equal to about 6 percent of world gross savings. Interest rates, however, have remained low as monetary policy has been accommodative and global investment tepid. The U.S. fiscal position is expected to remain in deficit for the next several years.

To date both the United States and the rest of the world have benefited from the U.S. fiscal stimulus. It has had a positive impact on U.S. output and foreign output—as the United States has increased imports from the rest of the world—without yet putting significant pressure on long-term interest rates. The U.S. fiscal expansion provided important support for global demand at a time when monetary policies—particularly in the United States and Japan—were already stretched. In its absence, the global recovery would most probably not have been as strong and broad as it has been in practice. However, many observers, including IMF staff, have expressed concern about the medium-term effects of the U.S. fiscal expansion, pointing to the potential implications of sustained and large U.S. fiscal deficits for global interest rates, productivity and income—especially as monetary policy returns to a more neutral stance and investment revives—as well as for the U.S. current account deficit, which has reached record-high levels, and the value of the U.S. dollar going forward. This essay discusses these issues by addressing the following questions.

- What will be the medium-term impact of the U.S. budget deficit on economic activity in the rest of the world?

Table 2.1. Cumulative Percentage Point Contributions to Budget Turnaround

	2000–04
Tax cuts	–2.5
Higher spending[1]	–2.1
Cyclical factors	–1.5
Losses in revenue buoyancies	–0.7
Total	–6.8

Source: Congressional Budget Office (2003a).
[1]Discretionary spending, debt service, and other legislation.

- What are the consequences of the higher U.S. public debt, current account deficit, and net foreign liabilities for the U.S. dollar and, eventually, world economic activity?
- Are there specific consequences for emerging market economies from the current U.S. fiscal outlook?
- Can the United States avert the future undesired consequences of its fiscal policies, and if so how, given what we know from similar fiscal episodes in the past?

How Worrisome Is the U.S. Fiscal Outlook?

From an extremely strong position in fiscal year 2000, the U.S. fiscal position has deteriorated rapidly (Figure 2.1). The U.S. federal government's unified budget has shifted from a surplus of 2½ percent of GDP ($236 billion) in FY2000 to an estimated deficit of 4½ percent of GDP ($521 billion) in FY2004.[1] This reflects, in approximate order of importance, tax cuts, higher discretionary and nondiscretionary spending, cyclical factors, and, finally, losses in revenue buoyancies from capital gains taxes following the burst of the equity bubble in the late 1990s (see Table 2.1).

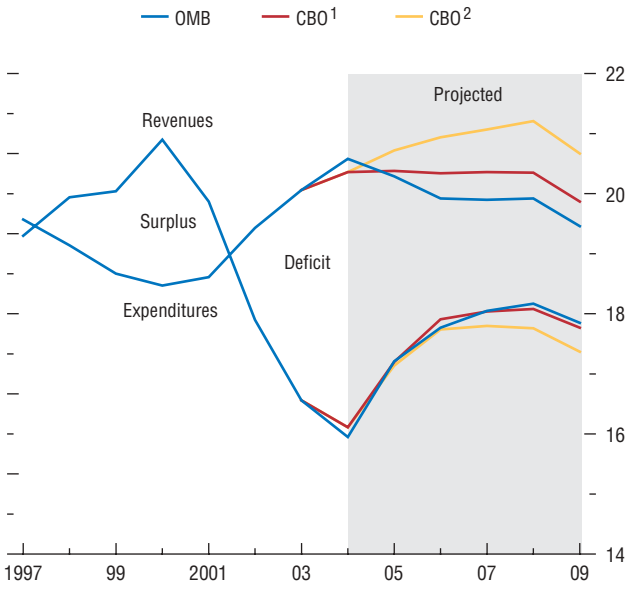
In the five years after 2004 the U.S. Administration projects that the deficit will fall to roughly half its FY2004 level (Figure 2.2). This projected decline is predicated on a series of somewhat optimistic assumptions about government operations, including a comeback in rev-

[1]For a detailed analysis of recent U.S. fiscal policies see Mühleisen and Towe (2004).

Figure 2.2. United States: Fiscal Risks

(Percent of GDP; fiscal years)

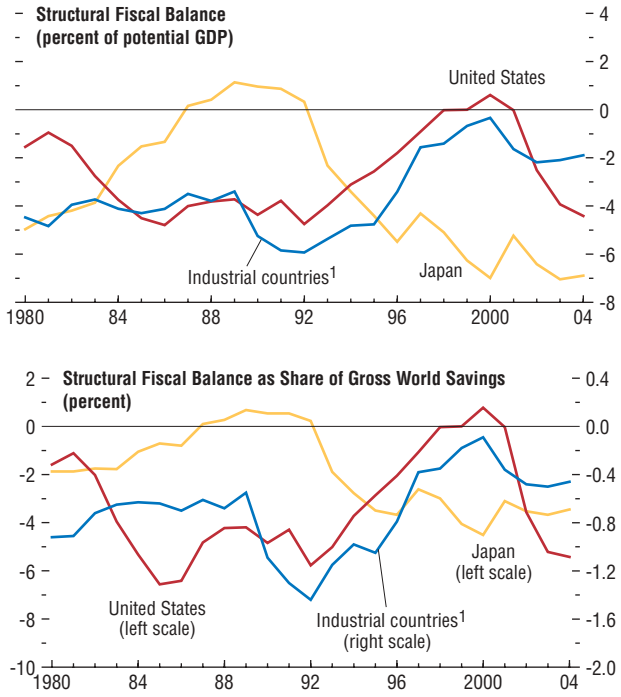
In the five years after 2004 the U.S. Administration projects a halving of the fiscal deficit, but the Congressional Budget Office has a more pessimistic view.



Sources: FY2005 budget of the U.S. government (OMB); and Congressional Budget Office (CBO).
Note: All fiscal balance numbers are expressed as percent of GDP, while GDP figures are IMF estimates.
[1]CBO 2004 baseline adjusted by extending expiring Economic Growth and Tax Relief Reconciliation Act (EGTRRA) and Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA) tax provisions.
[2]CBO 2004 baseline adjusted by extending expiring Economic Growth and Tax Relief Reconciliation Act (EGTRRA) and Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA) tax provisions, and assuming a reform of the Alternative Minimum Tax as well as an increase in discretionary appropriations by the rate of inflation after 2004.

Figure 2.3. Structural Fiscal Balances of Advanced Countries

With the exception of Japan, today the deterioration in the fiscal position is largely limited to the United States, unlike in the 1980s. The current U.S. budget deficit is about 6 percent of world gross savings.



Source: IMF staff calculations.
[1]Canada, France, Germany, Italy, and the United Kingdom.

enue buoyancies, no reform of the Alternative Minimum Tax (AMT)—which is neither indexed for inflation nor adjusted to compensate for the recent tax cuts and will affect a growing number of people—no costs to U.S. taxpayers of peacekeeping operations in Iraq beyond FY2004, and a strict containment of non-defense and non-homeland-security-related spending in the coming years. Clearly, if these assumptions did not materialize, the fiscal outlook would turn out to be considerably worse. The Congressional Budget Office (CBO), for example, has provided estimates of the path of the deficit if real discretionary spending per capita (including defense and homeland security) were held constant and Congress amended the AMT, while leaving other administration assumptions unchanged. They project that under this scenario actual U.S. fiscal deficits—instead of halving—would stay close to their current level as a ratio to output over the next decade (Figure 2.2).[2] Of course, the fiscal outlook also depends on the growth of activity and hence could improve if productivity growth exceeds expectations in the coming years. From a historical perspective, the speed of deterioration in the deficit has few parallels. The budget turnaround from FY2000–04 as a ratio to GDP is the fastest in the past fifty years and nearly double the previous worst four-year setback since the Korean War. In level terms, the current federal deficits are large but not unprecedented as a ratio to GDP. The projected deficit in FY2004 is similar in magnitude to those seen in the mid-1980s following the tax cuts embodied in the Economic Recovery Tax Act of 1981, when a phased reduction in personal income tax rates starting in 1982 and boosts to military expenditures increased the U.S. structural deficit (Figure 2.3). The large shortfalls of the mid-1980s continued into the 1990s, despite more optimistic

[2]To aid comparability with the administration's Office of Management and Budget (OMB) estimates, Figure 2.2 also shows CBO (2004) baseline estimates adjusted only by extending expiring tax provisions from the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) and from the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA).

projections by the administration at the time. They eventually disappeared following a series of painful efforts to impose fiscal rules intended to reduce and then eliminate budget deficits.

This experience suggests that a sustained effort may be required to reduce the current U.S. fiscal deficit. Whether this task will prove more or less difficult than in the 1980s and 1990s depends on both the relative size of today's and previous deficits and on the U.S. current conjuncture relative to that back then. On the positive side, today the U.S. economy looks potentially stronger than in the 1980s, and, with the exception of Japan, the deterioration in the fiscal position is largely limited to the United States, although the situation elsewhere is inevitably somewhat mixed (Figure 2.3). On the negative side, however, pressures on the budget are likely to increase steadily over coming years owing to the retirement of the baby boom generation, which will commence in 2012, and to greater longevity, increasing the urgency of consolidation.[3] Moreover, today the external position of the United States is weaker, involving record-high current account deficits and rapidly growing net foreign liabilities, and so it is more vulnerable to changes in sentiment in exchange rate markets.

What Is the Impact of a U.S. Fiscal Expansion?

A fiscal expansion in the United States can affect the world economy through four key channels. First, it boosts economic activity at home and abroad via a demand-side effect, the so-called short-run "fiscal multiplier." The impact on activity depends on the composition of the expansion and the resulting upward pressures on interest rates and the exchange rate, which will tend to be smaller if the monetary authorities accommodate the fiscal stimulus. Second, over the medium term, the imbalance either reduces private consumption (because higher private saving is needed to make up for public dissaving) or lowers private investment, or both, through a mechanism called crowding out. The eventual cost is lower global productivity growth and income. Third, changes in tax rates affect U.S. incentives to work and save. Finally, the expansion puts further pressure on the U.S. current account position in the short term, and creates a need to service higher U.S. debt and debt payments to the rest of the world over time, which erodes the value of the dollar, lowering consumption in the United States and increasing it elsewhere. These four channels, and their relative importance, are briefly discussed below.

Short-Run Fiscal Multipliers

A fiscal expansion implemented through tax cuts and higher government spending raises disposable income and directly expands aggregate demand via increases in government consumption. As the extra income gets spent, demand rises by a multiple of the initial increase, the so-called "fiscal multiplier." While there is a wide range of estimates of the size of this multiplier (0.1–1.6), partly reflecting a range of technical assumptions (including the response of monetary policy), typical results from both recent regression exercises and large macroeconomic models (summarized in Tables 2.2 and 2.3, respectively) suggest that the impact of a fiscal expansion is significantly positive; it is generally larger for government spending increases than tax cuts; and it wears off over time. In addition, multicountry models also suggest that about one-fourth to one-half of the impact on the United States spills over to the rest of the world.

These findings have been complemented by a large literature that looks at how the size, composition, and initial conditions of the fiscal shock affect the size and sign of the short-run fiscal multipliers.[4] This literature, which focuses on the impact of fiscal contractions as experienced

[3]The CBO has projected that federal spending on Social Security, Medicare, and Medicaid will rise from 9 percent of GDP in 2010 to 14 percent in 2030 (CBO, 2003b). IMF staff estimates based on an intergenerational accounting framework predict analogous increases (see Cardarelli and Towe, 2004).

[4]For a review of this literature see, among others, Alesina and Ardagna (1998).

Table 2.2. Effects of Fiscal Policy on Output (VAR Estimates)

Study	Sample	Spending Multipliers			Tax Multipliers		
		Impact	Peak[1]	Long-term	Impact	Peak[1]	Long-term
Blanchard and Perotti (2002)	1960–97[2]	0.8	1.3 (15)	1.0	0.7	0.8 (5)	0.2
	1960–77[1]	0.9	0.9 (1)	0.7	0.7	1.3 (7)	1.3
Fatás and Mihov (2001)	1960–99	0.1	0.3 (16)	0.2	. . .	. . .	. . .
Mountford and Uhlig (2002)	1955–2000	0.2	0.5 (3)	. . .	0.2	0.4 (9)	. . .
Perotti (2002)	1960–2000	0.4	1.1 (15)	1.0	0.3	0.8 (7)	0.5
	1960–79	0.7	1.6 (10)	−0.6	0.4	1.1 (13)	0.8
	1980–2000	0.1	0.5 (3)	−1.3	0.2	0.2 (1)	0.1

[1]Figures in parentheses are calendar quarters after impulse when peak response occurs.
[2]Assuming stochastic trend for output.

Table 2.3. Estimates of Multipliers from Macromodel Simulations

Study and Model(s)	Simulation	Multipliers			
		United States		Rest of the world	
		Short-term	Long-term	Short-term	Long-term
Bryant and others (1988) (various models)	Sustained increase in real government consumption of 1 percentage point of GDP	1.2	0.65	0.6	0.3
	Sustained increase in personal income taxes of 1 percentage point of GDP	−1	1	−0.5	0.5
Dalsgaard, André, and Richardson (2001) (OECD INTERLINK)	Sustained increase in government consumption of 1 percentage point of GDP	1.1	0.1	0.55	0.05
	Sustained reduction in personal income taxes of 1 percentage point of GDP	0.6	0.3	0.3	0.15
WEO May 1996 (MULTIMOD)	Sustained reduction in government consumption of 1 percentage point of GDP	−1.1	0.6	−0.55	0.3
	Sustained increase in personal income taxes of 1 percentage point of GDP	−0.7	0.2	−0.35	0.1
Reifschneider and others (1999) (FRB/U.S.)	Sustained increase in government consumption of 1 percentage point of GDP	1.4	1.1	0.7	0.55
	Sustained increase in personal income taxes of 1 percentage point of GDP	−0.4	−1.5	−0.2	−0.7
Oxford World Macroeconomic Model (2000)	Sustained increase in government consumption of 1 percentage point of GDP	1.2	0.3	0.6	0.1
	Sustained increase in personal income taxes of 1 percentage point of GDP	−1.4	−0.6	−0.7	−0.3

by European countries in the 1990s, indicates that the negative effects on activity are smallest when changes in the fiscal stance are credible and incentive friendly. This suggests that the size of the multipliers of today's U.S. fiscal expansion may ultimately depend on the credibility of planned future consolidations and on the ultimate impact on incentives.

Crowding Out

Sustained fiscal deficits lower national savings in the United States, creating an imbalance between total savings and investment, and eventually raise real interest rates both in the United States and abroad, thus crowding out global private investment. The extent to which this occurs depends on four main factors. First, a higher deficit may cause consumers to raise saving in expectation of higher taxes at some point in the future, an effect that both lowers the size of the short-term fiscal multiplier and reduces the need for a subsequent adjustment in private saving and investment, thus lowering crowding out. Second, much depends on the relative sensitivity

Table 2.4. Estimates of Effect of FY2004 Budget Proposals from Small-Scale Models
(Average change in GDP from CBO's baseline, percent)

	2004–08	2009–13
Textbook growth model	–0.2	–0.7
Closed economy life-cycle growth model		
Lower government consumption after 2013	–0.3	–1.5
Higher lump-sum taxes after 2013	0.5	0.3
Open economy life-cycle growth model		
Lower government consumption after 2013	–0.6	–0.5
Higher lump-sum taxes after 2013	0.3	0.6
Infinite horizon growth model		
Lower government consumption after 2013	0.2	–0.6
Higher lump-sum taxes after 2013	0.9	1.4

Source: Congressional Budget Office (2003c).

of consumption and of investment to the real interest rate. If consumption is not very sensitive to real interest rates compared with investment, crowding out will be stronger as higher real interest rates are needed to curb consumption, and so investment falls by more. Third, the final extent of crowding out also depends on how monetary policy responds to the fiscal expansion. If the fiscal stimulus is accompanied by easy monetary conditions, as is currently the case in the United States, the rise in real interest rates may not materialize fully at the beginning, and so crowding out will be smaller initially—although rates will eventually have to rise as inflation starts increasing after the fiscal-monetary expansion. Fourth, if international asset markets are closely linked, part of the crowding out will be transferred to the rest of the world through higher foreign real interest rates.

Model-based evidence supports the existence of a significant degree of crowding out. For example, a CBO study (CBO, 2003c) using a variety of macroeconomic models found that the FY2004 budget proposals would lower GDP between ½ and 1½ percent below baseline during 2009–13 (Table 2.4). A number of empirical studies also find a significant impact of fiscal deficits on real interest rates, although the range of estimates is wide (Table 2.5). This evidence on the impact of deficits is broadly consistent with Elmendorf and Mankiw (1999), who examine the effect of a rise in the debt-to-GDP ratio on real interest rates, and with Gale and Orszag (2002), who survey a number of large macroeconomic models.

The impact on the rest of the world depends crucially on the degree to which U.S. and foreign asset markets are linked and hence foreign real interest rates rise following a U.S. fiscal expansion. Evidence suggests that over time changes in U.S. interest rates feed through about one-to-one to foreign interest rates, implying that, in the long run, the rest of the world is

Table 2.5. Selected Studies on the Impact of Deficits on Real Interest Rates

	Crowding-Out Effect (basis points)[1]	Interest Rates Considered	Fiscal Variable	Business Cycle Regressor
Laubach (2003)	23	10-year treasury bond yield expected over the next 5 years	CBO 5-year-ahead forecast	No
Laubach (2003)	36	5-year treasury bond yield expected over the next 5 years	OMB 5-year-ahead forecast	No
Laubach (2003)	9	10-year treasury bond yield	CBO 5-year-ahead forecast	No
Canzoneri, Cumby, and Diba (2002)	60	Slope of yield curve (10-year note less 3-month bill)	CBO 5-year-ahead forecast	No
Canzoneri, Cumby, and Diba (2002)	40	Slope of yield curve (10-year note less 3-month bill)	CBO 10-year-ahead forecast	No
Elmendorf (1993)	49	Change in 3-year treasury bond yield	DRI forecast of deficit-to-GDP ratio	Unemployment rate

[1]Increase in interest rates caused by a 1 percentage point rise in the deficit-to-GDP ratio.

Table 2.6. Correlations of G-7 Real Interest Rates (1977–2002)[1]

	Canada	Germany	United Kingdom	Japan	United States	France	Italy
Canada	1						
Germany	0.7	1					
United Kingdom	0.6	0.4	1				
Japan	0.7	0.7	0.5	1			
United States	0.6	0.3	0.5	0.5	1		
France	0.6	0.5	0.6	0.7	0.5	1	
Italy	0.7	0.5	0.7	0.5	0.5	0.8	1
World	0.8	0.8	0.7	0.8	0.6	0.8	0.8

Source: OECD.

[1]Interest rates are 12-month Euromarket interest rates deflated by the same period CPI inflation rate. The world real interest rate is the simple average of national rates.

affected in a similar manner to the United States. Correlations between real interest rates for industrialized countries are all positive, significant and sizable, suggesting the existence of a "world" real interest rate (Table 2.6).[5] These estimates suggest that the 15 percentage point increase in the U.S. public debt ratio projected over the next five years by the CBO could increase global real interest rates by ½ percentage point or more,[6] dampening global consumption and reducing capital accumulation in the rest of the world in a similar manner to the United States.

The implications of higher U.S. real interest rates go beyond crowding out, particularly for countries whose access to global financial markets is less secure (see Box 2.1). Emerging markets, particularly those with high levels of external debt indexed to U.S. interest rates, are directly affected through higher cost of finance and worsened fiscal positions. In practice, the cost of finance generally rises by more than the increase in U.S. interest rates as the increase in the debt burden weakens financial conditions and raises risk premia. Even in the absence of explicit indexing, fiscal positions in these countries can deteriorate as global interest rates increase and money tends to flow toward safer assets. Finally, higher U.S. interest rates increase financial fragility in these countries as they can potentially trigger capital outflows.[7]

Incentives to Work and Save

The negative effects of crowding out can be mitigated to the extent that tax cuts reduce distortions that affect the labor market and firms' decisions to invest and so generate supply-side benefits.[8] The size of these effects is again an area of significant uncertainty—estimates from the literature, reported by the Council of Economic Advisers, suggest that the proposed tax cuts could generate potential gains between 2 and 6 percent of GDP in the medium term (Council of Economic Advisers, 2003). Others, however, suggest that the incentive effects are much smaller, and in any case many of the supply-side-friendly elements of the tax cuts announced in the 2001 administration's proposal—such as the elimination of double taxation of corporate income—were watered down in the legislative process.[9] More fundamentally, if budgetary consolidation through spending

[5]See Helbling and Wescott (1995), Ford and Laxton (1999), Orr and Conway (2002), and Mühleisen and Towe (2004).

[6]For a discussion, see the staff report on the latest Article IV consultation with the United States (IMF, 2003).

[7]The Latin American debt crisis of the 1980s is a dramatic example of the links between U.S. interest rates and emerging markets' finances.

[8]See Chapter III for further evidence on the impact of comprehensive tax reforms on growth.

[9]Angrist (1991) and Blundell, Duncan, and Meghir (1998) suggest the incentive effects of taxes on work are small (for broader surveys, see Pencavel, 1986, 2002). Likewise, it has been argued that the effect on investment from reducing taxes on dividends may be negligible because increased dividend payouts could reduce funds available for new capital spending (Gale and Orszag, 2003).

Box 2.1. How Do U.S. Interest and Exchange Rates Affect Emerging Markets' Balance Sheets?

As discussed in the main text, increases in the U.S. fiscal deficit have an impact on the rest of the world through a variety of real sector channels, in aggregate tending to raise output in the short term but depressing it over the medium term, as global interest rates rise. For emerging market economies, however, the changes in U.S. interest rates and exchange rates induced by U.S. fiscal deficits can generate additional short-term effects through a range of financial channels. Notably, higher U.S. interest rates tend to reduce net capital inflows into emerging markets (see, for example, Calvo, Leiderman and Reinhart, 1996); worsen fiscal positions, since much emerging market public debt is indexed to U.S. or world interest rates;[1] and—in emerging markets where exchange rates are linked to the dollar—lead to intervention that tightens monetary conditions.

In addition, changes in U.S. interest rates and exchange rates can have important effects on private sector balance sheets in emerging market economies, through a mechanism called the "financial accelerator." The financial accelerator works broadly as follows. Lenders to firms in emerging market countries are uncertain about the ability of borrowing firms to repay loans and so they ask borrowers to post collateral, in the form of real or financial assets, when lending to them. If a shock—such as a U.S. fiscal expansion—raises real interest rates, this reduces both domestic demand in emerging market countries and the value of the collateral that has been posted. In response, lenders increase the premiums on their loans, raising the cost of both old and new borrowing to firms, who correspondingly cut investment back, further exacerbating the downturn (the "financial accelerator effect"). The same mechanism operates in reverse if interest rates fall. Since lenders to firms in the emerging market country generally prefer to lend in dollars—a phenomenon called "original sin"[2]—there is also an important role for the exchange rate. Shocks that lead to an appreciation of the U.S. dollar—and thereby a depreciation of the emerging market's currency—tend to worsen the corporate balance sheets of emerging markets, especially when these have borrowed in dollars and produce goods for domestic markets—which can again lead to a rise in risk premia and exacerbate an economic contraction.

Against this background, the impact of a sustained 1 percent increase in the U.S. fiscal deficit—achieved through a tax reduction—leading to a 10 percentage point rise in the debt-to-GDP ratio over the medium term on emerging markets is examined, using simulations of a two-country quarterly U.S.–emerging market model embodying a financial accelerator mechanism extended here to incorporate explicitly a fiscal sector.[3] The emerging market model is parameterized to represent a prototypical Latin American country with an average corporate leverage ratio (i.e., firms' average ratio of total liabilities to total assets) of 50 percent. In addition, it is assumed that external debt is 50 percent of GDP and exports are 20 percent of GDP. To illustrate the impact of the exchange rate channel, two different simulations are run assuming that emerging market external debt is either denominated entirely in local currency (blue lines in the figure) or entirely in U.S. dollars (red lines).

In both cases the rise in the U.S. budget deficit initially raises U.S. consumption and output, and reduces U.S. investment through the usual crowding-out mechanism. The fiscal deficit opens a differential between U.S. and foreign real interest rates leading initially to an appreciation of the dollar. As the budget returns

Note: The main authors of this box are Nicoletta Batini and Simon Gilchrist.

[1]This can happen even in the absence of explicit indexing (see Calvo, 2001).

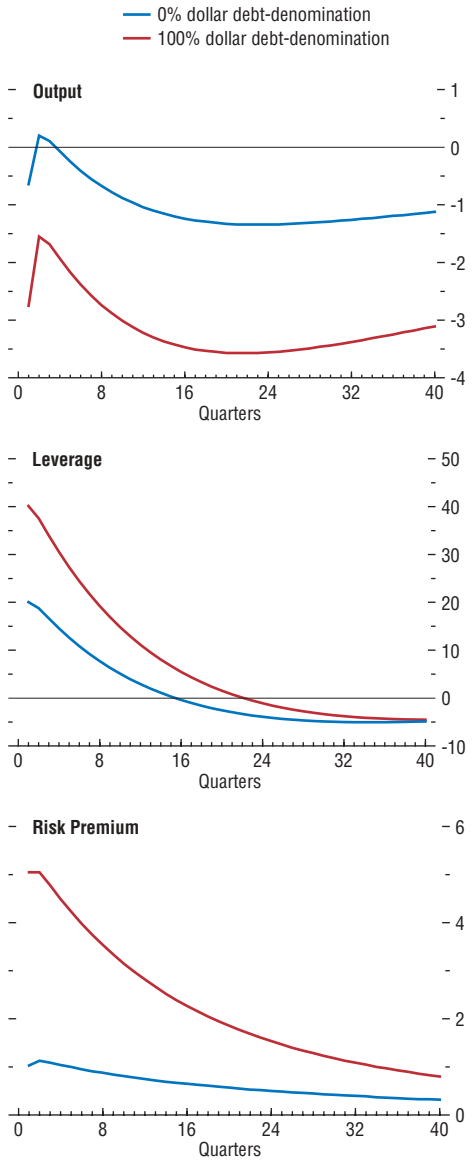
[2]For simplicity, the analysis assumes that emerging market countries have flexible exchange rates and so ignores the additional implications of changes in the dollar for emerging markets with dollar pegs.

[3]The model replicates that in Gilchrist, Hairault, and Kempf (2002) based, in turn, on an open-economy version of the financial accelerator model by Gertler, Gilchrist, and Natalucci (2003).

Box 2.1 *(concluded)*

Emerging Markets: Output, Leverage, and Risk Premium

(Percent deviation from baseline)



Source: IMF staff calculations.

to balance over time, the interest rate differential disappears and the exchange rate depreciates to maintain uncovered interest rate parity.

Eventually, economic activity in both regions returns to trend. Given the financial accelerator effect, the fall in activity in the emerging market country is larger than in the United States, since the risk premium on emerging market borrowing rises as balance sheets deteriorate, particularly when external debt in the emerging market country is denominated in dollars. In that case, the initial appreciation of the dollar further deteriorates the corporate sector balance sheet in emerging markets—in our experiment, corporate leverage (denominated in dollar terms) in these markets increases by 40 percent more than in the baseline case—and causes a 5 percentage point increase in the cost of external finance. As a result, the contraction in investment and output in the emerging market country is more than twice as large as in the local currency debt denomination case. This effect of course goes into reverse as the U.S. dollar depreciates over the longer term.

These results are sensitive to a number of assumptions. First, much depends on the situation of the corporate sector before the shock: the higher the leverage or the greater the financial frictions, the stronger the impact of the financial accelerator. Second, in the model all corporate debt is of short maturity. However, if firms in emerging market countries can borrow long term, the effect shown here could be mitigated. Finally, openness is also critical. The greater the share of trade in GDP, the less the exchange rate needs to move in response to a given external shock, and the smaller the impact on balance sheets.

This analysis would seem to have two implications regarding the impact of the U.S. fiscal deficit on emerging markets.

- To date, as discussed in Chapter 1 of this *World Economic Outlook*, financing conditions for emerging markets have been very favorable, as the impact of higher U.S. fiscal deficits has not yet been seen in interest rates, in part reflecting cyclical factors. However, with U.S. interest rates likely to rise in the future, financing conditions are likely to deteriorate, and the impact would be exacerbated

by the financial accelerator effect described above.

- Although the U.S. dollar effective exchange rate has been depreciating since early 2002, currencies in emerging markets that are more prone to adverse financial accelerator effects—notably in Latin America, which includes many nations relatively closed to trade and highly indebted to external lenders—have depreciated against the dollar (Figure 1.4 in Chapter 1), with presumably negative consequences for their corporate balance sheets. Were this dollar trend to reverse, there would be a correspondingly positive impact on these emerging market countries' corporate balance sheets, which could partially offset the impact of higher U.S. interest rates.

cuts is not fully credible, there remains the possibility that tax increases may be needed in the future to close the deficit, eroding the incentive benefits over time.

Foreign Debt and the Dollar

A U.S. fiscal expansion is generally thought to lead to an appreciation of the dollar, since it causes foreign capital to flow in in response to higher U.S. interest rates, and leads to a weaker external position as some of the increase in domestic demand is satisfied from abroad.[10] In the medium term, however, the story is reversed as the exchange rate starts depreciating to rebalance the current account deficit and generate surpluses to meet the additional costs of the higher net foreign liabilities accumulated during the fiscal expansion. Evidence for such a negative medium-term relationship between movements in net foreign liabilities and the real exchange rate can be found in Obstfeld and Rogoff (2001), Gagnon (1996), and Lane and Milesi-Ferretti (2002). In addition, the prospect of a higher foreign debt in the future can weaken the exchange rate even in the short term if it diminishes foreign investors' appetite for U.S. assets. As discussed in Chapter I, the prospect of continuing large U.S. fiscal and external deficits and the implied external borrowing adds to concerns about international imbalances, increasing the chances of a disorderly resolution, including a rapid fall in the value of the dollar and a rise in U.S. long-term interest rates.

Increases in U.S. long-term interest rates and abrupt changes in the value of the dollar could be especially damaging for emerging market economies with large external debt loads denominated in U.S. dollars, since they affect these countries' balance sheets and thus add to their intrinsic macroeconomic volatility and difficulty in servicing and repaying their debts. This is particularly true when corporate balance sheets in these countries are weak and trade openness is limited so that it is difficult to earn needed foreign exchange through exports and imports (the consequences for emerging markets of rises in U.S. real interest rates and changes in the value of the dollar are discussed in Box 2.1).

Putting It All Together

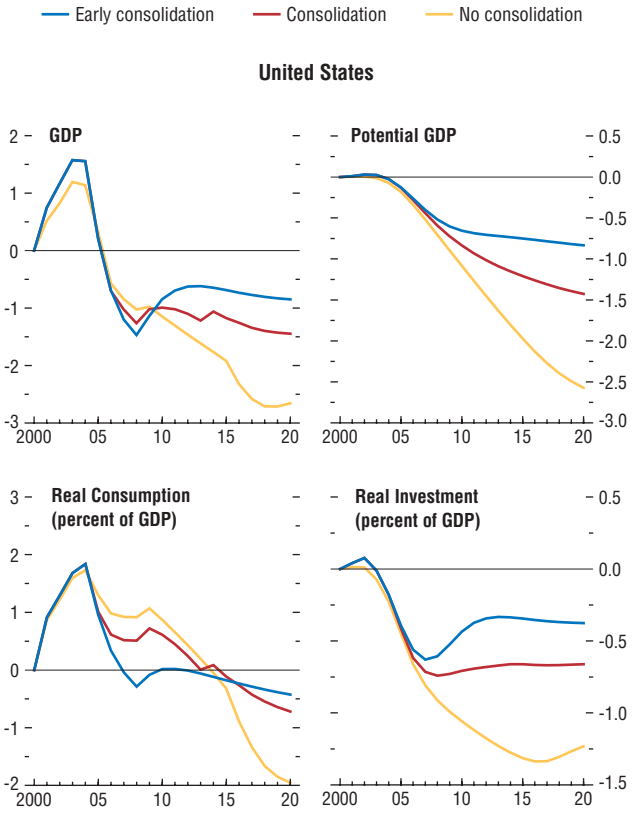
This section attempts to quantify the potential effect of the U.S. fiscal expansion on both the United States and the rest of the world. The IMF's Multi-Region Econometric Model

[10]Following the emergence of "twin deficits" in the 1980s, many studies have looked at the relationship between fiscal policy, the exchange rate, and the current account, but no consensus has emerged, with some studies finding no causal link between budget and trade deficits (e.g., Evans, 1989; and Dewald and Ulan, 1990), and others concluding that the fiscal deficit is a prime determinant of the trade deficit (e.g., Bernheim, 1988; Miller and Russek, 1989; and Enders and Lee, 1990).

Figure 2.4. Main Simulation Scenarios

(Percent deviation from baseline)

The medium-term impact on U.S. actual and potential output depends largely on the plans for future consolidations, with an earlier one giving best prospects going forward.



(MULTIMOD, described in Laxton and others, 1998) is used for this purpose. MULTIMOD incorporates most of the key channels discussed above—fiscal multipliers, crowding out, and the medium-term impact of changes in U.S. net foreign liabilities on real exchange rates—with parameter values that are around the midpoint of the ranges discussed above.[11]

That said, there are two potential drawbacks to using MULTIMOD:

- *Incentive effects on work are not included in the baseline model.* While the benefits of lower taxes on capital are incorporated in the model (although, like many macroeconomic models, it does not include detailed features of the tax system such as the double taxation of saving), the labor force is assumed to be unresponsive to changes in tax rates. To examine the potential role of such incentives, a version of the model was built in which the labor force was made sensitive to the tax rate.
- *The model lacks an emerging market countries bloc.* Accordingly, Box 2.1 reports results using a model that incorporates a wide range of features that could be important in the transmission of a U.S. fiscal shock to emerging markets, such as financial frictions and currency mismatches in balance sheets.

As an additional check on the robustness of the MULTIMOD results, Box 2.2 reports some simulations from a prototype fiscal model being developed at the IMF that incorporates explicit microeconomic foundations. The new model brings to the fore links between the expected path of the real exchange rate, consumption, and hours worked. The results on the medium-term effects of a fiscal consolidation are fairly similar to those in MULTIMOD. The short-term multipliers are smaller than MULTIMOD's as

[11]MULTIMOD's fiscal sector and parameters are described in Laxton and others (1998). In MULTIMOD, the implied rise in U.S. real interest rates from a fiscal expansion is close to the midpoint of other estimates, as are the responses of the real exchange rate, net foreign assets, and the sensitivity of trade to the real exchange rate (which help determine the response of the current account).

the prototype model currently assumes that prices are fully flexible, thereby limiting the channels through which aggregate demand affects real output.

We consider three main scenarios.[12] The first and most pessimistic scenario (yellow line, Figure 2.4) looks at the potential results of failing to control the budget over the medium term, as occurred in response to the fiscal expansion in the 1980s. The simulations replicate the 5 percentage point of GDP structural fiscal expansion that has happened in the United States post-FY2000 and assume that monetary policy remains accommodative until late 2004, following a Taylor (1993)–type interest rate policy rule thereafter. This causes a deficit path similar in size to the post-2000 budget turnaround, which is then assumed to be maintained through the end of the decade before being withdrawn at the same rate and in the same manner as it was introduced.[13] The fiscal stimulus results in a boost to real output in the United States and other industrial countries, with output rising some 1½ and ½ percent above baseline by 2004 respectively, largely reflecting the jump in U.S. consumption from higher disposable incomes. The model confirms, therefore, that without the U.S. fiscal stimulus, U.S. and global growth over the past few years would have been significantly lower.[14]

Subsequently, the positive effects of the shock wane as both short- and long-term interest rates rise to make up for the loss in government saving and for the rise in private consumption from higher government debt, and to rein in inflationary pressures from higher aggregate

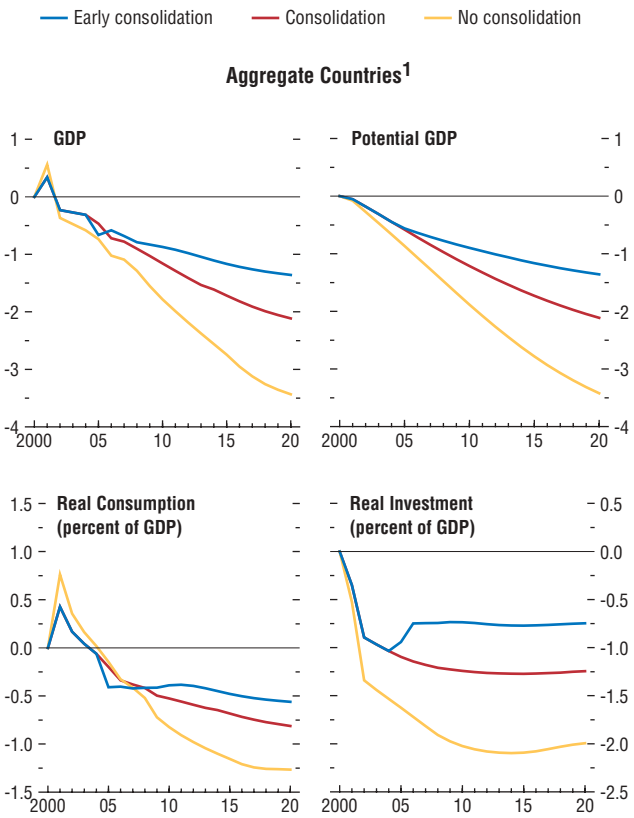
[12]Throughout, results are reported in terms of deviations from baseline. Results are not particularly sensitive to the choice of the baseline, which is, in this case, a recent World Economic Outlook forecast.

[13]The model cannot be solved with permanent deficits, so it is assumed that taxes are raised from 2010 onward to stabilize the government debt as a ratio of GDP. Most projections, however, assume that the tax cuts will not expire in the future, in line with policy statements.

[14]The analysis of the stimulus provided by the U.S. fiscal expansion of course hinges on a variety of assumptions, including the monetary and exchange rate response.

Figure 2.4 *(concluded)*

The short-term impact on the rest of the world of a U.S fiscal expansion is small, while the medium-term losses are large. An early U.S. consolidation could minimize future costs abroad of the current U.S. expansion.



Source: IMF MULTIMOD simulations.
[1]Industrial countries include Canada, France, Germany, Italy, Japan, the United Kingdom, and small industrial countries.

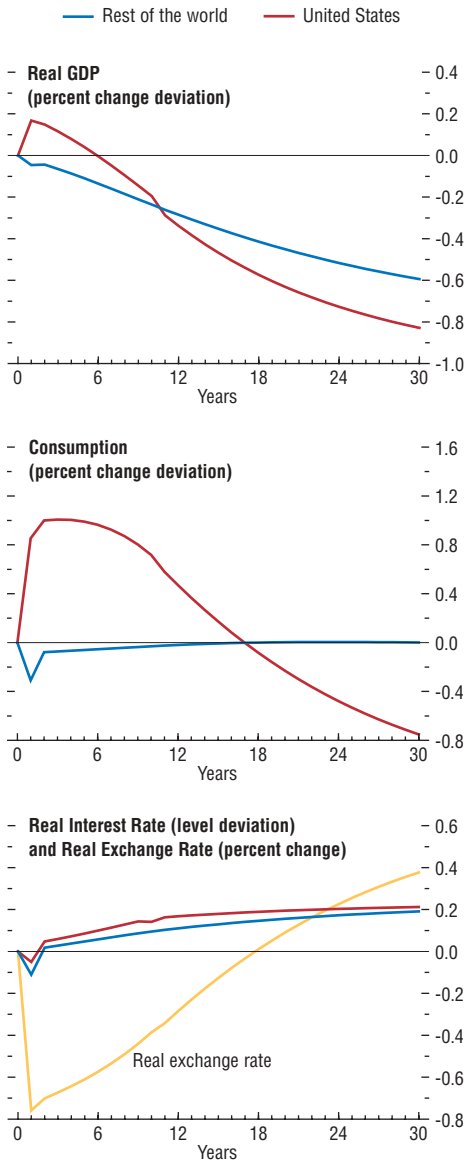
Box 2.2. The Effects of Tax Cuts in a Global Fiscal Model

This box provides an alternative perspective to the MULTIMOD simulations presented in the main text by considering the effects of a tax cut in a prototype version of the Global Fiscal Model (GFM), which is similar in spirit to the Global Economy Model (GEM) recently developed in the IMF's Research Department.[1] Like GEM, GFM is a dynamic general equilibrium model with strong microeconomic foundations but, as the name implies, it is specifically designed to examine fiscal issues, including medium-term and long-run multipliers, crowding out, and the effects of tax distortions. Key structural parameters determining the magnitude of these effects are the sensitivity of hours worked to changes in the after-tax real wage, the desire of consumers to smooth their consumption over time, and consumers' planning horizon.

GFM is calibrated such that the home economy reflects the United States. To provide a comparison with MULTIMOD, the base-case model assumes labor supply to be fairly unresponsive to changes in after-tax real wages. Unlike MULTIMOD, however, the current experimental version of GFM features flexible prices, reducing aggregate demand channels and hence short-term multipliers. The implications of a 10-year, 1-percentage-point (of GDP) tax cut in the United States are reported in the figure. The tax cut is assumed to fall completely on labor income. After the tenth year, labor income taxes are assumed to adjust to stabilize the government-debt-to-GDP ratio at its new value, which is 15 percentage points above its baseline value when the impact of higher interest payments is taken into account.

The tax cut results in a short-term expansion of U.S. output with a multiplier of 0.2, which then gradually declines and turns negative after six years. As anticipated, the short-term multiplier is smaller than that in MULTIMOD, although the effects on output last longer. The rise in consumption is prolonged by the expected depreciation of the real exchange rate,

One-Percentage-Point of GDP Tax Cut in the United States for 10 years
(Deviation from baseline)



Source: IMF staff calculations.

Note: The main authors of this box are Dennis Botman and Douglas Laxton.

[1]GEM is described in Box 4.3 in the April 2003 *World Economic Outlook*.

One-Percentage-Point of GDP Tax Cut in the United States for 10 Years: Sensitivity Analysis

		United States			Rest of the World		
Scenario	Variable	Impact	First 10 years (average)	Long run	Impact	First 10 years (average)	Long run
Baseline	GDP	0.2	—	–1.0	—	–0.1	–0.8
	Consumption	0.9	0.9	–1.3	–0.3	–0.1	–0.1
	Real interest rate	–0.1	0.1	0.2	–0.1	—	0.2
Strengthening supply-side effects[1]	GDP	0.6	0.6	–1.9	0.1	–0.1	–1.4
	Consumption	0.8	1.2	–2.2	–0.1	–0.1	–0.4
	Real interest rate	–0.1	—	0.3	–0.1	—	0.3
Increasing the effects of deficits on interest rates[2]	GDP	0.2	–0.1	–1.7	–0.1	–0.2	–1.4
	Consumption	1.2	1.0	–1.6	–0.2	—	–0.3
	Real interest rate	0.1	0.1	0.4	–0.1	0.1	0.4
Making the savings rate more sensitive to future tax increases[3]	GDP	0.1	—	–0.3	—	0.0	0.0
	Consumption	0.3	0.2	–0.9	—	–0.1	0.3
	Real interest rate	—	0.0	—	0.0	—	0.0

Source: IMF staff estimates.
[1]Base-case model, but the labor supply is elastic.
[2]Base-case model, but the intertemporal elasticity of substitution is lower.
[3]Base-case model, but consumers have a longer planning horizon.

leading individuals to take advantage of lower prices on foreign goods now compared to later. The real exchange rate depreciates to generate positive trade balances to finance the higher interest burden on the stock of net foreign liabilities. Over time, higher tax rates and real interest rates in response to higher government debt crowd out consumption and investment, resulting in a reduction in U.S. GDP of about 1 percent in the long run even though, as consumption falls, its marginal benefit increases, causing consumers to enjoy less leisure.

The multiplier in the rest of the world is negligible as the path of increasing real interest rates crowds out investment, offsetting the gains from the improvement in the trade balance. Consumption falls initially and then steadily returns to its original level owing to the anticipated appreciation of the real exchange rate despite long-term crowding out of a similar magnitude in the United States.

In three alternative scenarios the sensitivity of these base-case results to the key parameters of the model were examined (see the table):

- Strengthening supply-side effects. Increasing the incentive effects of tax cuts amplifies and prolongs the short-run expansion in the U.S. economy as workers respond to the temporary lower tax rates by increasing their labor effort and firms increase investment to raise their capital stock. As in the MULTIMOD scenario, these stronger supply-side responses increase the short-term output multiplier and the effects are prolonged. This, however, is reversed when taxes are eventually raised to finance the interest burden on the higher level of government debt, resulting in larger negative consequences in the long run. For the rest of the world, the tax cut is more expansionary because there is less crowding out of investment and workers increase their labor effort although, as in the United States, there are larger losses in the long run.
- Increasing the effects of deficits on interest rates. Reducing the sensitivity of consumption to changes in the real interest rate implies a short-term multiplier of about the same size as in the base case. Higher real interest rates cause a larger fall in investment, but this is offset by a larger increase in consumption as individuals indulge in more consumption

Box 2.2 *(concluded)*

smoothing. A larger increase in real interest rates is required in the long term to equilibrate saving and investment, implying greater long-run crowding-out effects in the United States and the rest of the world, as in the MULTIMOD scenario.

- *Making the savings rate more sensitive to future tax increases.* Lengthening the planning horizon of consumers results in a smaller short-run boost to consumption and a reduced short-term multiplier as individuals are more sensitive to the prospect of higher tax liabilities in the future. The long-run crowding out effects are likewise smaller because real interest rates rise by less and hours worked remain higher as consumption and leisure are positively linked in the long run. The negative impact on the rest of the world is smaller because there is less crowding out of investment.

The GFM simulations provide a similar qualitative picture to that provided by MULTIMOD, although the short-term multipliers are reduced because prices are currently assumed to be fully flexible. The stronger microeconomic structure permits some additional insights into the effects of the tax cut. In particular, there are two interactions that the GFM simulations highlight. First, there is a link between the expected future path of the real exchange rate and consumption, with U.S. consumers spending more in the short term to take advantage of temporarily low prices of imported goods, while consumers in the rest of the world do the opposite. Second, there is a long-term negative link between consumption and hours worked as workers balance their benefits from using goods with the disutility of working more. As a result, U.S. workers not only consume less but also work harder in the long term.

demand.[15] This crowds out U.S. consumption and private investment, gradually reducing U.S. potential output to about 2 percent below baseline by 2015. These losses in productive potential are more than replicated in other industrial countries as foreign real interest rates gradually rise to match the increase in their counterparts in the United States. Despite the fact that the falls in productive potential in the United States and abroad are not too dissimilar, U.S. consumption falls by more than in the rest of the world in the long run. This is because higher U.S. international interest payments erode the value of the dollar, allowing the rest of the world to obtain U.S. goods cheaply while raising the price of their own goods to people in the United States. These terms-of-trade effects mean that U.S. consumers experience a larger loss in welfare than their counterparts in the rest of the world.

The second scenario (red line, Figure 2.4) involves the same fiscal expansion followed by a gradual consolidation of the type envisaged by the U.S. Administration in the FY2005 budget—namely, tax cuts are maintained, losses in revenue buoyancies from the stock market crash are reversed, and spending is trimmed.[16] Taken

[15]Over the long term, the increase in government debt raises interest rates by about 100 basis points.

[16]More specifically, the simulation assumes that lower taxes reduce revenues by about 2½ percent of GDP, phased in at slightly over ⅔ percentage point increments over 2001–03 and phased out after 2010 at the same rate. In contrast to taxes, consolidation on the spending side is assumed to occur from 2005. Direct purchases of government goods and services are assumed to increase gradually up to a peak of 1 percent of GDP in 2004, and then decrease gradually to zero with increments/decrements of ⅓ of a percent of GDP starting in 2005. Other government spending is assumed to increase in equal increments over 2001–03 to a peak of 1¾ percent of GDP above baseline in 2004 and is phased out starting from 2005 in equal decrements. This consolidation largely reflects restraints on discretionary spending but, in addition, some allowance has been made for technical factors, including a recovery in revenue buoyancies. Taken together, these assumptions broadly replicate the deterioration of some 5 percentage points of GDP in the structural fiscal deficit seen since 2000. After 2010, taxes are assumed to rise above baseline to stabilize the government's debt position.

Table 2.7. MULTIMOD Alternative Scenarios

Scenario		GDP		Consumption	
		United States	Rest of world	United States	Rest of world
No consolidation	Impact	0.52	0.56	1.17	1.22
	Peak	1.20	0.56	2.32	1.22
	Long-run	−3.68	−4.20	−6.34	−2.14
Consolidation	Impact	0.75	0.34	1.24	0.68
	Peak	1.57	0.34	2.46	0.68
	Long-run	−1.88	−2.55	−2.89	−1.44
Early consolidation	Impact	0.75	0.34	1.24	0.68
	Peak	1.57	0.34	2.46	0.68
	Long-run	−1.03	−1.47	−1.54	−0.88
Risk premium shock	Impact	0.75	0.34	1.24	0.68
	Peak	1.57	0.34	2.26	0.68
	Long-run	−1.85	−2.49	−2.87	−1.40
Endogenous labor supply	Impact	1.16	0.27	1.60	0.52
	Peak	2.16	0.27	2.90	0.52
	Long-run	−2.08	−2.04	−2.89	−1.23
Lower interest rate sensitivity of consumption	Impact	0.69	0.81	0.67	2.12
	Peak	1.49	0.81	1.90	2.12
	Long-run	−2.78	−4.08	−3.69	−2.99

together, these assumptions involve a halving of today's budget deficit by FY2009. The short-term boost to output is similar to the earlier experiment, reflecting the fact that different assumptions about the subsequent course of fiscal policy have little impact on short-term multipliers. The gradual consolidation has a mildly negative impact on real output later this decade, but the difference in the level of real output between the two scenarios never exceeds ¼ percent of GDP as the medium-term weakening effects on output are partially offset by smaller crowding-out effects when the rise in government debt is lessened. In this case, the longer-term losses in output capacity through crowding-out effects are reduced by about one-half in the United States, with a broadly similar reduction in the rest of the world.

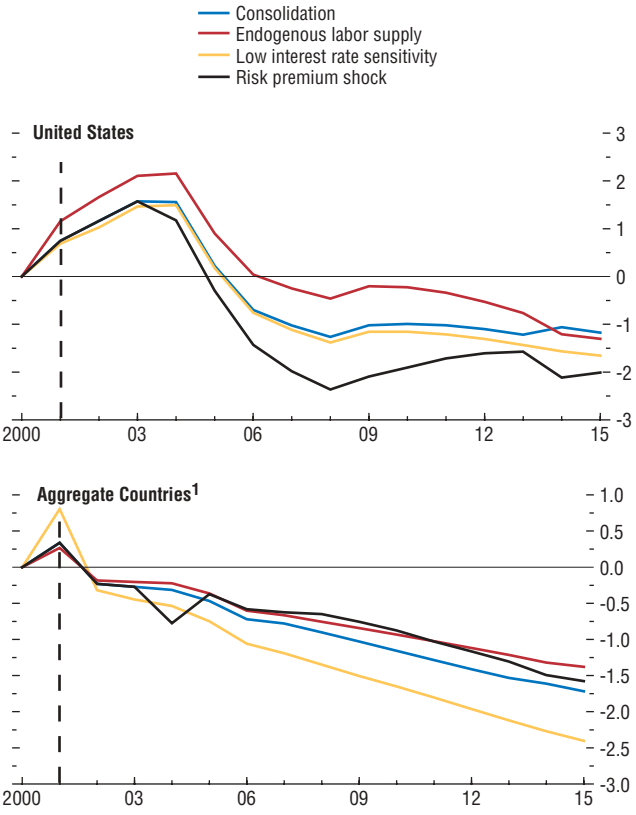
A third scenario (blue line, Figure 2.4) considers the consequences of reversing the fiscal expansion at a faster rate than envisaged by the administration. More precisely, it is assumed that from FY2005 onward the fiscal stimulus is withdrawn at the same rate it was introduced, with the structural deficit returning to its earlier path by about FY2008. Such a scenario involves mildly lower real output over 2005–08, on the order of ¼ percent less than the more gradual consolidation path envisaged by the administration, while cutting the long-term negative impact on potential output in the United States and the rest of the world by about three-fourths.

These scenarios assume that there are no adverse disturbances in the future and no sudden shifts in the willingness of foreign investors to hold dollar assets. One clear consequence of higher U.S. fiscal deficits is to reduce the macroeconomic room for maneuver in the face of subsequent negative disturbances in the U.S. economy. In addition, the risk of a fall in confidence by international investors is clearly larger if they have a more pessimistic view about the rate at which U.S. deficits will be reduced. To investigate the consequences of an abrupt shift in sentiment, a variation on the second scenario was also created, involving a 15 percent reduction in the value of the dollar in 2004 combined with an expectation that U.S. inflation would rise by 1 percentage point for the next five years (results from this new scenario are reported in Table 2.7). The increase in inflationary expectations and rise

Figure 2.5. GDP in Alternative Scenarios

(Percent deviation from baseline)

Higher tax sensitivity of labor supply mitigates the impact of the fiscal shock on the United States, but not on the rest of the world. Lower interest rate sensitivity of consumption worsens prospects for all, while a risk premium shock is particularly penalizing for the United States.



Source: IMF MULTIMOD simulations.
[1]Industrial countries include France, Germany, Italy, Japan, the United Kingdom, and small industrial countries.

in dollar prices of foreign goods necessitates a hike in interest rates with adverse consequences on U.S. output in both the short term—as aggregate demand is deflated—and medium term—as crowding out is increased. The short-term impact on the rest of the world is small where monetary policy is flexible and is able to offset the adverse nominal exchange rate shock on demand. However, output falls significantly in the short term in countries where macroeconomic policies are constrained, such as Japan.

Two more scenarios were run to examine the sensitivity of the results of the second main scenario (which reflects the views of the U.S. Administration) to alternative assumptions about the importance of tax cuts on work and about the sensitivity of consumption and investment to real interest rates. Results from these scenarios are also summarized in Table 2.7, and are plotted in Figure 2.5 and discussed below.

- *Supply-side effects may turn out to be greater.* To capture the potential benefits of tax incentives, U.S. labor supply was made dependent on tax rates using a coefficient at the upper end of available estimates from microeconomic studies. Hence, while the main three scenarios embed a relatively pessimistic view about the impact of incentive on work effort, this alternative embeds an optimistic one. The positive impact on labor supply increases short-term multipliers and mitigates crowding-out effects in the United States (U.S. output remains ¾ percent above the scenario without these effects through 2010). The long-term consequences, of course, depend crucially on whether the fiscal consolidation required to reverse the expansion and cover the significantly higher interest payments on debt occurs through lower spending or higher taxes. The negative impact on other industrial countries remains similar to the scenario without such incentive effect, as the boost to U.S. labor also increases demand for capital in the United States, producing a similar increase in global real rates.
- *Deficits have a larger impact on interest rates.* Consumption was made less sensitive to real

interest rates by reducing MULTIMOD's intertemporal elasticity of substitution on consumption from 0.4 to a value of 0.3, close to the lower bound of plausible empirical estimates. This has little impact on short-term responses, but significantly increases the crowding out of investment and hence the negative impact on potential output. This is because interest rates have to increase by more to achieve the same fall in overall spending, putting relatively more pressure on investment spending.

Finally, Box 2.1 examines the consequences for emerging markets of a sustained increase in the U.S. deficit of 1 percentage point of GDP. The results illustrate the crucial importance of movements in U.S. real interest rates for such countries. The key channel is the rise in U.S. real interest rates, which causes a rise in risk premia and affects emerging markets' exchange rates with respect to the dollar. Both these effects, in turn, erode already weak balance sheets, with adverse consequences for activity. In the case where all debt is denominated in dollars and the country is relatively closed to trade, these effects almost fully offset the beneficial effects on activity from short-term fiscal multipliers, while increasing crowding out over the medium term. The risk of a negative effect on emerging markets through high real interest rates becomes less pervasive if the country borrows in domestic currency or is more open to trade by reducing balance sheet vulnerabilities. Although few such effects have been evident to date, the risks of negative effects on emerging markets are linked to market perceptions about prospects for the U.S. deficit, as discussed earlier in the context of other asset market spillovers, and so may materialize unexpectedly.

Policy Implications

To date, the U.S. fiscal expansion has supported the recovery from recessions in the United States and elsewhere without apparent adverse effects on long-term interest rates. This expansion provided significant support for the global economy over recent years. However, there are reasons to be concerned that this cannot last. At some point, the support for activity will almost certainly be eroded through some combination of withdrawal of stimulus and/or higher long-term interest rates, as the U.S. government debt rises. Likewise, the large U.S. current account deficit, exacerbated by the effect of the fiscal stimulus on U.S. domestic demand, will have to be rebalanced. As emphasized in Chapter I, achieving an orderly resolution of U.S. and indeed global imbalances requires a cooperative strategy that includes medium-term fiscal consolidation in many industrial and emerging market economies; greater currency flexibility, especially in most of emerging Asia; a faster pace of pro-growth structural reforms in the euro area and Asia; and further banking and corporate reforms in Japan. For the United States, the crucial issue is how to ensure that the withdrawal of stimulus does not weigh too heavily on the global recovery while limiting the erosion in long-term productive potential through higher interest rates, further falls in the dollar, and increasing risks of an adverse financial market response. The latter concerns are particularly important for emerging market economies with large levels of debt denominated in foreign currencies, as such countries are particularly sensitive to higher global real interest rates or to the value of the dollar.

The analytical results presented in this essay confirm that the U.S. fiscal stimulus supported growth in the United States and abroad in recent years, and suggest that significant benefits could now be obtained from a more ambitious consolidation path over the medium term than the one that has been proposed by the U.S. Administration. In particular, the losses in output from such a withdrawal of stimulus will probably be mitigated by the lower degree of crowding out of productive potential through higher real interest rates. In addition, the longer consolidation is postponed, the larger the increase in government debt and debt service, increasing the size of future cuts in noninterest spending or increases

in revenues needed to stabilize the fiscal position, limiting room for maneuver in response to unexpected events, and complicating preparation for the fiscal pressures from an aging population. With both the United States and the global economy in recovery mode, a phased withdrawal of fiscal stimulus over the next few years in a manner that pays due attention to incentives to work and invest in the United States would seem to be a sensible and prudent way of balancing short- and long-term economic goals.

China's Emergence and Its Impact on the Global Economy

The main authors of this essay are Nikola Spatafora, Yongzheng Yang, and Tarhan Feyzioğlu. Paul Atang provided research assistance.

Over the past 20 years, and after a long period of isolation, China's role in the global economy has increased sharply. Its GDP has grown at an average annual rate of over 9 percent, while its share of world trade has risen from less than 1 percent to almost 6 percent. As a result, China is now the sixth-largest economy (at market exchange rates) and the fourth-largest trader in the world. Not only have its exports gained significant market share abroad, but its rapidly rising imports have supported the strong performance of neighboring economies and contributed to the recent strength in world commodity prices.

China's economic weight and its integration into the world economy are likely to continue increasing rapidly, as the necessary structural reforms (including in the financial and enterprise sectors, labor markets, and social safety nets) are implemented (Feyzioğlu and Wang, 2003). While the effect on the world as a whole is likely to prove positive, the impact could vary considerably across countries, industrial sectors, and socioeconomic groups. For instance, while industrial-country exports to China, particularly of skill- and technology-intensive items, are likely to continue increasing rapidly, certain sectors may undergo job losses as Chinese firms' market share expands. Similarly, some developing countries facing increased Chinese competition may experience an erosion of their market share for unskilled-labor-intensive manufactures. In addition, rapid growth in China may significantly increase world prices for some commodities, including agricultural products and energy.

The purpose of this essay is accordingly to investigate the likely impact of China's continued emergence, to identify who will reap the largest opportunities and who may have to bear the heaviest adjustment burden, and to discuss the policies required to maximize the benefits while minimizing the adjustment costs. The essay focuses on the following questions.

- How does China's growth and integration experience so far compare with previous historical episodes of rapid integration?
- How will China's integration affect the rest of the world? What structural characteristics determine whether a country will gain or suffer from China's growth?
- How can individual countries maximize their gains from China's emergence? What can the international community do to help any losers?

Stylized Facts

To assess China's likely impact in the future, it is instructive to systematically compare China's integration experience with previous episodes of rapid integration. In particular, it is of interest to compare the Chinese experience over the past quarter-century with that of Japan, the NIEs, and the ASEAN-4 during their own integration phases, when output and exports first started exhibiting sustained growth.[17]

[17]The NIEs consist of Hong Kong SAR, Korea, Singapore, and Taiwan Province of China. ASEAN-4 consists of Indonesia, Malaysia, the Philippines, and Thailand. For China, integration is defined as starting in 1979, when major economic reforms began. For all other regions, integration is defined as starting when the three-year moving average of constant-price export growth first exceeded 10 percent: 1955 for Japan, 1967 for the NIEs, and 1973 for the ASEAN-4.

Table 2.8. China: Tariffs, 1982–2002

	Unweighted Average	Weighted Average	Dispersion (standard deviation)	Maximum
1982	55.6	. . .	. . .	. . .
1985	43.3	. . .	. . .	. . .
1988	43.7	. . .	. . .	. . .
1991	44.1	. . .	. . .	. . .
1992	42.9	40.6	. . .	220.0
1993	39.9	38.4	29.9	220.0
1994	36.3	35.5	27.9	. . .
1995	35.2	26.8	. . .	220.0
1996	23.6	22.6	17.4	121.6
1997	17.6	16.0	13.0	121.6
1998	17.5	15.7	13.0	121.6
2000	16.4	. . .	. . .	. . .
2001	15.3	9.1	12.1	121.6
2002	12.3	6.4	9.1	71.0

Sources: Chinese authorities; UNCTAD; World Bank; WTO; and IMF staff estimates.

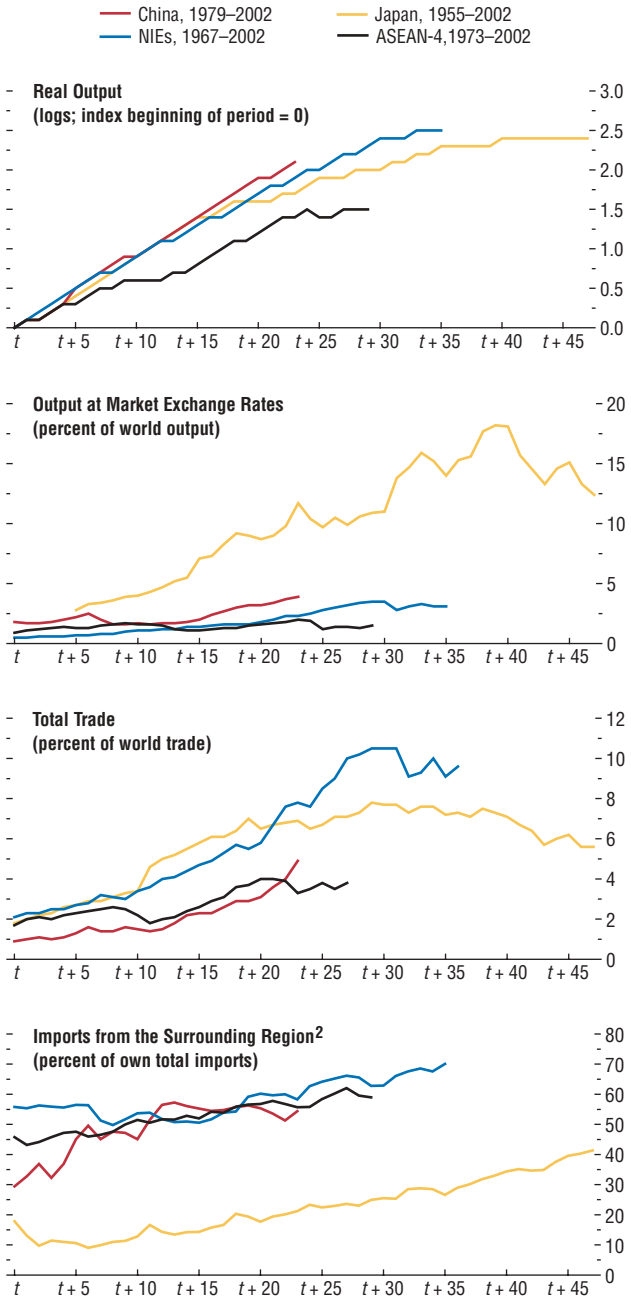
There are many similarities between these episodes of integration, and the Chinese experience does not necessarily stand out as unusual. For instance, China's output growth rates so far are by no means exceptional (Figure 2.6), and while China's share of world GDP (at market exchange rates) has been rising, it is still significantly below Japan's, and not much above that of the NIEs or the ASEAN-4, at corresponding phases of their integration.[18] The growth of China's exports and imports, encouraged by a steady reduction in the level and dispersion of trade barriers (Table 2.8),[19] has also been similar

[18]China's share of world output at purchasing-power-parity exchange rates has been rising faster and is currently much higher, reflecting the presence of a large nontradable sector whose goods are traded at relatively low prices. The focus here, however, is on China's impact on other countries. Since this impact arises principally through trade and other flows that are conducted at market exchange rates, it is more appropriate to compare GDP shares across integration episodes using market exchange rates.

[19]See OECD (2003), Adhikari and Yang (2002), Gertler (2002), Lardy (2002), Mattoo (2002), Rumbaugh and Blancher (2004), U.S. Trade Representative (2002), and U.S. General Accounting Office (2002) for a description of China's trade regime and how it is evolving. Under its WTO commitments, China will reduce its tariffs by a further one-fifth by next year. In addition, tariff exemptions are widespread, especially for processing trade and foreign investment.

Figure 2.6. Output and Trade During Periods of Rapid Integration[1]

China's growth experience over the past quarter-century displays many similarities with previous episodes of fast integration.



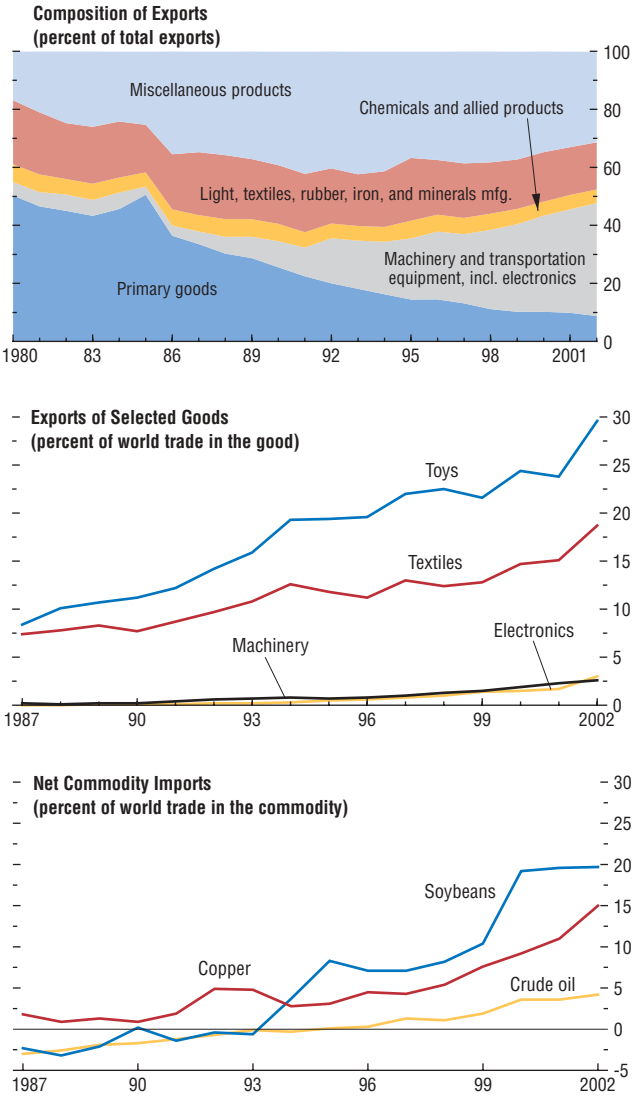
Sources: IMF, *Direction of Trade Statistics;* and IMF staff calculations.

[1]*t* denotes the year when integration starts: 1955 for Japan, 1967 for the NIEs, 1973 for ASEAN-4, and 1979 for China.

[2]The surrounding region is defined as China, Japan, the NIEs, and ASEAN-4.

Figure 2.7. China's Exports and Imports

Since the early 1980s, China's manufactured exports have become increasingly diversified, and their share of total world exports has increased in nearly all categories. In contrast, the importance of primary goods has dwindled. On the import side, China accounts for a large and rising share of world trade in many commodities.



Sources: CEIC Data Company Limited; World Bank, WITS Database; and IMF staff calculations.

Table 2.9. China: Market Share in Major Export Markets

(Imports from China in percent of total imports)

	1960	1970	1980	1990	1995	2000	2001	2002
Japan	0.5	1.4	3.1	5.1	10.7	14.5	16.6	18.3
United States	—	—	0.5	3.2	6.3	8.6	9.3	11.1
European Union[1]	0.8	0.6	0.7	2.0	3.7	6.2	6.7	7.5

Source: IMF, *Direction of Trade Statistics*.
[1]Adjusted for intra-EU trade.

to the other integration episodes. Indeed, China's share of world trade is still far below that of Japan or the NIEs, and only slightly above that of the ASEAN-4, at corresponding phases in their integration process. As was the case in these previous integration episodes, China's market share has been growing in all major export markets, including Japan, the United States, and the European Union (Table 2.9), and its exports, while still largely labor-intensive, have become increasingly diversified over time (Figure 2.7).[20] Interestingly, while China's imports from all major regions have been growing rapidly, imports from the surrounding region (including the NIEs and the ASEAN-4) have increased especially fast (Figure 2.6). This reflects China's rising role as a regional reprocessing center and manufacturing hub for re-exports,[21] and suggests that its impact as a regional engine of growth could soon become even larger than Japan's. In addition, China has become an increasingly prominent importer of primary goods, accounting for a large and rap-

[20]In the 1980s and early 1990s, China exported mainly clothing, footwear, other light manufactures, and fuels. Since then, its share of world manufactured exports has increased in nearly all categories, with especially rapid growth in office machinery, telecommunications, travel goods, furniture, and industrial supplies, while the importance of primary exports has dwindled. More recently, China has made substantial gains in assembling and exporting more technology-intensive goods, including automated data processing equipment. Indeed, electronic goods now account for as much as 20 percent of its exports.

[21]For example, China's imports of electronic components from Asia have grown markedly in recent years, in line with the increase in its electronics exports to the United States, the European Union, and Japan.

idly rising share of world trade in several key commodities, including crude oil, copper, and soybeans (Figure 2.7).

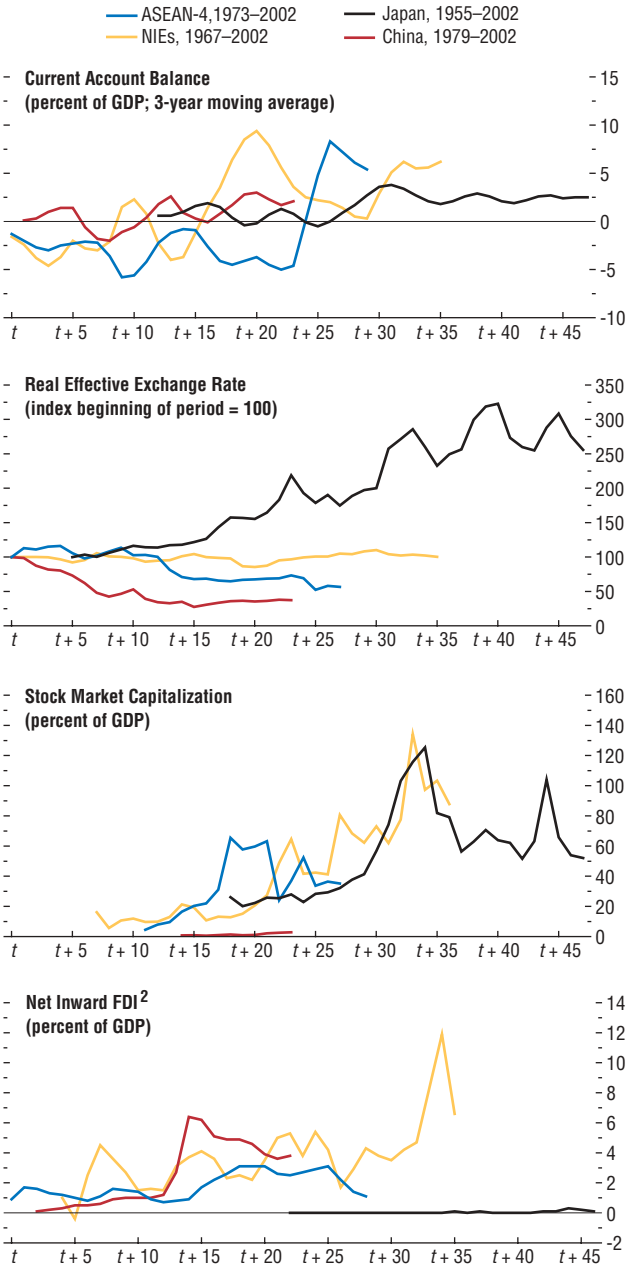
For much of its integration process, China has been running current account surpluses, in contrast to the deficits often experienced by many of the comparators (Figure 2.8). In this context, it might be noted that China's real effective exchange rate (REER) depreciation in the 1980s also stands out from the experience in other integration episodes. However, this depreciation was at least in part related to the sizable trade liberalization, and an unwinding of significant overvaluation, at the start of the reform period.[22] Moreover, the relative stability of the nominal and real effective exchange rates since the early 1990s suggests that other factors were more important in explaining China's rapid export growth, especially in the latter period. In particular, fast labor-productivity growth and low labor costs, supported by a large pool of unskilled as well as skilled labor, helped maintain China's competitiveness through periods of effective nominal exchange rate appreciation as well as depreciation.

As regards capital inflows, China has been receiving smaller amounts (relative to GDP) than was true of many of the comparators. The reason lies partly in less developed financial markets, including stock markets (Figure 2.8); in turn, this partly reflects capital controls. Also, while inward foreign direct investment has enjoyed a well-publicized boom, its magnitude was not in fact unusual in comparison with the NIEs (especially Singapore and Taiwan Province of China) during their integration process. Conversely, China has been acquiring substantial amounts of foreign securities, although almost entirely through official and public sector holdings. For instance, as of mid-2002 it was the second-largest foreign holder of U.S. long-term debt securities, accounting for $165 billion, or 6.5 percent, of total foreign holdings (up from 4.9 percent in 2000 and

[22]In addition, the calculation of the REER in the 1980s is complicated by data issues, such as the presence of multiple exchange rates and difficulties in measuring inflation.

Figure 2.8. Current and Capital Accounts, and Financial Markets During Periods of Rapid Integration[1]

China has often run somewhat larger current account surpluses than seen in previous integration episodes, even though its real exchange rate has stabilized since the early 1990s. Capital inflows have not been very large: China's stock market is relatively undeveloped, and even FDI inflows (relative to GDP) have not been exceptional.



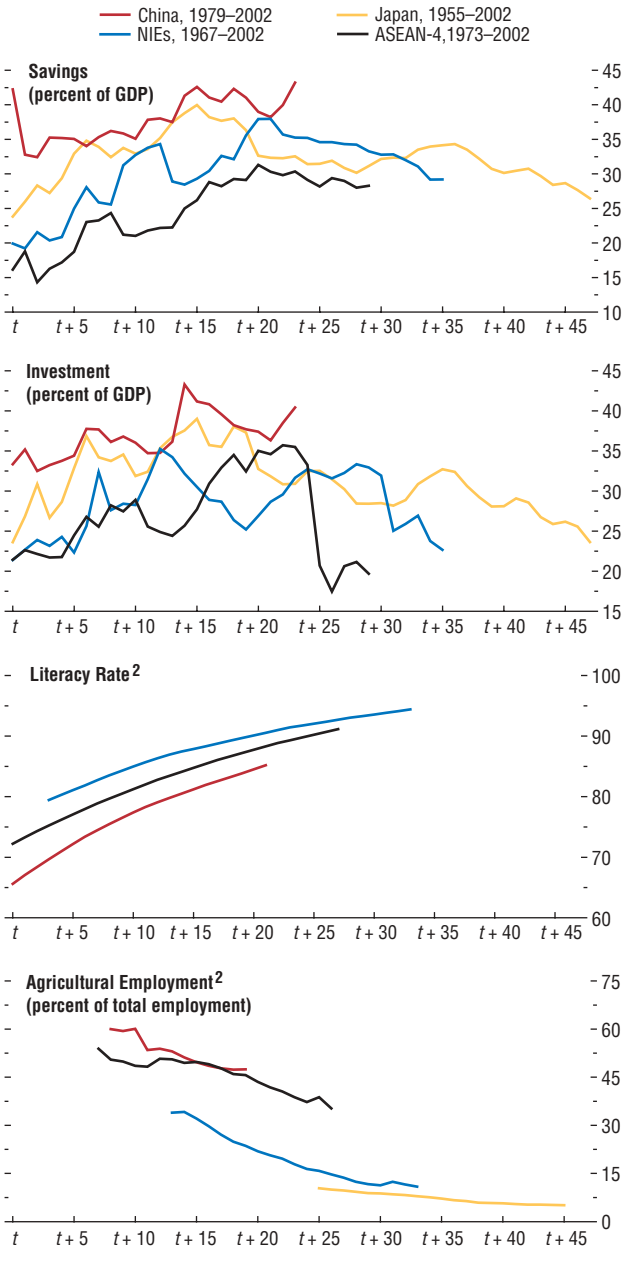
Sources: Datastream International; CEIC Data Company Limited; World Bank, *World Development Indicators;* and IMF staff calculations.

[1]*t* denotes the year when integration starts: 1955 for Japan, 1967 for the NIEs, 1973 for ASEAN-4, and 1979 for China.

[2]Values end in 2001.

Figure 2.9. Determinants of Growth: Savings, Investment, Human Capital, and Sectoral Reallocation During Periods of Rapid Integration[1]

China's rapid growth may continue for significantly longer than in previous integration episodes: saving and investment rates are exceptionally high, and there is still much scope to increase human capital and to reallocate labor out of low-productivity agricultural employment.



Sources: World Bank, *World Development Indicators;* and IMF staff calculations.
[1] *t* denotes the year when integration starts: 1955 for Japan, 1967 for the NIEs, 1973 for ASEAN-4, and 1979 for China.
[2] Values end in 2000, and data for agricultural employment for the NIEs consists only of Korea.

2.1 percent in 1994; see U.S. Department of the Treasury and others, 2004).

While China's economic performance and its global impact so far are in line with what was observed in previous waves of rapid integration, there are good reasons to think that China will eventually play a much larger role in the global economy than any of the comparators. Box 2.3 provides a fuller discussion of the reasons behind China's past growth. It points out that China faces serious structural reform challenges in the financial and enterprise sectors and in its labor markets, which, if not addressed in a forceful and timely manner, could significantly hamper future performance. However, as long as these issues are tackled successfully, China's rapid growth and integration are likely to continue for much longer. Among the relevant factors, China has consistently had high savings rates, and even with some decline this is likely to permit continued high levels of physical capital formation over the medium term (Figure 2.9). Human capital has been growing rapidly, but remains at a lower level than in the comparators, and can also be expected to continue increasing for a considerable period. Further, growth has been driven to a significant degree by the reallocation of labor from low-productivity agricultural employment to the higher-productivity urban industrial sector. This process has much further to go in China than elsewhere. The key point is that China's GDP per capita, at about US$1,060, is still only a fraction of levels in Japan, the NIEs, and even most of the ASEAN-4; as convergence continues, China is likely to become much larger than any of these countries. Put differently, China's emergence will eventually represent a larger shock to world factor endowments and to the global economy than previous integration episodes, potentially implying a major impact on certain sectors and regions.

China's Impact: Potential Channels and Previous Studies

China's continued rapid growth, together with further trade and financial liberalization meas-

ures, is likely to affect the rest of the world through several channels. As trade integration proceeds, one key long-run impact will be through *terms-of-trade effects*.

- The increase in China's supply of labor-intensive manufactures will reduce their relative price on world markets, benefiting countries that are substantial net importers of such goods. Further, as China's domestic demand increases, other countries stand to gain from increased prices for their exports, including capital- and skill-intensive goods and services as well as food, energy, and intermediate inputs used in processing by China's manufacturing sector. The gains may be especially large if trade in services (especially telecommunications, financial services, and information processing and other clerical services) grows as fast as expected.
- Some countries, however, may suffer terms-of-trade losses and experience a "hollowing out" of domestic manufacturing in the face of Chinese competition. In particular, some developing countries that, like China, are relatively abundant in unskilled labor and trade little with China but compete with it in third-country export markets may indeed face reduced demand and lower prices for their own manufactures. Further losses could arise in those countries that are net importers of commodities whose prices are driven up by expanding Chinese demand.
- These terms-of-trade changes may have a significant impact on the sectoral composition of output and on income distribution within, as well as across, countries. In particular, given China's abundance of less-skilled labor, its emergence could raise worldwide returns to capital and skilled labor, while lowering relative rewards for unskilled labor. Consequently, some sectors or groups in certain countries could be highly vulnerable to increased competition from China.

China's integration may also affect other countries through *financial channels*.

- The expansion over the past 15 years in inward FDI has both benefited China (not least by facilitating its trade boom) and given foreign investors the opportunity to diversify holdings while earning potentially high returns. The magnitude of future capital flows to and from China is difficult to predict. On the one hand, China's share in private international portfolio capital flows may continue rising, as investors further pursue (and are allowed to pursue) opportunities for higher returns and portfolio diversification. On the other hand, as China's investment rate eases from its current high level, foreign direct inflows may abate. In addition, Chinese firms and households may seek to expand their portfolio and direct investments abroad. The relative strength of these effects will clearly depend on the pace and precise form of China's capital-account liberalization.
- While the world as a whole is likely to gain from these developments, some developing countries may again suffer from Chinese competition for scarce international capital. For instance, higher FDI flows to China may reduce FDI to other developing countries, just as the integration of central and eastern Europe into the global economy may be posing a challenge to relatively more established FDI destinations, such as Portugal and Spain (Brenton, Di Mauro, and Lücke, 1999, and Phelps and Raines, 2003). An alternative view, however, is that the increased FDI going to China will complement flows to the rest of the region (see Chapter 4 in Panitchpakdi and Clifford, 2002), and indeed that outward FDI from China to other economies will expand further, as was the case with Japan.

Greater trade and financial integration of China could also have additional effects, which cannot be readily quantified but could prove significant. In particular, China's integration may affect the incentives for factor accumulation and productivity growth, not only in China but also in other countries (for instance, through terms-of-trade effects, improved allocation of financial capital, and increased competitive pressures, which will among other things stimulate reforms in other countries). These dynamic impacts on

Box 2.3. Can China Sustain Its Rapid Output Growth?

Since embarking on structural reforms two and a half decades ago, China has achieved impressive output growth, which on average exceeded an annual rate of 9 percent. Growth accounting methods suggest that the main engines of this growth were sustained rates of capital accumulation and strong productivity growth. The analysis in this box suggests that China can continue to achieve high growth rates in the future, but this would critically depend on implementing structural reforms in a broad range of areas.

Based on production function estimates, Heytens and Zebregs (2003) argue that before 1978 almost all output growth stemmed from capital accumulation, with some additional contribution from labor-force growth. Estimates of total factor productivity (TFP) growth were either insignificant or negative. Since the start of the reforms, average potential output growth exceeded 9 percent, more than 3 percentage points higher than in the pre-reform period. Heytens and Zebregs estimate that TFP growth accounted for most of this increase, rising on average from zero to close to 3 percent (broadly in line with most other studies, although Young (2000) calculates a somewhat lower value for TFP growth during the reform period). The contribution of capital accumulation to output growth remained about 4–6 percentage points, and the labor force, which grew on average 1 percent, contributed about ½ percentage point to output growth.

The role of structural reforms is believed to have been significant in increasing productivity growth during this period (see, for example, Borensztein and Ostry, 1996; and Chow and Li, 1999). The liberalization of the agricultural sector in the early 1980s and the acceleration of market-oriented reforms in the early 1990s in particular have led to strong productivity growth in industrial enterprises as well as in agriculture. Also, structural reforms increased overall productivity indirectly by facilitating a more efficient allocation of labor. Specifically, as labor moved out of the agricultural sector, where it has low marginal productivity, into industry and services, where marginal productivity is higher, the economy's overall productivity increased. Heytens and Zebregs argue that productivity growth stemming from this labor migration was a key contributor to output growth during the past two decades.

Looking forward, further implementation of key structural reforms could allow China to maintain economic growth at about 6–9 percent, although setbacks in the reform process would carry serious downside risks to the growth outlook. Assuming structural reforms proceed, the financial sector will become more commercially oriented in extending credit and, consequently, capital accumulation may slow somewhat. Nevertheless, even if investment rates were to decline from over 40 percent of GDP at present to about 30–35 percent of GDP, the rate of capital accumulation would still be 7–8 percent, contributing 4–5 percentage points to overall growth.

The contribution of labor force growth to output growth is expected to remain small at about ¼ percentage point, in line with previous trends and population-growth projections. However, the contribution of labor migration from agriculture into the industrial and service sectors could be significantly higher. According to different estimates, the surplus labor in agriculture could amount to 150 million people or more, compared with an estimated total labor force in China of about 740 million, and total employment in the industrial and service sectors of about 370 million.[1] Migration of this surplus

Note: The main author of this box is Tarhan Feyzioğlu.

[1]As discussed in Brooks and Ran (2003, p. 14), "[d]espite increased migration, considerable surplus labor persists in the rural areas. OECD (2002) estimates that if the average GDP contribution per worker in nonagricultural jobs is used as a benchmark, rural hidden unemployment can be estimated to represent around 275 million (where hidden unemployment is defined as low-productive employment regardless of working time). If the benchmark is set more modestly at one-third of the productivity of nonagricultural workers (in line with other Asian countries), rural hidden unemployment would be around 150 million."

labor from agriculture to more productive activity in the industrial and service sectors could contribute 1–2 percentage points to productivity growth. Sizable foreign direct investment inflows are also expected to continue playing a key role in promoting increased efficiency and facilitating technology transfer from abroad. Overall, China could then sustain 2–4 percent TFP growth, provided the following key structural reform challenges are addressed.[2]

- To improve the allocation of investment, China needs to strengthen banks' balance sheets and increase their market orientation, and further develop capital markets. While significant steps have already been taken, further measures will be needed to improve banks' risk management, internal controls, governance structure, and ability to price risk. Also, banks' ownership structure needs to be diversified through strategic investors.
- To ensure strong productivity growth, China needs to facilitate the migration of labor by establishing a well-functioning labor market. To that end, training and education have improved, and various incentives for reemployment have been established. However, to create a more efficient and less segmented labor market, China will need to allow greater labor mobility and expand the coverage of its social safety net. Pensions, once provided by state-owned enterprises, will eventually need to cover those working in the private sector and be made portable. Basic social services, such as health care and education, will need to be made accessible to all urban residents and expanded to cover more rural residents.
- Reforms in the state-owned enterprise sector will also help China maintain its overall productivity growth. Notwithstanding important steps that have already been taken to improve the market orientation of these enterprises, excess labor continues to depress productivity, corporate governance is still weak, and most enterprises continue to operate without hard budget constraints and with a heavy social burden, including the provision of many social services for their employees.
- Of course, all these reforms have significant fiscal implications. Nonperforming loans and unfunded pension obligations represent large contingent liabilities for the public sector, and increased demand for education, health care, and environmental protection will require higher public spending. Structural reforms in the banking and enterprise sectors, as well as in the pension system, could reduce the government's liabilities in these areas, and the government could meet some quasi-fiscal liabilities by selling a part of its substantial assets. Even with these measures, however, growing expenditure pressures will likely require additional measures on both the revenue and the expenditure sides and reform of center-local fiscal relations.

[2]See Feyzioğlu and Wang (2003) for further discussion of recent structural reforms and remaining reform needs.

output and welfare are difficult to assess, but are likely to be positive and potentially of a higher order of magnitude than all other effects.[23] In addition, from a business-cycle standpoint, China's rising share in world output and its relatively low correlation with industrial-country output may help dampen cyclical swings in the global economy.[24] However, China's business

[23]Acemoglu and Ventura (2002) provide a recent theoretical attempt to integrate long-run terms-of-trade movements into the endogenous growth literature. They emphasize that terms-of-trade changes affect returns to capital accumulation, and hence provide a mechanism whereby productivity gains in one country yield an incentive for growth in other countries. At an empirical level, Bleaney and Greenaway (2001) confirm that when terms of trade improve, both investment and growth increase.

[24]During 1979–2003, China's business cycle (defined as the percentage difference between its output and a log-linear trend) has displayed a correlation of only 0.0 and 0.2 with the business cycles of the world and the United States, respectively.

cycle will likely become more synchronized with the rest of the world, as it integrates further into the global economy.

Previous attempts to quantify these various effects have typically focused on the impact of China's accession into the World Trade Organization (WTO), and concentrated on the trade channels noted above. These studies (see Box 2.4 for more details) broadly concluded that China's WTO accession entails an overall welfare gain both for China and for the rest of the world as a whole. However, some developing countries, which compete with China in world markets for labor-intensive products such as textiles, could encounter losses. While the impact on China is significant, the net effect on other countries, with the exception of South Asia, is generally small.[25] These studies are suggestive, but they focus on the direct impact of trade liberalization alone. In fact, China's future economic growth (itself in part related to liberalization) is likely to have a much larger impact on trade volumes. Further, the studies tend to ignore how structural rigidities in other economies might affect the scope for resource reallocation and hence welfare.

Yang and Vines (2000), by contrast, examine the global impact of China's accelerated growth over 1975–95. They freeze China's size and its trade openness (relative to the values for advanced economies) at their 1975 level, and compare the resulting counterfactual equilibrium with the actual global economy in 1995. They find that China's growth acceleration during the period benefited at least some developing countries, and had little impact on others. The reason is that, on average, China's accelerated growth led to an improvement in other developing countries' terms of trade vis-à-vis China, which outweighed any deterioration in their terms of trade vis-à-vis the rest of the world. However, using a backward-looking analysis to infer the consequences of future Chinese growth is misleading, since the starting point (for both China and the rest of the world) is very different now than it was thirty years ago. For instance, advanced economies currently have less unskilled labor and far lower employment in labor-intensive sectors, such as apparel, than was previously the case.

Estimating the Impact of Future Chinese Integration

To assess the global implications of growth in China empirically, it is useful to focus on the impact of China's expanding international trade, given that this has been the subject of considerable public debate and controversy. To this end, the Global Trade Analysis Project (GTAP) model was used to quantify the impact on the terms of trade and trade flows of different regions of various scenarios for the path of growth in China through 2020. GTAP is a computable general equilibrium model that captures in detail the geographic and sectoral structure of trade flows (see Appendix 2.1 for an overview of GTAP). It is therefore well suited to analyzing the impact of expanding Chinese trade on different regions' terms of trade, and examining the reallocation of production and trade that will be required for each region to maximize the benefits from Chinese growth.

The GTAP framework, however, has some drawbacks. First, it treats overall economic growth as exogenous. Hence, it does not capture any dynamic impact of China's emergence on productivity growth and factor accumulation in other regions, but only the gains arising through the reallocation of productive resources. Second, GTAP assumes that adjustment to shocks occurs smoothly and costlessly, although this assumption is partially relaxed later to help assess the importance of structural flexibility in helping different economies meet the challenge of an emerging China. Overall, while the precise

[25]For instance, Ianchovichina and Martin (2003) conclude that WTO accession will raise China's and Taiwan Province of China's income per capita by 2.2 percent and 0.6 percent, respectively, and reduce Vietnam's and South Asia's by 1.4 percent and 0.5 percent, respectively. The net welfare impact on any other country or region will be less than 0.2 percent.

Box 2.4. Quantifying the International Impact of China's WTO Accession

Methodologies

Research aimed at quantifying the impact of China's WTO accession intensified in the past five years.[1] It has focused on the specific impact of WTO-related trade reforms in China against baseline projections incorporating Uruguay Round trade reforms. The welfare impact has been assessed based on global general equilibrium models. The Global Trade Analysis Project developed at Purdue University, which focuses on terms-of-trade and trade-flow effects, is one of these models; other studies are based on the G-Cubed Asia Pacific Model developed at the Australian National University.

Results

Most studies concur that China's WTO accession entails an overall welfare gain for China and the world as a whole. However, since China's tariffs had already been lowered substantially prior to accession, this effect is not likely to be sizable in the future. Another general result is that countries will tend to benefit (or lose) in proportion to the degree of complementarity between their trade patterns and China's. More detailed results include the following.

- Sustaining China's growth momentum should benefit all its trading partners: in addition to the prominent role played by processing trade, imports for domestic use have increased rapidly and outbound tourism grew by 37 percent in 2002. Multinational companies are increasingly investing in China to meet local final demand rather than solely for re-export purposes. China's energy and mineral imports are also expected to continue to increase rapidly, providing benefits to resource-rich countries. These developments have contributed to maintaining strong growth in the Asian region despite low growth in the rest of the world.
- The NIEs of Asia would, in particular, gain from China's expanding trade: most of them have a complementary trade pattern with China and are benefiting from processing trade, as reflected in the rapid increase in their exports of intermediate products and components to China. However, China's exports are moving up the value-added chain and domestic production of components is rising. While China could pose a more direct competitive threat to these economies in the future, the benefits from growing intra-industry trade are likely to dominate.
- ASEAN countries and South Asia are also experiencing benefits as exports of all countries to China are expanding rapidly. However, to the extent that there is competition in the export of labor-intensive products, some of these economies may have to undergo significant adjustments. For example, the expected future growth in China's clothing exports could have an adverse impact, especially on those economies that benefited from the quota system under the WTO Agreement on Textiles and Clothing, although this impact could be mitigated for some countries by increased opportunities for textile exports to China as inputs for China's clothing exports. ASEAN countries may also have to adjust to a greater share of foreign direct investment in the region going to China, and take steps to ensure that technological innovations and productivity improvements continue to take place in their economies.

Limits to Existing Research

The actual impact of China's WTO accession on the rest of the world may prove greater than such analyses would suggest. First, most existing models have several technical limitations, including uncertainties in estimated trade elasticities stemming from rapid changes in the structure of China's and the region's international trade. More fundamentally, most models fail to take into account key aspects of China's WTO membership such as the opening of trade in services or reforms that will remove obstacles to foreign investment and further change China's role as a global export base.

Note: The main author of this box is Thomas Rumbaugh.

[1]Examples include Bhattasali, Shantong, and Martin (2004a, 2004b); Dorsey and others (2003); Hertel and Walmsley (2000); Ianchovichina and Martin (2003); Tongzon (2001); and Wang (2003).

Table 2.10. Trade-Related Impact of Faster Chinese Integration, 2020[1]

	Welfare[2]	Exports	Imports	Terms of Trade
World[3]	5.3	7.4	7.2	0.0
China	126.1	86.6	85.7	−7.0
Advanced economies	0.1	2.3	2.7	0.7
NIEs	0.2	2.2	2.9	0.5
ASEAN	—	0.9	0.5	−0.1
South Asia	−0.2	0.1	−2.3	−1.0
Sub-Saharan Africa	0.4	0.2	0.8	1.4
Mexico, Colombia, and Venezuela	0.1	−0.7	−1.2	0.3
Other Western Hemisphere developing countries	0.2	2.5	2.8	0.9
Middle East and North Africa	0.7	−0.8	0.4	1.9
Rest of the world	0.1	1.3	0.6	0.4

Source: GTAP model simulations.
[1]As percentage deviation from the values prevailing in the slow-Chinese-integration scenario.
[2]Welfare is defined as the equivalent variation, relative to GDP.
[3]F.o.b. prices for exports, and c.i.f. prices for imports. The discrepancy between changes in exports and in imports reflects transport costs.

quantitative calculations of the welfare impact of China's growth on other regions may be considerably underestimated by the model, the trade-related interactions that are highlighted by this framework provide interesting insights, and allow the identification of potential winners and losers associated with China's emergence.

For the purposes of this study, a 10-region, 7-sector version of GTAP was constructed.[26] In the first scenario, economic variables (including in particular aggregate GDP, productivity, and factor endowments) are broadly assumed to grow at values consistent with the long-term projections from the *World Economic Outlook*, the World Bank, and the United Nations. In China, productivity, employment, and human and physical capital are assumed to continue growing rapidly, reflecting a sustained pace of reform and a rapid absorption of rural labor into the modern sector of the economy. Under this "fast-Chinese-integration" scenario, China's economy is able to absorb approximately 150 million additional workers (over and above the natural demographic growth of the population and labor force), coming largely from rural, agricultural areas. As a result, China's real output grows by almost 8 percent a year, and its shares of world output and trade more than double by 2020. The NIEs and South Asia also experience rapid growth, while the advanced economies' share of world output declines by 10 percentage points, reflecting both productivity catch-up by developing countries and population aging in richer economies.

To isolate the impact on the global economy of fast Chinese integration, a second, counterfactual scenario was also constructed, in which China's share of world output is instead assumed fixed at current levels, with little change in its share of world trade.[27] While this "slow-Chinese-integration" scenario is not meant as a realistic alternative path for China's future integration, contrasting it with the fast-Chinese-integration scenario makes it possible to determine the winners and losers from continued rapid Chinese growth. Crucially, all other countries are assumed to display structural flexibility, and can adjust smoothly to different growth rates in China.

The results suggest that by far the largest impact of faster Chinese growth will be on China itself (Table 2.10). Specifically, under the fast-Chinese-integration scenario, China's output in 2020 is more than twice as large as under the slow-Chinese-integration scenario. The expansion in China's exports, mainly of labor-intensive manufactures, and imports, mainly of commodities and skill-intensive manufactures, results in a deterioration in China's terms of trade, but even so overall welfare increases sharply. In other regions, under the assumption of unchanged factor accumulation and full structural flexibility, the key effect comes through changes in the

[26]The 10 regions were China; the advanced economies; the NIEs; ASEAN; South Asia; sub-Saharan Africa; Mexico, Colombia, and Venezuela; all other Western Hemisphere developing countries; the Middle East and North Africa; and the rest of the world. The seven sectors were agriculture; mining; textiles and clothing; unskilled-labor-intensive manufacturing; skilled-labor-intensive manufacturing; unskilled-labor-intensive services; and skilled-labor-intensive services.
[27]Under this scenario, China's growth rate declines to the average for the rest of the world, about 2½ percent on a market-exchange-rate-weighted basis.

terms of trade.[28] Most regions benefit from increased Chinese demand for their exports, and cheaper labor-intensive imports. However, labor-abundant regions that have limited direct trade with China and supply it with few intermediates, such as South Asia, face more intense Chinese competition and lower prices for their labor-intensive exports, while commodity importers face higher prices owing to greater Chinese demand. Overall, South Asia is the only net loser, while the Middle East and North African region is on average the largest gainer, reflecting its substantial exports of oil and other primary commodities, which enjoy a hefty increase in demand under the fast-Chinese-integration scenario.[29]

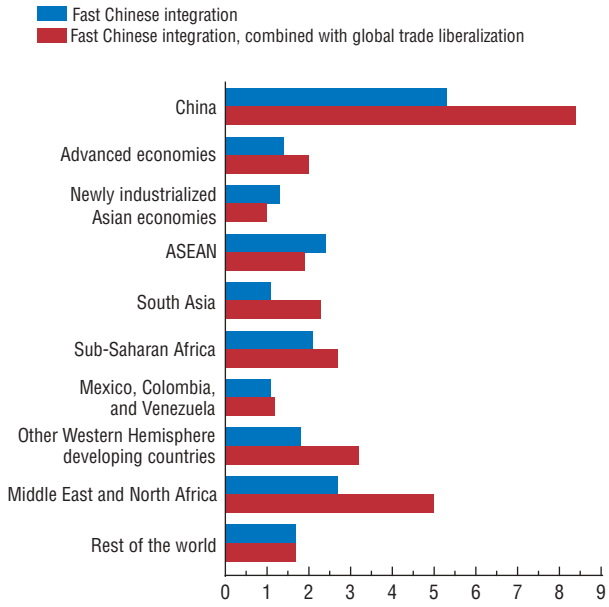
Importantly, the assumption of structural flexibility helps mute the losses and increase the gains from terms-of-trade shocks, as sectoral employment and output respond to changes in relative prices and act to mitigate them. In virtually every region, 1–2 percent of the workforce moves to a different employment sector in response to faster Chinese integration (Figure 2.10)—a shift that equals roughly one-fifth of the total required response under the initial scenario to *all* developments in *all* countries between 2002 and 2020. In South Asia, a contraction in textiles output and exports is partially offset by an expansion in agriculture and in more skill-intensive manufacturing and services (Table 2.11). Also, faster integration of China leads to substantial shifts in the geographic orientation of trade, both in the aggregate and within each sector. For instance, while

[28]The changes in other countries' terms of trade may appear quite small. It is important to note, however, that while world prices for labor-intensive manufactures fall (e.g., textile and clothing prices decline by 5 percent), prices for agricultural and mineral products and services increase. This acts to limit terms-of-trade changes, even for regions such as South Asia that export large volumes of textiles and clothing. The terms-of-trade effects are further mitigated in the model by product differentiation by country of origin, and by intra-industry trade.

[29]However, individual countries in the region, such as Egypt and Morocco, which are net textile exporters, may well experience losses from Chinese competition.

Figure 2.10. Required Structural Adjustment[1]
(Percent)

To reap the benefits of China's emergence and minimize its costs, other countries will need to display significant structural flexibility. Trade liberalization will in general increase further the need for such flexibility.



Source: IMF staff estimates.
[1]Share of the workforce required to move across employment sectors, relative to the outcomes prevailing in the scenario with slow Chinese integration.

Table 2.11. Impact of Faster Chinese Integration on South Asia's Output and Trade Volumes, 2020[1]

	South Asian Output	South Asian Exports			South Asian Imports		
		Total	To China	To rest of world	Total	From China	From rest of world
All sectors	−0.1	0.1	83.6	−3.7	−2.3	70.9	−7.2
Contribution of:[2]							
Agriculture and food	0.1	0.2	2.9	0.1	−1.8	−6.4	−1.4
Minerals	0.1	0.5	14.0	—	0.1	−0.8	0.1
Textiles and clothing	−0.3	−4.6	5.1	−5.0	−0.2	25.3	−1.9
Labor-intensive manufactures	—	−0.3	4.1	−0.5	−0.1	9.0	−0.7
Skill-intensive manufactures	—	1.2	22.4	0.4	0.1	44.9	−2.8
Labor-intensive services	−0.1	1.0	10.4	0.3	−0.1	0.3	−0.1
Skill-intensive services	0.3	2.0	24.5	1.0	−0.2	−0.6	−0.2

Source: GTAP model simulations.
[1]As percentage deviation from the values prevailing in the slow-Chinese-integration scenario.
[2]Each sector's contribution to the total change is given by the change in that sector, multiplied by the sector's share in total output/exports/imports, as appropriate.

South Asia's total export volumes remain broadly constant, its exports to China increase by more than three-fourths, offsetting a decline in exports to the rest of the world; likewise, South Asia's manufactured exports to China (partly for reprocessing and re-export) increase by about one-fourth, offsetting declines elsewhere. In a similar vein, advanced economies gain by increasing their specialization in services and skill-intensive sectors, and reorienting their trade toward China.

While the estimated impact of faster Chinese integration on other regions is relatively limited, this represents the aggregate effect on all economic groups, in all industries, in all countries within the given region. However, some industries in certain regions, such as the textiles sector in ASEAN, experience sharp reductions in demand and hence output (down by 12 percent; see Table 2.12). Other sectors, such as agriculture in the Western Hemisphere, benefit considerably from the shift in patterns of trade (with output up by 4 percent). In addition, any negative impact tends to be focused on unskilled labor. In China itself, while real wages for unskilled workers rise in absolute terms, they fall markedly relative to the wages of skilled workers (as the 150 million surplus agricultural workers are absorbed into the productive economy, increasing the relative supply of unskilled labor). In other countries, relative wages for unskilled workers also decrease, although by smaller amounts. Linked to this, any negative impact is likely to be significantly larger for those South Asian or ASEAN countries, such as Bangladesh, Vietnam, and Cambodia, that are more specialized in labor-intensive manufacturing and compete more directly with China than their regions as a whole.[30]

It is also of interest to consider the likely impact of faster Chinese integration in an environment where other economies display less structural flexibility. To this end, a separate simulation assumes that real wages for unskilled labor are fixed at the value prevailing in the slow-Chinese-integration scenario. While this assumption does not fully capture the true extent of real-world rigidities and the entire cost of having to rapidly adjust output and employment levels, the results broadly confirm that faster Chinese integration, assuming structural rigidities elsewhere, would be associated

[30]It is interesting to note that, between January–September 2001 and January–September 2003, as Chinese exports of newly liberalized (under "third-phase quota integration") textiles to the United States and the European Union tripled and doubled, respectively, corresponding exports from Bangladesh and Thailand to the United States and the European Union and from Vietnam to the European Union all fell by more than 40 percent. See Ahearne and others (2003) for a fuller analysis of export competition between China and other Asian countries.

Table 2.12. Impact of Faster Chinese Integration on Sectoral Gross Output, 2020[1]

	All Sectors	Agriculture	Minerals	Textiles and Clothing	Manufactures		Services	
					Labor-intensive	Skill-intensive	Labor-intensive	Skill-intensive
China	97.3	45.7	33.0	76.6	103.0	128.3	117.0	100.3
Advanced economies	−0.1	6.1	2.6	−9.6	−5.4	−2.6	0.4	0.3
NIEs	−0.3	2.7	2.5	−11.9	−3.2	−0.7	0.6	0.5
ASEAN	−0.6	2.0	3.5	−12.0	−6.6	−0.6	0.1	1.6
South Asia	−0.3	0.6	3.2	−8.0	−0.9	−0.1	−0.2	1.3
Sub-Saharan Africa	−0.5	2.6	2.5	−7.1	−10.3	−4.1	0.1	0.9
Mexico, Colombia, and Venezuela	−0.3	1.2	2.0	−5.5	−3.8	−2.0	0.1	1.0
Other Western Hemisphere developing countries	−0.3	4.0	3.4	−4.6	−5.1	−2.6	0.2	0.2
Middle East and North Africa	−0.8	1.6	2.1	−8.2	−4.7	−8.3	0.6	1.3
Rest of the world	−0.3	2.3	2.0	−10.8	−5.1	−2.6	0.5	0.4

Source: GTAP model simulations.
[1]As percentage deviation from the values prevailing in the slow-Chinese-integration scenario.

with changes in aggregate output and employment (Table 2.13). As a result, losses in South Asia would double and the ASEAN and Western Hemisphere regions would also become net losers.

To put these findings into perspective, a separate simulation considers the impact of faster Chinese integration combined with further global trade liberalization. This scenario assumes that all tariffs and export subsidies worldwide are reduced by 50 percent (over and above already existing WTO commitments). The results illustrate that a broad-based, multilateral liberalization would both benefit all regions and likely offset any negative regional impacts from faster Chinese integration (Table 2.14). Under such a scenario, even unskilled labor would find its real income increasing, for instance by 1–2 percent in the NIEs, ASEAN, and South Asia. However, trade liberalization would typically not reduce, but rather would increase, the need for structural flexibility. The share of the workforce required to move across employment sectors would, for example, double in South Asia, and reach almost 5 percent in the Middle East and North Africa (Figure 2.10). The scenario also highlights the interesting point that the trade-related impact on other economies of China's continued rapid integration is likely to be relatively small compared with the outcome of a significant multilateral trade liberalization.

Conclusions and Policy Implications

China's growth and integration experience so far are broadly in line with previous historical episodes of rapid integration, including the post–World War II experience of Japan, the NIEs, and the ASEAN-4. Nonetheless, in the long run China is likely to play a much larger global role than any of these economies. China itself clearly stands to gain the most from its rapid growth and continued integration into the global economy.

Table 2.13. Impact of Faster Chinese Integration Assuming Structural Rigidities, 2020[1]

	Welfare[2]	GDP	Unskilled Employment (percent of workforce)
World	5.1	5.6	2.8
China	126.1	140.5	27.8
Advanced economies	0.1	—	−0.1
NIEs	0.1	—	−0.2
ASEAN	—	−0.1	−0.3
South Asia	−0.5	−0.4	−0.9
Sub-Saharan Africa	0.1	−0.2	−0.5
Mexico, Colombia, and Venezuela	−0.1	−0.1	−0.4
Other Western Hemisphere developing countries	−0.1	−0.2	−0.5
Middle East and North Africa	0.2	−0.4	−1.3
Rest of the world	−0.3	−0.3	−0.8

Source: GTAP model simulations.
[1]As percentage deviation from the values prevailing in the slow-Chinese-integration scenario. Structural rigidity is imposed by fixing real wages for unskilled labor, in all countries except China, at the values prevailing in the slow-Chinese-integration scenario.
[2]Welfare is defined as the equivalent variation, relative to GDP.

Table 2.14. Impact of Faster Chinese Integration Combined with More Rapid Global Trade Liberalization, 2020[1]

	Welfare[2]	Exports	Imports	Terms of Trade	Real Wages for Unskilled Labor
World[3]	5.5	16.9	16.6	—	1.0
China	127.4	121.1	123.5	–7.8	65.7
Advanced economies	0.2	7.8	7.4	1.1	0.2
NIEs	0.6	8.5	11.1	1.1	1.3
ASEAN	0.4	9.7	13.8	–0.1	1.7
South Asia	0.3	26.8	26.2	–2.4	1.2
Sub-Saharan Africa	0.6	10.7	14.4	0.8	0.8
Mexico, Colombia, and Venezuela	0.2	6.9	6.3	–0.3	0.4
Other Western Hemisphere developing countries	0.5	20.0	21.3	0.8	0.4
Middle East and North Africa	1.4	9.3	13.4	1.4	0.9
Rest of the world	0.1	13.6	9.2	–0.2	0.2

Source: GTAP model simulations.
[1]As percentage deviation from the values prevailing in the slow-Chinese-integration scenario.
[2]Welfare is defined as the equivalent variation, relative to GDP.
[3]F.o.b. prices for exports, and c.i.f. prices for imports. The discrepancy between changes in exports and in imports reflects transport costs.

The impact on the rest of the world as a whole will be more limited but also beneficial, and could well include dynamic productivity gains. While individual sectors could suffer significant losses, such costs will typically be offset by gains in other sectors. In particular, advanced economies will benefit from cheaper labor-intensive imports, as well as greater demand for skill-intensive goods and services. Other developing countries will see increased opportunities for exports to China, both of primary commodities and of manufactures for reprocessing and re-export. However, countries whose factor endowments are similar to China's, and that compete most closely with it in world markets, will need to undertake sizable adjustments and display considerable flexibility in their product and labor markets. Otherwise, increased competition from China could lead to significant losses.

Individual countries can maximize the gains from China's emergence and minimize the associated costs by increasing the flexibility of their economies through structural reforms. A successful response to China's growth, like many other shocks, will involve significant intersectoral mobility. As resources move to more productive areas, transitional problems may arise, particularly for less-skilled workers. The temptation to mitigate such problems through protectionism or subsidies, however, should be resisted. Rather, affected countries will fare better by speeding up their own liberalization and integration. This will improve the efficiency of resource allocation in their economies, and allow them to better pursue their own comparative advantage. For advanced economies, this will likely entail factors of production shifting to more skill- and capital-intensive activities. For middle-income developing countries with relatively well educated workforces, enhanced flexibility, combined with increased efforts to upgrade human capital through education and training, will help them move up the value-added curve and capitalize on the opportunities afforded by a larger and more dynamic global economy. Countries with a relatively large pool of less-skilled workers will face a harder task, but stand to benefit considerably from a faster-growing world economy, which will offer productive employment opportunities for their unemployed and underemployed labor resources. To capitalize on such opportunities, reforms to ease impediments to the absorption of less-skilled workers and the movement of workers across sectors will be needed, together with investment in workers' training and skill upgrading.

The trade-related impact on other economies of China's continued integration is likely to be relatively limited in comparison with other prospective global changes over the next decade or two. In particular, deeper and further-reaching

trade liberalization than currently envisaged under existing WTO commitments could affect economies, and sectors within those economies, much more profoundly. Linked to this, while the developing countries themselves will bear the bulk of the responsibility for ensuring that their economies are flexible enough to meet the challenge of China's integration, substantive multilateral trade liberalization in the context of the Doha Round, for instance of agricultural products, could significantly aid this process. Finally, the importance of structural reforms to enhance flexibility will be magnified if China's emergence is accompanied by that of India and other large developing countries.

Appendix 2.1. Modeling the Impact of China's Emergence on the Global Economy

The main author of this appendix is Yongzheng Yang.

The Global Trade Analysis Project (GTAP) model used in this analysis is a comparative-static, computable, global-general-equilibrium model based on neoclassical trade theory.[31] Firms are assumed to maximize profits. Production exhibits constant returns to scale, and both product and factor markets are perfectly competitive. Each industry produces a single commodity using intermediate inputs and a primary factor composite, which is a constant elasticity of substitution (CES) function of land (used in agriculture only), unskilled labor, skilled labor, capital, and natural resources (confined to mining). Intermediate inputs are CES blends of home products and imports, which are sourced from all regions in a CES manner (the Armington approach).

Expenditure in each region consists of household and government consumption, and the remaining national income goes to savings. Households maximize their utility based on a non-homothetic constant difference in elasticity (CDE) function. Public consumption claims a fixed proportion of national income, as do savings, unless exogenously specified. All goods and services purchased by households and the government are CES combinations of home products and imports.

All regions contribute their savings to a global savings pool managed by a global bank, which purchases capital goods in each of the regions on behalf of world savers. The allocation of investment among regions is based on regional expected rates of return, which in turn reflect projected productivity growth and factor accumulation. While capital (i.e., savings) is mobile across regions, the capital stock is not—although it is perfectly mobile within a region, as is labor. Land and natural resources are sector specific.

The analysis uses Version 5.4 of the GTAP database, with 1997 as the base year.[32] To reflect the substantial changes in world trade patterns since 1997, and to make forward-looking projections more realistic, the database was updated using 2002 data on bilateral trade flows and macroeconomic aggregates (such as GDP and employment). The updating process resembles a forward-looking projection exercise whereby trade flows and macroeconomic aggregates in all regions are exogenously raised to their observed 2002 levels with all other variables determined endogenously.

In simulating the impact of China's emergence on the global economy, we first undertake a benchmark projection for the global economy in 2020 based on forecasts broadly consistent with those of the IMF, World Bank, and United Nations (Table 2.15).[33] At the projected growth rate, China is assumed, by 2020, to be able to absorb 150 million surplus workers into its work-

[31]The standard version of the model is documented in Hertel (1997), and is solved using GEMPACK (Harrison and Pearson, 1996).

[32]The database is documented in Dimaranan and McDougall (2002).

[33]In addition to factor accumulation and GDP growth, the benchmark projection assumes that the current Doha Round trade talks result in trade liberalization of a similar magnitude to the outcome of the Uruguay Round. Specifically, tariffs in industrial countries are assumed to be cut by 36 percent, domestic agricultural subsidies by 20 percent, and export subsidies by 24 percent. Developing country reductions are one-third less.

Table 2.15. Projected Average Annual Growth Rates of Population, GDP, and Factors of Production Under the Fast Integration Scenario, 2002–20[1]

	Population	Real GDP	Real Per Capita GDP	Labor	Unskilled Labor	Skilled Labor	Capital
World	1.1	2.7	1.7	1.4	1.4	1.3	2.1
China	0.6	7.6	7.1	1.7	1.9	0.6	7.0
Advanced economies	0.4	2.0	1.6	—	–0.1	—	1.3
NIEs	0.7	4.6	3.9	0.9	0.7	1.3	4.6
ASEAN	1.0	4.9	3.9	1.4	1.1	2.2	5.4
South Asia	1.3	5.6	4.3	1.5	1.4	2.1	6.5
Sub-Saharan Africa	1.9	4.4	2.5	2.2	2.2	2.3	4.5
Mexico, Colombia, and Venezuela	1.2	3.1	1.9	1.6	1.5	1.9	2.0
Other Western Hemisphere developing countries	1.0	3.0	2.0	1.4	1.2	1.6	2.0
Middle East and North Africa	1.5	4.5	3.1	2.0	1.9	2.5	4.0
Rest of the world	1.1	4.6	3.4	1.3	1.1	1.8	3.1

Sources: IMF; World Bank; United Nations; and IMF staff estimates.
[1]The slow integration scenario assumes instead that China's share of world output remains constant over the period 2002–20. Accordingly, factor accumulation and technological progress in China are much slower.

force as unskilled labor. A second projection is then carried out assuming that China's share of world output remains constant over the period 2002–20. Accordingly, factor accumulation and technological progress in China are much slower, and no surplus labor is absorbed over time. Comparisons between the two projections yield the impact of China's faster integration into the global economy. It is worth noting that we have assumed that faster Chinese integration does not affect the rates of factor accumulation nor technological change in other regions. The impact of China's faster integration on other regions arises through changes in trade and global savings (and the associated changes in capital flows), which in turn lead to changes in the terms of trade and to reallocation of productive resources. In the simulation where faster Chinese integration is combined with global trade liberalization, it is assumed that trade distortions (tariffs and agricultural subsidies) are reduced by 50 percent in all regions (over and above the assumed Doha Round liberalization already embodied in the benchmark projection).

To keep the model manageable, a 10-region, 7-sector aggregation of the model was chosen (Table 2.16). The selection of regions was based largely on the characteristics of their trade relations with China. For example, the Asian NIEs are separately identified in the model because they have intensive trade relations with China, yet their exports are now sufficiently diversified and different from China's that the region is expected to gain from China's further integration into the global economy. In contrast, South Asia, whose factor endowments are similar to China's and which is heavily concentrated in labor-intensive exports, is expected to face intense competition as China grows. The Middle East and North Africa region is a large supplier of energy and other mineral imports to China, and China's growth will further increase its demand for these imports. However, the region is also a larger net importer of food and agricultural products, and its import bill for these products is expected to increase as China grows. Sub-Saharan Africa and Western Hemisphere

Table 2.16. Regions and Sectors Identified in the Model

Country/Region	Sector
China	Agriculture and food
Advanced countries	Mining
NIEs	Textiles and clothing
ASEAN	Labor-intensive manufacturing
South Asia	Skill-intensive manufacturing
Sub-Saharan Africa	Labor-intensive services
Mexico, Colombia, and Venezuela	Skill-intensive services
Other Western Hemisphere developing countries	
Middle East and North Africa	
Rest of the world	

Table 2.17. Elasticities of Substitution in Demand for Goods and Factors of Production

Sector	Between Primary Factors	Between Home and Generic Imports	Between Imports by Country of Origin
Agriculture and food	0.6	4.8	9.4
Mining	0.2	5.6	11.2
Textiles and clothing	1.3	6.2	12.6
Other labor-intensive manufacturing	1.3	5.9	12.1
Skill-intensive manufacturing	1.3	6.7	11.9
Labor-intensive services	1.5	3.9	7.8
Skill-intensive services	1.3	3.8	7.6

Source: STAP Version 4.5 elasticities, modified following Hertel and others (1996), as discussed in the text.

developing countries are also identified in the model on the basis of their large exports of primary commodities, as is the oil-exporting group comprising Mexico, Colombia, and Venezuela.

The sectors identified in the model include agriculture, mining, textiles, other manufacturing, and services. In turn, "other manufacturing" and "services" are classified into labor- or skill-intensive, according to their relative factor intensity. This follows Tyers and Yang (1997), who rank the full set of industries in the GTAP database (Version 3) according to total factor intensity, which includes both direct factor inputs and indirect factor inputs embodied in intermediate inputs. Specifically, if a (manufacturing or service) industry ranks higher (respectively, lower) in unskilled-labor intensity than in skilled-labor intensity, then it is placed in the labor-intensive (respectively, skill-intensive) sector, regardless of the relative shares of skilled and unskilled labor in total value added. The split between skilled and unskilled workers in the GTAP database is based on the International Labor Organization Classifications of Occupations (see Liu and others, 1998, for details).

All simulations employ standard GTAP values for all elasticities, except those directly related to international trade. Following Hertel and others (1996), we doubled the standard Armington elasticities of substitution for all commodities, to reflect the long-run nature of our experiments (see Table 2.17). Sensitivity analysis shows, however, that our results are not particularly sensitive to the magnitude of these elasticities. When the elasticities are lower (higher), the impact of China's faster integration on other countries' trade and production volumes tends to be smaller (larger), but this is often offset by larger (smaller) terms-of-trade effects. For example, halving the Armington elasticities slightly reduces the export expansion in the NIEs, but it further improves their terms of trade, resulting in a larger increase in welfare.

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