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CHINA'S ECONOMIC PROSPECTS 2006–2020

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CONTENTS

KEY FINDINGS

- China's remarkable growth over the last quarter century has lifted hundreds of millions of people out of extreme poverty. Yet most of the population continues to survive on less than $2 a day. Poverty is concentrated in rural areas, where it has been difficult to generate sufficient employment opportunities to raise productivity and incomes.
- An exercise simulating China's accession to the World Trade Organization shows that accession generally benefits the economy, although terms of trade turn against China, with prices of imports rising more than prices of goods China exports. The government suffers a net loss of revenue due to tariff reductions. Most households benefit from WTO accession; however, urban households gain more than rural households, increasing already pronounced disparities.
- The imposition of textile and apparel export restraints by the European Union and the United States reduces China's benefits significantly during the period the restraints are in effect (through 2008). However by 2010 the losses are largely eliminated.
- The WTO scenarios suggest that accession increased employment by about 13 million jobs, or 1.4 percent. Compared with the estimated 300 million jobs needed to achieve full employment in China, it is clear that growth in trade alone cannot solve the country's employment challenges.
- A separate exercise was conducted to probe the effect on China of three different scenarios of international and national developments. The first scenario continues the trends of recent years. A second scenario is more optimistic, with world trade continuing to grow and China improving its resource allocation. A third, more pessimistic scenario simulates a higher risk global environment, with trade tensions increasing, and a less effective modernization of the Chinese economy through domestic policy changes.
- Under the scenario that continues current trends, the economy maintains an average annual growth rate of about 8 percent over the next five years. At 2002 constant prices, the aggregate GDP would reach $3.6 trillion in 2010, slightly smaller than that of Japan in 2002. Per capita GDP would be about $2,670, comparable to the current per capita incomes of Brazil, South Africa, and Turkey. From 2010 to 2020, growth is projected to slow somewhat, to an annual average of about 7.6 percent. By 2020, GDP would be about $7.5 trillion and per capita GDP would be about $5,300, comparable to per capita incomes in Hungary and Poland today.
- The most dramatic difference in impact between the optimistic and pessimistic scenarios is experienced by poor rural households. There are fewer opportunities for agricultural workers to find jobs in the cities and their already low wages stagnate. At the same time, China imports fewer agricultural products from the rest of the world, as agricultural production declines more slowly in China and incomes rise less.
- The experiments lead to the finding that domestic demand will likely be the main source of employment creation. This finding suggests policy responses in several areas. Policies that raise household incomes widely, particularly those of rural and lower-income urban households, will be needed to generate broad-based demand. At the same time, such policies would reduce the economy's reliance on trade, help to address current account imbalances, and contribute to more balanced development between urban and rural areas. Fiscal policies and labor market policies have a major role to play. An emphasis on service sector development, particularly in personal services such as education and health care, could generate more labor-intensive jobs, both in urban and rural areas, to absorb surplus labor from the agricultural sector.
- China's continued development will require a reasonably benign international environment if recent rates of growth are to be maintained. However, policy choices by the Chinese government will determine whether living standards rise throughout the country, whether productivity increases to smoothly compensate for the aging of the population, and whether the economy evolves in a balanced and sustainable manner.

INTRODUCTION

China's economic growth during the past twenty-five years has been remarkable, averaging more than 9 percent a year. While there have been earlier episodes of comparable growth rates in countries such as Japan and South Korea, there is no precedent for such rapid growth in a country the size of China, whose population of 1.3 billion is thirteen times that of Japan when that nation began its rapid growth. The impact on the rest of the world of economic dynamism on this scale is already being felt. If China continues its rapid growth in the coming decades, it will take the global economy into uncharted terrain.

Within China, rapid economic development has brought a welcome lifting of incomes. As recently as 1980, almost 80 percent of the population lived in extreme poverty (defined as less than $1 per day), according to World Bank figures.[1] Today, less than 20 percent does. Yet despite unprecedented progress in reducing the most severe poverty, about 70 percent of the population still survives on very low incomes, defined at the World Bank standard of $2 per day. Poverty is concentrated in the rural areas, where the average net income in 2005 was $397 per person, compared with $1,281 for urban residents.[2] With about 45 percent of the workforce still engaged in low-productivity agriculture, the Chinese economy needs to create hundreds of millions of jobs in higher-productivity sectors to enable these workers to earn their way out of poverty. Overall, China still faces serious income and employment challenges. It will require a further period of sustained growth to provide even a moderate standard of living for its entire population.

The interplay between the Chinese and global economies will have major, perhaps determinative, effects on the well-being of Chinese households. For example, if world trade continues to expand, Chinese exports are likely to continue to grow, and more low-income farmers would be drawn into higher-productivity manufacturing. However, if trade frictions increase, job creation would slow. To explore the prospects for the future development of China in this global context, this paper draws on economic models that simulate the impact of different international and national policy choices and environments. The models are those of the Development Research Center of the State Council of China (DRC).

The paper is organized as follows. The first section reviews major trends in the evolution of the Chinese economy from 1980 to 2005. The second section examines the impact on China of the country's 2001 accession to the World Trade Organization (WTO), including both China's implementation of its commitments and the imposition by the United States and the European Union of restraints on China's textile and apparel exports to those markets. The third section explores different growth patterns that China could experience over the next fifteen years under three different scenarios. The scenarios combine national and international developments ranging from conditions that are more favorable than recent trends, to a continuation of current trends, and finally to a higher-risk environment. The final section concludes by summarizing the broad patterns emerging from the experiments. It points to the key challenges that Chinese policy makers must address during the coming decades if they are to optimize China's development pattern to broadly benefit its population.

1. THE EVOLUTION OF THE CHINESE ECONOMY FROM 1980 TO 2005

After China began major economic reforms in 1978, its growth accelerated dramatically. The country's gross domestic product (GDP) increased by more than a factor of ten over the period 1978–2004, with an average annual growth of 9.6 percent. By the end of 2005, China had the fourth largest economy in the world, and its GDP per capita reached $1,713 at international exchange rates (table 1.1).

Table 1.1 Economic Growth in China, 1980–2005

Measure	1980	1990	2000	2005
GDP (billion dollars)	303.4	390.3	1,198.4	2,234.4
Average annual GDP growth rate (percent)[a]		2.5	11.9	13.3
GDP per capita (dollars)	309	344	949	1,713
GDP per capita at purchasing power parity[b]	763	1,596	3,928	N.A.

Note: N.A. = not available. Data converted to dollars from Chinese yuan using IMF International Financial Statistics exchange rate data; unless otherwise noted data calculated at current prices.

[a]Growth rates calculated for the periods 1980–1990, 1990–2000, and 2000–2005.

[b]Purchasing power parity is a measurement of income that adjusts for differences between the relative prices of goods and services in different countries so that a dollar of income measured at purchasing power parity has the same purchasing power in all countries.

Sources: National Bureau of Statistics of China (2005, 2006); World Bank (2006); International Monetary Fund, International Financial Statistics database.

The Pattern and Sources of Economic Growth

The relative contributions of capital, labor, and total factor productivity (TFP) improvement to China's growth are presented in table 1.2. The most powerful force driving China's economic growth has been capital accumulation. From 1978 to 2003, the average growth rate of capital was 9.9 percent, contributing 63.2 percent of overall growth of GDP. By contrast, the contribution of increasing labor supply to overall growth is diminishing, reflecting a decline in population growth. After the 1980s, the contribution of labor growth to economic growth fell below 10 percent. TFP growth made the second-largest contribution to economic growth, although its contribution was uneven. Two distinct periods can be identified. From 1978 to 1997, TFP grew by more than 3 percent. From the late 1990s, TFP growth slowed. Still, the overall average growth rate since 1978 has been 2.4 percent. The sources of productivity growth are discussed in appendix A.

Table 1.2 Sources of China's Economic Growth since 1978 (percent)

Measure	1978–1985	1985–1989	1990–1997	1997–2000	2000–2003	1978–2003
Growth rate of GDP and factors						
GDP[a]	9.8	8.9	11.2	7.7	8.4	9.4
Capital[b]	8.5	9.8	11.2	10.7	10.5	9.9
Labor[c]	3.1	2.6	1.1	1.1	1.1	2.5
Total factor productivity[d]	3.5	2	4	0.8	1.6	2.4
Contribution of factors to economic growth						
Capital[b]	52	66.1	60	83.4	75	63.2
Labor[c]	12.7	11.7	3.9	5.7	5.2	10.6
Total factor productivity[d]	35.3	22.2	36.1	10.9	19.8	26.2

[a]GDP data are from the National Bureau of Statistics of China (2004), based on the 1978 price level.

[b]Capital data before 1997 are from Wang and Zhai (1998); data after 1997 were updated by author Li Shantong. The capital stock of the current year equals the capital stock of the previous year minus depreciation plus the fixed capital formation of the previous year (deflated using the price index of fixed capital investment).

[c]Labor data are from the National Bureau of Statistics of China's China Statistical Yearbook for the employed population.

[d]Total factor productivity (TFP) is based on Solow's equation of growth accounting; i.e., TFP = DP Growth Rate – α× Capital Growth Rate – (1–α)× Labor Growth Rate, where α is the capital output elasticity. The elasticity here is 0.4.

The Changing Industrial Structure of the Economy

The overall growth of the Chinese economy masks significant variation in the performance of different industrial sectors. This has led to a changing industrial composition of the economy (table 1.3). The primary sector (agriculture, forestry, and fishing) has steadily declined as a share of GDP, from 29.9 percent in 1980 to 12.6 percent in 2005. The share in GDP of the secondary sector, comprising manufacturing and construction, contracted in the early 1990s as a result of the restructuring of many state-owned enterprises but has since recovered to about the same share in 2005 (47.5 percent) as in 1980 (48.2 percent). The tertiary sector, covering service industries, expanded from 21.9 percent in 1980 to almost 40 percent in 2005.

Table 1.3 Industry Structure, 1980–2005 (percentage of GDP)

Sector	1980	1990	2000	2005
Primary	29.9	26.9	14.8	12.6
Secondary	48.2	41.3	45.9	47.5
Industry	43.9	36.7	40.4	42.0
Construction	4.3	4.6	5.6	5.5
Tertiary	21.9	31.8	39.3	39.9

Note: Data were calculated at current prices.

Source: National Bureau of Statistics of China (2006).

Investment

High rates of investment have accelerated capital accumulation, which has been a key contributor to China's rapid growth, as mentioned. From 1980 to 2000, the investment rate averaged about 35 percent of GDP. In recent years, it has accelerated to more than 40 percent, reaching 43.4 percent in 2005.

Since the late 1990s, the main sources of investment dynamism have been public investment in infrastructure, domestic and foreign investment in certain manufacturing sectors, and the expansion of household investment in residential housing. Public infrastructural investments in communication, transportation, irrigation, and urban public facilities have increased, and these in turn have contributed to the growth of the service sector. Though investments in infrastructure are counted as nonproductive investments, they contribute to overall economic development, decrease transaction costs, promote a better allocation of resources, and improve living standards. Despite the recent acceleration of public investment, China still has a relatively backward infrastructure, significant disparity in regional infrastructure, and a low level of urbanization, so the need for high levels of investment in this area will continue.

Investment in manufacturing has expanded during the period, although it has fluctuated and been concentrated in certain industries, including steel, aluminum, cement, textile and automobile. Excessive investment in some industries has led to excess productive capacity and less investment efficiency.

The increase in investment by households in residential housing has followed the rise of incomes, especially in coastal regions. Under the national economic accounting system, household expenditures on residential housing are included in investment rather than consumption, although they are nonproductive. However, the rise of investment in housing has a positive effect on current-period demand, through stimulation of construction and related activities. Population growth, accelerated urbanization, and rising income levels are likely to lead to ongoing strength in housing investment in the future.

Investment/consumption ratios are associated with the consumption and saving habits of a country as well as with the level of development. International comparisons reveal that countries in East Asia, including China, tend to have higher savings rates than countries elsewhere in the world. In developed East Asian countries, investment ratios began to decline after their per capita GDP reached about $7,000. China is at a much lower income level, with a weak economic safety net for households and heavy development tasks ahead; thus its savings and investment ratios are likely to remain high.

Consumption

As China's investment has risen, the share of consumption as a portion of GDP has fallen (table 1.4). Despite this shift in the distribution of economic resources from consumption to investment, the country's strong overall GDP growth has meant that its per capita income and living standards have improved in both urban and rural areas, as seen in figure 1.1. The change in the Engel's coefficient, a measure of the share of household income spent on food, is an indicator of the shift from subsistence to higher and better-quality consumption. It has declined for urban households from about 58 percent of income in 1978 to about 37 percent today. For rural households, the decline has been from 68 percent of income in 1978 to about 46 percent today.

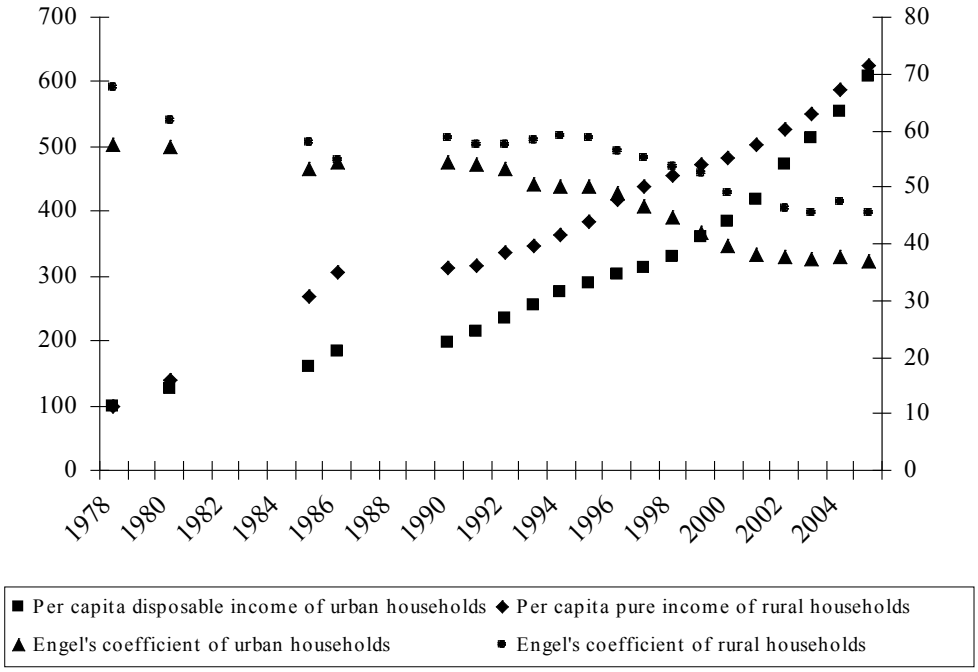
Table 1.4 Investment and Consumption in China, 1980–2005

Measure	1980	1990	2000	2005
Investment (billion dollars)	106.8	141.1	420.9	971.0
Consumption (billion dollars)	200.8	252.8	743.0	1,182.8
Ratio of investment to consumption	0.53	0.56	0.57	0.82

Note: Data were converted to dollars from Chinese yuan using IMF International Financial Statistics exchange rate data; data were calculated at current prices.

Sources: National Bureau of Statistics of China (2005, 2006); International Monetary Fund, International Financial Statistics database.

Figure 1.1 Household Income and Engel's Coefficient



Source: National Bureau of Statistics of China (2006).

Population and Labor Force

The growth and structure of China's population is an important economic determinant, because it sets the boundaries for the supply of labor and influences consumption, savings, and public expenditures. In 2005, the year-end population of China was 1.306 billion, with a net increase of 6.12 million for the year. The growth rate was 0.47 percent, 0.11 percent lower than the previous year. The present death rate of China remains almost unchanged, while the birthrate continues to decline, presenting a population pattern of a low birthrate, low death rate, and low increase.

The Chinese population will continue to grow for the next fifteen years, although at a low and decreasing rate (table 1.5). The population growth rate is projected to remain at about 0.8 percent until 2010. From 2010 to 2020, the growth rate will decrease to 0.67 percent. In 2020, the Chinese population is anticipated to be 1.419 billion.

Table 1.5 Projected Population Growth of China, 1980–2020

Measure	1980	1990	2000	2005	2010	2015	2020
Total population (million)	987.1	1,143.3	1,265.8	1,306.0	1,347.0	1,387.0	1,419.0
Labor force (million age 15–64 years)	607.0	762.6	888.6	918.1	968.5	997.3	994.7
Seniors (million over 64 years of age)	48.4	64.0	88.6	99.3	111.8	133.2	168.9
Labor force (percent age 15–64 years)	61.5	66.7	70.2	70.3	71.9	71.9	70.1
Seniors (percent over 64 years of age)	4.9	5.6	7	7.6	8.3	9.6	11.9

Sources: National Bureau of Statistics of China (2006) for current and historical data; data for future years were provided by Wang Guangzhou of the Institute of Population and Labor Economics, Chinese Academy of Social Sciences.

Starting in the mid-1970s, China began to implement an aggressive birth control policy. As the smaller cohorts born under this policy began moving through the demographic structure of the country, the percentage of children in the overall population declined while the percentage of working age individuals (that is, 15 to 64 years) increased. From 1980 to 2000, the average annual growth rate for the total population was about 1.3 percent, while the working-age population grew at an average of over 2 percent. The working-age population ratio is projected to continue increasing until about 2010, reaching a high point of about 72 percent of the total population. After 2015, both the ratio and the absolute size of the labor force will likely decrease gradually due to continued small cohorts of children. In parallel, the share of the aged in total population will keep rising, especially after 2010. From a share of 7 percent in 2000, the aged are projected to constitute 11.9 percent of the population by 2020.

From the 1980s, the urban population grew rapidly, while the rural population grew slowly and then began to decline in the late 1990s. The urbanization process is projected to accelerate, with the urban share of the population reaching 55 percent by 2020 (table 1.6).

Table 1.6 Projected Urban and Rural Population Distribution of China, 1980–2020

Measure	1980	1990	2000	2005	2010	2015	2020
Total population (million)	987.1	1,143.3	1,265.8	1,306.0	1,347.0	1,390.0	1,419.0
Urban population (million)	191.4	302.0	459.1	562.1	630.0	710.0	780.0
Rural population (million)	795.7	841.4	808.4	745.4	720.0	680.0	640.0
Urban (percent)	19.4	26.4	36.2	43.0	47.0	51.0	55.0
Rural (percent)	80.2	73.6	63.8	57.0	53.0	49.0	45.0

Sources: National Bureau of Statistics of China (2006); data for future years were provided by Wang Guangzhou of the Institute of Population and Labor Economics, Chinese Academy of Social Sciences.

Foreign Trade and Trade Dependence

China's external trade began to grow after economic reforms in the late 1970s, accelerating gradually during the 1980s and 1990s (table 1.7). Trade growth has been more rapid since China's accession to the World Trade Organization in 2001. The total of imports and exports reached $1.4 trillion in 2005, making China the world's third largest trader, after the United States and Germany, accounting for 7.3 percent of world exports and 6.1 percent of world imports.

Table 1.7 China's Exports and Imports, 1980–2005

Measure	1980	1990	2000	2005
Exports (billion dollars)	18.1	62.4	249.2	764.6
Average annual export growth rate (percent)[a]		13.2	14.8	25.1
Imports (billion dollars)	19.9	53.8	225.1	662.4
Average annual import growth rate (percent)[a]		10.4	15.4	24.1
Foreign trade (billion dollars)	38.1	116.2	474.4	1,426.9
Trade dependence ratio	0.13	0.30	0.40	0.64

Note: Data have been converted to dollars from Chinese yuan using IMF International Financial Statistics exchange rate data; data were calculated at current prices.

[a]Growth rates were calculated for the periods 1980–1990, 1990–2000, and 2000–2005.

Sources: National Bureau of Statistics of China (2005, 2006); International Monetary Fund, International Financial Statistics database.

China's dependence on foreign trade as a driver of its economy has also increased sharply in recent years, from a ratio of total imports and exports to GDP of 43.8 percent in 2000 to 63.9 percent in 2005. China has been in a transitional period of trade policy since its accession to the WTO in 2001 as it implemented its commitments in stages through the end of 2006. Tariffs have been reduced and nontariff measures have been eliminated in line with commitments; the committed opening of service markets was completed in late 2006. The average tariff level decreased from 17.5 percent in 2000 to 9.9 percent in 2005.

The industrial composition of China's trade has shifted in the recent past (table 1.8). Two new trends stand out: the vigorous growth in both imports and exports of higher-technology products and the increase in imports of primary products. The proportion of high-technology imports and exports in total imports and exports increased from 19 percent in 2000 to 28 percent in 2004. The growth in exports of high-technology products has been higher than imports, with the trade balance in these products shifting from years of deficit to equilibrium. Primary products have decreased as a share of exports but increased as a share of imports since 2000.

Table 1.8 Composition of China's Exports and Imports (value in billion dollars)

Measure	2000		2001		2002		2003		2004	
	Value	%	Value	%	Value	%	Value	%	Value	%
Total imports and exports	474.3	100	509.8	100	620.8	100	851	100	1,155	100
Total exports	249.2	52.5	266.2	52.2	325.6	52.4	438.2	51.5	593.4	51.4
Primary products	25.5	5.4	26.3	5.2	28.5	4.6	34.8	4.1	40.6	3.5
Industrial finished products	223.7	47.2	239.8	47	297.1	47.9	403.4	47.4	552.8	47.9
High-technology products	37	7.8	46.5	9.1	67.7	10.9	110.3	13	165.5	14.3
Total imports	225.1	47.5	243.6	47.8	295.2	47.6	412.8	48.5	561.4	48.6
Primary products	46.7	9.8	45.7	9	49.3	7.9	72.8	8.6	117.3	10.2
Industrial finished products	178.4	37.6	197.8	38.8	245.9	39.6	340	40	444.1	38.5
High-technology products	52.5	11.1	64.1	12.6	82.7	13.3	119.3	14	161.4	14
Trade balance	24.1		22.5		30.4		25.4		32	

Sources: National Bureau of Statistics of China (2004); 2004 data are from the web site of the Ministry of Commerce.

2. THE IMPACT OF CHINA'S ACCESSION TO THE WORLD TRADE ORGANIZATION: PROJECTIONS THROUGH 2010

As noted above, the role of trade in China's economy has grown dramatically during the past quarter-century and has been particularly strong since the country's accession to the WTO in 2001. At the end of 2006, China completed implementation of its accession commitments. Its trading partners extended most-favored-nation (MFN) status to China upon its accession in late 2001.[3]

However, with regard to two sectors that are important to China's economy, textiles and apparel, two of its largest trading partners implemented restraints on Chinese exports in 2005, after the expiration of the WTO Agreement on Textiles and Clothing (ATC). The ATC had allowed for the rationing of import quotas for textile and apparel products, which constrained Chinese exports. During the months after the ATC expired on January 1, 2005, China's exports grew rapidly. The European Union and the United States promptly began investigations of the effect on their domestic producers and requested consultations with China. Under the terms of China's WTO accession, safeguards were permitted in the textile and apparel sectors until 2008.[4]

As a result of their consultations, the European Union and China signed a memorandum on July 11, 2005, limiting the growth rate of China's exports to the E.U. market of ten categories of products to between 8 and 12.5 percent a year.[5] On November 8, 2005, China and the United States reached an agreement that China would limit the growth of its apparel exports to the United States to 10 percent in 2006, 12.5 percent in 2007, and 15 percent in 2008. For textile products, the parties agreed to limit China's export growth to 12.5 percent in 2006 and 2007 and 16 percent in 2008.

These restraints will delay the full effects of accession on China's economy until 2009. Implementation of some other measures is recent and changes induced are still occurring. To better understand the effects on the Chinese economy during this transitional period, including the impact of the imposition of textile and apparel safeguards, we used an existing DRC computable general equilibrium (CGE) model of China's trade to quantify the effect of separate aspects of the accession agreement and its implementation. The modeling exercise also allows us to probe potential distributional consequences of the accession. The model is a fifty-three-sector, recursive-dynamic CGE model, which is described in detail in appendix B. This model was used to measure the impact of the following four changes: (1) tariff reduction and elimination of quotas on industrial products; (2) agricultural trade liberalization, including tariff reduction and introduction of a tariff rate quota (TRQ) system for agricultural goods; (3) the phaseout of the quotas on textile and clothing under the ATC; and (4) the reimposition of growth restraints on Chinese exports of textiles and apparel into the E.U. and U.S. markets until 2008.[6] The response of the Chinese economy to these changes is projected until 2010.

At the macroeconomic level, the CGE model was used to capture effects such as the impact of the trade policy changes on growth of GDP, trade, investment, consumption, employment, and the sectoral composition of the economy. At the microeconomic level, the model was used to examine the distribution of gains among different types of households.

Scenario Design

The following scenarios were used to assess the impacts of WTO accession. A baseline projection, scenario 1 (S1), was first established to create a reference point for comparing the effects of the trade policy changes. This baseline projects a growth trajectory of the economy to 2010 in the absence of WTO accession. The baseline assumes that China continues its grain self-sufficiency policy and that the import quotas for agricultural goods grow at 3 percent annually from 2000 to 2010.

Four scenarios were then constructed to reflect the four trade policy changes identified above arising from WTO accession. Scenario 2 (S2) considers the tariff reduction and quota elimination on industrial products that China implemented under the terms of its accession.[7] In S2, the growth rate of import quotas for petroleum and automobiles accelerated in the period 2000–2005 and the quantitative restrictions were eliminated in 2005. Scenario 3 (S3) focuses on agricultural trade liberalization. A TRQ system was introduced to replace the previous quota system for rice, wheat, corn, cotton, wool, vegetable oil, and sugar. The tariffs for other agricultural goods were reduced based on the tariff schedule in the China–United States WTO accession agreement. Scenario 4 (S4) looks at the impact on China of the textile and apparel quota (ATC) elimination in 2005, without the restraints that were subsequently negotiated with the United States and the European Union. Scenario 5 (S5) examines the impact of the restraints on China's textile and apparel exports to the U.S. and E.U. markets for the period 2005–2008.

Two cumulative scenarios are then modeled. Scenario 6 (S6) combines scenarios 2, 3, and 4 to examine what the overall effect of China's WTO accession would have been without the subsequent restraints on textile and apparel exports. Scenario 7 (S7) combines scenarios 2, 3, and 5, which approximates the actual situation today. Table 2.1 summarizes the assumptions used for the baseline scenario and the six policy change scenarios.

Table 2.1 Summary of Scenario Design

Scenario 1 (S1): Baseline

Real GDP and agricultural output exogenous

Sector-specific TFP growth rate endogenous

3 percent growth rate of import quota for goods subjected to quantitative restriction (rice, wheat, corn, cotton, wool, vegetable oil, sugar, petroleum refining, automobiles)

Exogenous export quota growth for textile and apparel:

	Annual Growth Rate of Quota (percent)
Textile	5.0
Apparel	6.2

All tax rates are fixed at their base-year level

Balance of payment gradually declines to 30 percent of its base-year level in 2010

Scenario 2 (S2): Industrial trade liberalization

An average 55 percent cut of 2000 tariff levels from 2000 to 2008, based on the nominal tariff schedule in the China–United States WTO accession agreement

Phased elimination of import quotas on petroleum refining and automobiles from 2000 to 2005:

	Initial Quota in 2000 (billion yuan)	Annual Growth Rate of Quota (percent)
Petroleum refining	27.6	15
Automobiles	496.8	15

Scenario 3 (S3): Agricultural trade liberalization

Introduction of TRQ system:

	Initial Quota in 2000 (billion yuan)	Annual Growth Rate of Quota (percent)
Rice	8.57	18.9
Wheat	11.58	7.2
Corn	3.25	12.5
Cotton	10.46	4.7
Wool	6.35	4.5
Vegetable oil	104.28	14.5
Sugar	15.23	8

Tariff cut for other agricultural goods based on the nominal tariff schedule in the China–United States WTO accession agreement

Scenario 4 (S4): Phaseout of ATC

Acceleration of textile and apparel quota growth rate from 2000 to 2004

Elimination of quota (modeled as zero export tax) on textile and apparel from 2005

Scenario 5 (S5): U.S. and E.U. Textile and Apparel Restraints
Acceleration of textile and apparel quota growth rate from 2000 to 2004 Growth of China's textile and apparel exports limited to 10 percent annually for period 2005–2008 Eliminate all restraints after 2008
Scenario 6 (S6): WTO Accession Package 1
S2, S3, and S4 combined
Scenario 7 (S7): WTO Accession Package 2
S2, S3, and S5 combined

Note: ATC = Agreement on Textiles and Clothing; TRQ = tariff rate quota.

Macroeconomic Results

Overall, the simulation exercise using the CGE model shows that China benefits from its WTO accession by most measures, including increases in overall real income (also called welfare), GDP, consumption, investment, exports, and imports. According to the model, the country experiences declines in two areas. Government revenue declines, primarily as a result of diminished tariff collection. Terms of trade also turn against China, as the prices of its imports increase more than the prices of its exports.

The simulation was first conducted with the assumption that there is full employment in the Chinese economy, a simplifying assumption that is commonly used in modeling exercises. However, this assumption is not consistent with actual labor market conditions in China, where there is some open unemployment in urban areas and significant underemployment in rural areas. This surplus labor can be expected to put downward pressure on wages, and therefore on product costs and household incomes. It will also affect the competitiveness of Chinese products in global trade. To approximate the actual labor market conditions in China, we conducted a variation of the experiment that incorporates a fixed real wage, meaning that firms can hire additional workers without upward pressure on wages. The results of both simulations for the main macroeconomic indicators are presented below.

The Results under the Full-Employment Assumption

In 2010, China's real GDP would be 1.29 percent higher than in the nonaccession baseline comparison (table 2.2). The real income gain (technically, the Hicksian equivalent variation, or EV) is smaller than the increase in GDP, due to a 1.1 percent deterioration in China's terms of trade. Private consumption would increase by 1.47 percent compared with the baseline, indicating the benefits to consumers from trade liberalization. Investment would increase by 0.85 percent compared with the baseline, less than the increase in consumption.

Table 2.2 Major Macroeconomic Results of China's WTO Accession Scenarios under the Full-Employment Assumption, 2010 (percent change relative to the baseline scenario)

	Accession Scenario					
Macroeconomic Measure	Tariff and NTB Reductions on Industrial Products (S2)	Agricultural Trade Liberalization (S3)	ATC Quota Elimination (S4)	New Textile and Apparel Restraints (S5)	Entire WTO Accession Package 1 (S6)	Entire WTO Accession Package 2 (S7)
Real income as percentage of GDP	0.25	0.96	0.3	0.31	1.08	1.09
GDP	0.33	0.94	0.41	0.42	1.27	1.29
Consumption	0.47	1	0.48	0.47	1.47	1.47
Investment	0.06	1.1	0.21	0.23	0.81	0.85
Exports	5.13	2.87	5.09	5.1	15.93	15.9
Imports	5.03	2.85	4.87	4.88	15.44	15.41
Government revenue	–3.17	0.36	2.04	2.06	–0.42	–0.38
Terms of trade	–0.34	–0.16	–0.44	–0.45	–1.09	–1.1

Note: NTB = nontariff barrier; ATC = Agreement on Textiles and Clothing. The results of S6 and S7 do not equal the sum of their component scenarios due to interactive effects.

Source: DRC Model.

China's trade expansion as a result of WTO membership is significant. Exports and imports would increase by 15.9 and 15.4 percent, respectively. Exports would grow at an annual rate that is 1.2 percent higher than the baseline case. Imports would show a similar acceleration of growth, driven in large part by imports that supply the processing trade, which accounts for more than half of China's total trade.

The decomposition of China's market accession package into the four elements simulated here (industrial liberalization, agricultural liberalization, elimination of ATC quotas, and reimposition of textile and apparel export restraints) illuminates the relative importance of the different trade reform measures. The liberalization of agricultural trade contributes the greatest share of gains to real income, GDP, consumption, and investment. This can be understood in part as arising from the fact that China was already accorded most-favored-nation (MFN) access to most world markets for its exports of manufactured goods. Therefore, its industrial export gains from accession were limited, although there was value in locking in that access for the future. Similarly, a large share of industrial imports already enjoyed low tariffs or duty-free treatment because they were inputs to the processing trade and it was in China's interest to keep barriers low.

In the agricultural sector, by contrast, import protection was relatively high at the time of China's WTO accession, and therefore there were gains to be achieved in the efficiency with which resources were allocated. China's agricultural land is scarce relative to the size of its population. Over time, as

its economy, population, and income levels grow, rising demand for food and agricultural products will make imports increasingly necessary and attractive. The simulation results show that by 2010, the elimination of import quotas on food and agricultural products will raise China's real GDP by 192 billion yuan, accounting for more than half of the gains that China obtains from its WTO entry.

The Results under the Surplus Labor Assumption

The simulation results discussed above were based on the assumption of full employment. If an economy is at full employment, as labor demand grows, wages will be driven up to attract scarce labor. This will raise costs and prices, which will act as a constraint on export growth, particularly in labor-intensive sectors. In China, however, the presence of urban unemployment (about 4 percent), a large migrant workforce, and substantial rural underemployment can be expected to keep downward pressure on wages in the short to medium term. Although some upward pressure on wages has been experienced recently in booming coastal areas, the labor market in the country as a whole still has a significant surplus of labor. As a result, it is arguably a better reflection of actual conditions in China to relax the assumption of full employment and instead treat real wages as fixed for the five-year time horizon under study.

When the effect of surplus labor on wages is taken into account, the results of the simulations change rather dramatically. The impact of WTO accession on growth of real income and GDP is more than twice as strong compared with the full-employment assumption, with real income increasing by 2.72 percent (compared with 1.09 percent in the earlier experiment) and GDP increasing by 2.95 percent (compared with 1.29 percent) (table 2.3). Consumption growth almost doubles.

Table 2.3 Major Macroeconomic Results of China's WTO Accession Scenarios under the Surplus Labor Assumption, 2010 (percent change relative to baseline scenario)

Macroeconomic Measure	Accession Scenario					
	Tariff and NTB Reductions on Industrial Products (S2)	Agricultural Trade Liberalization (S3)	ATC Quota Elimination (S4)	New Textile and Apparel Restraints (S5)	Entire WTO Accession Package 1 (S6)	Entire WTO Accession Package 2 (S7)
EV as percentage of GDP	1.24	1.46	1.1	0.96	2.98	2.72
GDP	1.34	1.45	1.23	1.08	3.22	2.95
Consumption	1.31	1.25	1.1	0.95	2.84	2.57
Investment	1.55	2.05	1.5	1.33	3.98	3.67
Exports	5.88	3.22	5.84	5.7	17.81	17.47
Imports	5.76	3.19	5.61	5.47	17.27	16.94

Note: EV = equivalent variation; NTB = nontariff barrier; ATC = Agreement on Textiles and Clothing.

Source: DRC Model.

The surplus labor assumption also changes the relative importance of different sectoral sources of growth arising from WTO accession. Under the full-employment assumption, growth from agricultural trade liberalization dominated the gains in real income, GDP, consumption, and investment, accounting for 88 percent of real income growth, for example. By contrast, if unemployment and underemployment are taken into account, the growth of the industrial sector makes a much more substantial contribution to the growth of these macroeconomic measures. For example, consumption grows more due to manufacturing liberalization than to agricultural liberalization. The change in real income due to industrial liberalization is five times greater (1.24 compared to 0.25 percent) than under the full-employment assumption.

Investment is strongly affected by the differing assumptions. The increase in overall investment surges to 3.67 percent if surplus labor is taken into account, compared with an increase of only 0.85 percent under the full-employment assumption. It is interesting to note that exports and imports increase only modestly, by about 10 percent, with the change in labor market assumptions. This suggests that the absorption of unemployed and underemployed labor contributes to overall welfare and GDP growth mainly by boosting domestic demand, both through consumption and investment.

Distribution of Gains from WTO Accession

Although the simulations show that China generally benefits from its WTO accession, the gains are distributed unevenly. Table 2.4 shows the distribution of gains among fourteen types of households, using the assumption of surplus labor. Urban households are projected to gain more than rural households in 2010, increasing already pronounced urban/rural disparities. The income of all groups of urban households will increase by an unweighted average of about 3 percent, while for rural households the increase will be about 1.85 percent.

Table 2.4 The Distribution of Gains among Households from WTO Accession under the Surplus Labor Assumption, 2010 (percent change relative to baseline scenario)

Household Characteristics		Accession Scenario					
		Tariff and NTB Reductions on Industrial Products (S2)	Agricultural Trade Liberalization (S3)	MFA Elimination (S4)	New-Quota (S5)	Whole WTO Accession Package 1 (S6)	Whole WTO Accession Package 2 (S7)
Urban by income	Lowest	0.87	1.96	0.73	0.61	3.03	2.8
	Low	0.94	2.07	0.83	0.7	3.25	3
	Medium-low	0.99	2.08	0.91	0.77	3.35	3.09
	Medium	1.06	2.07	0.98	0.83	3.44	3.16
	Medium-high	1.1	2	0.98	0.84	3.39	3.12
	High	1.13	1.91	0.97	0.83	3.28	3.02
	Highest	1.18	1.8	0.93	0.79	3.16	2.92
Rural by income	Lowest	0.8	0.86	0.43	0.36	1.6	1.47
	Low	1	0.82	0.67	0.57	1.87	1.7
	Medium-low	1.2	0.75	0.91	0.78	2.13	1.91
	Medium	1.41	0.64	1.13	0.99	2.32	2.06
	Medium-high	1.64	0.32	1.34	1.17	2.29	2
	High	1.83	0.08	1.5	1.32	2.28	1.96
	Highest	2	-0.2	1.64	1.44	2.2	1.85

Note: NTB = nontariff barrier; MFA = Multi-Fiber Arrangement. The results of S6 and S7 do not equal to the sum of their component scenarios due to interactive effects.

Source: DRC Model.

The overall gains to households represent the net effect of varying impacts from different sectoral responses to China's accession to the WTO. In the agricultural sector, the reduction of tariffs and the introduction and increase of TRQs over time will lead to decreases in the domestic price of agricultural products (S3). This will benefit all categories of urban households, which consume these products, while producing mixed results for rural households. The latter will gain from lower prices for the agricultural products they buy but lose from lower prices for the goods they produce and sell. Some rural households will see small gains, while others will see small losses.

The reduction of tariffs and nontariff barriers (NTBs) for industrial goods and the changes in textile and apparel trade are somewhat more neutral in terms of the distributional effects on households. The gains from industrial liberalization (S2) are small and similar for urban and rural households at low-income levels, while medium- and higher-income rural households see larger gains than other groups. Lower prices for manufactured goods translate into higher real income (consumption) for both rural and urban groups; however, the benefit for low-income households that purchase fewer manufactured goods is less than for higher-income households. Under the surplus labor assumption, the wages of urban workers do not increase, limiting the income gains of these households. Interestingly, when the model is run with a full-employment assumption, rural

households at all income levels gain little from manufacturing trade liberalization, perhaps because rising wages increase product prices and therefore limit both exports and domestic consumption growth, which would result in fewer workers from rural areas finding employment in the manufacturing sector.

Sectoral Adjustments

The aggregate results of the WTO accession simulations for China show overall welfare gains and growth resulting from a better allocation of resources among sectors. Some sectors grow and others contract, affecting employment, investment, imports, and exports. Table 2.5 shows the changes in output, employment, and trade across sectors. The results reported in this table reflect the full-employment assumption and the imposition of constraints on textile and apparel exports by the United States and European Union (S7).

Table 2.5 Projected Changes in Sectoral Output, Employment, and Trade after China's WTO Accession under the Full-Employment Assumption, 2010 (Scenario 7)

	CHANGE IN:							
	Output		Employment		Imports		Exports	
Sector	Yuan (billion)	%	Persons (10,000)	%	Yuan (billion)	%	Yuan (billion)	%
Rice	–16.2	–5.7	–184	–5.8	22.9	705.2	0	0.4
Wheat	–8.2	–4.3	–85.3	–4.4	12.6	74.4	0	–
Corn	–1.2	–1	–16.4	–1.1	5.8	530.2	0.1	4.3
Cotton	2.6	2.3	30.2	2.1	13.6	119.1	0	7.1
Other nongrain crops	–6.3	–0.5	–103.5	–0.6	9.5	21.4	0.2	4.8
Forestry	–8.3	–5.9	–140.7	–5.8	11	14.7	0	–1.7
Wool	–0.3	–4.7	–1	–4.8	1.3	15.3	0	1.9
Livestock	51.6	2.8	172.9	2.7	–0.1	–1.8	0.5	7.9
Fishing	10	1.6	55.7	1.8	0	0.7	0.3	4.4
Other agriculture	2.2	1	14.5	0.9	0	0.8	0	8.2
Coal mining	–0.4	–0.2	–0.8	–0.1	0	–0.4	0	0
Crude oil and natural gas	–2.3	–1.2	–1.8	–1.1	–2.2	–1.9	0	0
Ferrous ore mining	–1.8	–2.1	–0.9	–1.2	–0.7	–1.7	0	–2.4
Nonferrous ore mining	–4.3	–2	–1.5	–1.1	–0.3	–1.6	0	–2.4
Other mining	0.6	0.1	3	0.5	0.1	0.3	0	0
Vegetable oil	–37.5	–16.8	–6.6	–12.1	43.6	183.8	3.6	72.1
Grain mill and forage	14.6	2.3	2.3	1.9	–1	–1.5	0.8	18
Sugar	–6.4	–10.5	–6.3	–9.7	6.8	234.5	0.6	175.3
Processed food	20.8	1.8	6	1.7	1.7	6	4.5	6.8
Beverage	5.1	0.8	1.9	0.9	3.6	76.9	0.6	6.9
Tobacco	1.2	0.4	0.2	0.6	3.5	46.1	0.3	4.1
Textiles	418.6	19.6	86.5	9.7	131.8	72.3	219.2	67.6

Sector	CHANGE IN: Output Yuan (billion)	Output %	Employment Persons (10,000)	Employment %	Imports Yuan (billion)	Imports %	Exports Yuan (billion)	Exports %
Apparel	370.7	36.7	96.5	20.6	10.4	53.5	331.7	105.5
Leather	6.6	1.5	3.3	1.7	2.6	7.5	1.6	1.6
Sawmills and furniture	1.4	0.2	1.9	0.6	2.8	8.2	0.5	1
Paper and printing	–4	–0.5	–0.2	0	11.4	10.2	0.2	1.8
Social articles	3.8	0.7	2.6	1.3	2.1	5.4	0.7	0.4
Petroleum refining	–10.3	–1.3	–3.2	–1.2	10	17	0.3	0.3
Chemicals	–25.2	–1.3	–4.6	–0.7	34.7	9.7	–0.3	–0.2
Medicine	1.7	0.3	1.1	0.7	1.7	19.7	0.4	1.2
Chemical fibers	30.7	10.1	5.4	7.6	33.2	57.5	1.4	5.7
Rubber and plastics	–10.5	–0.9	–1.6	–0.4	5.4	8.1	–0.3	–0.2
Building materials	8	0.3	10.2	0.6	1	3.4	–0.2	–0.3
Primary iron and steel	–34.1	–2.2	–11.5	–1.6	9.6	6.3	–0.5	–1.2
Nonferrous metals	–13.3	–2.2	–3.2	–1.4	2.1	1.8	–0.6	–2.5
Metal products	–12.2	–1	–1.7	–0.3	8.4	7.8	–1.9	–1.7
Machinery	–33.2	–2.3	–10	–1.4	19.5	10.1	–2.3	–2.9
Special equipment	–12.6	–1.4	–3.4	–0.8	20.3	6.3	–0.6	–1.5
Automobile	–100	–10.5	–21.7	–8.3	48.6	219.3	–0.8	–5.1
Other transport equipment	0.8	0.1	2	0.6	2.8	2.6	–1	–1.8
Electric machinery	–20.5	–1.2	–2.6	–0.5	15.3	9.8	–4.1	–2
Electronics	–69.4	–4.3	–9.9	–3	31.3	6.1	–16	–2.9
Instruments	–13.5	–5.8	–7	–4.2	8.9	9.5	–4.7	–4.7
Other manufacturing	–1.7	–0.4	1.1	0.3	1.9	17.3	–0.7	–1.7
Utilities	–0.1	0	0.5	0.1	0	1	–0.3	–1.6
Construction	43.2	0.8	54.8	1	0.2	0.9	0	0.4
Transportation	3.9	0.2	11.5	0.4	0.3	1.1	–1.2	–0.7
Post, telecommunication	2	0.3	1.8	0.7	0.1	1.5	–0.7	–0.9
Commerce	71.1	1.8	67	0.9	2.7	3.8	–0.6	–2.9
Finance	4	0.3	0.8	0.2	0.4	2.6	–0.1	–2.3
Social services	3	0.1	–2.5	–0.2	2.7	2.2	–4.9	–1.9
Education, health	1.6	0.1	–1.6	0	0.3	2	–0.1	–2.2
Public administration	0.8	0.1	–0.2	0	0.2	2.2	0	–2.4

Source: DRC Model.

In agriculture and processed foods, output and employment fall in most agricultural crops and forestry but improve in livestock, fishing, cotton, and processed food. Overall, 2.7 million jobs are lost in the agricultural sector.

Output losses are highest for vegetable oil, sugar, rice, and wheat. Imports of these products rise, in some cases dramatically, including increases of 705 percent for rice, 530 percent for corn, 234 percent for sugar, and 184 percent for vegetable oil. However, grain imports increase from a very low base, somewhat limiting their impact on domestic production. In the case of wheat and cotton, tariff rate quotas would grow slowly and would bind imports, resulting in smaller increases than for rice and corn.

Among the gaining sectors, livestock, fishing, and processed food increase output. Exports of livestock and fish increase only marginally, with most increased production going to satisfy domestic demand. Exports of processed foods increase modestly. Both domestic production and imports of some products increase, such as cotton. Declining production and increased imports of vegetable oil and sugar are nonetheless accompanied by a small increase in exports.

In the secondary sector, most mining and natural resource activities show small losses in output and employment. The results in manufacturing are mixed, but there are net increases. Overall, manufacturing employment increases by about 1.4 million. Textile and apparel industries are the biggest gainers in output and employment, although the reimposition of export restraints by the United States and European Union reduces the gains that China expected upon the elimination of the global quota system on January 1, 2005. The output of textiles is projected to grow by 19.6 percent, while apparel output grows by 36.7 percent. Exports of textile and apparels increase by 67.7 and 104.8 percent, respectively. These sectors utilize China's large supply of unskilled and semiskilled labor, with employment in the two sectors growing by 1.8 million jobs. However, this is 100,000 fewer jobs than in simulation S4, under which quotas are eliminated and there are no export restraints. The adjustments in these sectors are discussed further below.

All capital-intensive sectors, even those that were not highly protected before WTO accession, such as machinery, electronics, and instruments, would experience relatively large contractions in production because of higher capital costs. The rapid expansion of labor-intensive sectors, especially textiles and apparel, bids capital away from other manufacturing industries. At the same time, the large amount of labor released from the agricultural sector pushes down the price of labor relative to capital.

Imports increase in all the industrial sectors, both those that expand and those that contract. The removal of tariffs and NTBs is only one factor leading to the surge in imports as a result of China joining the WTO. Because a high proportion of Chinese manufactured exports involve processing imported inputs, the export growth in labor-intensive products also contributes to the increased import of semiprocessed and intermediate inputs. The expansion of export production also drives up demand for capital- and technology-intensive imports.

In the tertiary sector, the main growth is seen in construction (an increase of 0.8 percent) and commerce (1.8 percent). Small increases are seen in financial services, transportation, and social services. Imports increase and exports decrease in almost all service industries. Employment in services increases by about 1.4 million.

Textile and Apparel Export Restraints

The imposition of restraints on China's textile and apparel exports to the U.S. and E.U. markets will have a negative impact during the years they are in effect. In 2008, the last year of the restraints, GDP growth is projected to be 24 percent less than would be the case if China enjoyed the full

benefit of the ATC quota elimination, as do other WTO members (table 2.6). However, by 2010, two years after the new restraints are to be eliminated, the negative effect is eliminated (see table 2.2). Indeed, overall GDP growth in 2010 is projected to be somewhat higher than in the simulation without the restraints (table 2.7). Real income and consumption show similar patterns. It is interesting to note that the textile and apparel restraints have little overall impact on investment. Agricultural liberalization has more of an impact on investment than industrial liberalization, both in general and in this sector. This may be due to the greater liberalization of the agricultural sector as a result of WTO accession, compared to the industrial sector which operated under a relatively high degree of de facto openness. This result changes, however, if the assumption of full employment is relaxed, as discussed above.

Table 2.6 Major Macroeconomic Results of China's WTO Accession Scenarios under the Full-Employment Assumption, 2008 (percent change relative to the baseline scenario)

Macroeconomic Measure	Accession Scenario			
	ATC Quota Elimination (S4)	New Textile and Apparel Restraints (S5)	Entire WTO Accession Package 1 (S6)	Entire WTO Accession Package 2 (S7)
EV (percentage of GDP)	0.25	0.19	0.9	0.79
GDP	0.36	0.23	1.09	0.85
Consumption	0.42	0.29	1.27	1.03
Investment	0.16	0.14	0.64	0.62
Exports	4.92	4.03	15.34	13.64
Imports	4.73	3.89	14.96	13.35
Government revenue	1.89	0.92	–0.65	–2.32
Terms of trade	–0.44	–0.13	–1.04	–0.55

Note: EV = equivalent variation; ATC = Agreement on Textiles and Clothing.

Source: DRC Model.

Table 2.7 Projected Impact of the Textile and Apparel Export Restraints, 2005–2010 (percent change in S5 relative to S4)

Macroeconomic Measure	2005	2006	2007	2008	2009	2010
EV (percentage of GDP)	–0.09	–0.11	–0.11	–0.12	0.01	0.01
GDP	–0.23	–0.23	–0.24	–0.24	0.01	0.01
Consumption	–0.24	–0.23	–0.23	–0.23	–0.02	–0.01
Investment	0.01	–0.01	–0.02	–0.02	0.06	0.04
Exports	–4.88	–4.86	–4.77	–4.7	–0.07	–0.03
Imports	–4.77	–4.72	–4.59	–4.49	–0.07	–0.03
Government Revenue	–1.85	–1.8	–1.73	–1.68	0.05	0.04

Note: EV = equivalent variation.

Source: DRC Model.

Table 2.7 shows the comparison of macroeconomic results for the scenario assuming textile and apparel export restraints (S5) compared with the scenario assuming full ATC quota elimination (S4). The restraints reduce GDP by about one-quarter percentage point for each year they are imposed, with similar losses in consumption. Exports are reduced by about 5 percent each year, while imports show a similar decline because of their role as inputs to be processed. However, the losses are quickly reduced or eliminated once the restraints end in 2009.

Changes in Employment

As noted above, the impact of China's WTO accession was modeled using both the assumption of full employment and an assumption of fixed wages, which is meant to approximate the impact of surplus labor on wages, employment, and production. Neither assumption adequately captures the complexity of Chinese labor markets. However, using both assumptions and comparing the results allows for important insights into the impact of different aspects of liberalization and the behavior of labor markets in response.

Under the assumption of full employment, the total number employed before and after structural changes induced by China's WTO accession must be the same by definition, except for minor increases in the labor force due to population growth. Thus the model shows a loss of about 2.6 million jobs in the agricultural sector, balanced by a gain of 1.3 million positions in the manufacturing sector and a similar increase in the service sector. The manufacturing sector has both gaining and losing industrial subsectors as a result of accession, with 2.1 million jobs created in gaining industries and about 800,000 lost in import-competing industries. China expected that the elimination of textile and apparel quotas on January 1, 2005, would significantly increase exports of these products, leading to the creation of about 2 million new jobs. After restraints were imposed by the United States and European Union, the simulation shows that there is still strong employment growth, but about 100,000 fewer jobs are created than in the scenario without the restraints.

When the scenarios are conducted with the assumption of surplus labor (as represented by fixed wages), the results are dramatically different. With surplus labor available, 13 million new positions are created as a result of WTO accession. Even in the agricultural sector, where output and employment are hardest hit by trade liberalization, there is a small net increase of 796,000 jobs. Growth in livestock production generates 2.4 million new jobs, while fishing, cotton, and other crops generate smaller numbers of new positions. These gains offset sharp employment losses in rice, where 1.8 million jobs are eliminated, and smaller losses in wheat, corn, and forestry. In the manufacturing sector, almost 4 million new jobs are created, with losses in the automotive and electronics industries offset by strong gains in textiles, apparel, and building materials and small gains in a broad array of other manufactured-product industries. The largest employment gains occur in the service industries, with a total of 7.75 million new positions created, mainly in commercial (trade) activities and construction.

Many of the new manufacturing and service sector jobs will be in higher-productivity industries and occupations, which could offer wage gains in the future, even if surplus labor supply holds down wages in the short term. At the same time, it must be recognized that the adjustment costs can be high for households that are affected by the structural changes, involving periods of unemployment, job search, and, especially for rural households, relocation.

The overall gain in employment under the surplus labor assumption is impressive, but it must be put in the context of the size of China's labor force and employment needs. With a current labor force of 918 million (see table 1.5), a gain of 13 million jobs is welcome but represents only a 1.4 percent increase. Estimates place the number of jobs needed to achieve full employment in China as high as 300 million.[8]

3. CHINA'S GROWTH PROSPECTS FOR 2006–2020

The overall prospects for China's continued growth and development over the medium term are positive, although there are several reasons for concern, both in the international and national contexts. At the international level, there are serious imbalances in some countries' trade, most notably current account deficits in the United States and surpluses in China and oil-producing countries. If the imbalances were to be corrected rapidly—for example, by a sharp shift in exchange rates or a rise in protectionism—there could be strong negative effects on China's export sector. There is excess productive capacity at the global level in labor-intensive manufactures, such as textiles, apparel, and consumer electronics, and in some capital-intensive products, such as steel and ship building. This has put sustained downward pressure on prices for such goods, affecting the income for labor and capital employed in those sectors. In contrast, world energy prices have been trending higher, which accentuates the relatively inefficient use of energy in the Chinese economy. As China liberalizes its financial markets in compliance with its WTO commitments, the flow of international resources may increase, but there is also a greater risk of financial instability and contagion.

At the national level, the aging of China's population may mean a decline in the savings rate, which would slow investment and capital formation. This demographic change will gradually ease pressure for employment creation, but overall employment creation demands will remain high until the large overhang of agricultural workers is absorbed into more productive sectors. Continued low incomes in rural areas will depress domestic demand. Increasing inequality of incomes between urban and rural households and between regions could feed social instability.

To evaluate the likely effects of alternative international and national policy developments on the Chinese economy, sectors, and households, we utilized a CGE model of the Chinese economy developed by the Development Research Center of the State Council of China (DRC-CGE 2004 Model) to project outcomes under three different scenarios.[9] This model uses the most current data available, calibrated to a social accounting matrix based on national input/output tables for 2000. All data reflect the 2005 revision of Chinese economic statistics. A pre-experiment was conducted to stimulate growth from the 2000 base year data up to 2005. The details of the model are found in appendix C. The scenarios were constructed to capture a range of plausible changes in the global and domestic environments. They include a baseline scenario in which current trends and conditions prevail for the fifteen-year period; a more favorable scenario, which we label the "optimistic" scenario; and a less favorable scenario, labeled the "risk" scenario. We combine certain international and domestic changes in each scenario to reflect the interaction of these factors.

Scenario Design

All the scenarios reflect certain common assumptions. These assumptions are based on foreseeable changes, such as inputs to the Chinese economy that can be projected with reasonable confidence and global trade terms that are bound by existing agreements (table 3.1). For example, the increases in population, labor force, and land supply are all set exogenously, based on projections of official expert agencies of the Chinese government. The international tariffs and quotas faced or imposed by China are based on the terms of China's WTO accession agreement. The imposition of constraints on Chinese textile and apparel exports to the United States and European Union, as agreed in separate negotiations in 2005, are reflected in all the scenarios. In addition to these predictable factors, all the scenarios reflect the following assumptions, except where noted: (1) all domestic tax rates (that is, excluding those related to exports and imports) are fixed at base-year levels; (2) China's international balance of payments surplus declines to zero in 2010 and remains in balance throughout the forecast period; and (3) the growth rate of government consumption (spending) is equal to the estimated growth rate of GDP, except in the risk scenario, where it is 10 percent higher than the growth rate of GDP.

Table 3.1 Summary of Scenario Design

Elements of All Scenarios
Population growth and composition is exogenous
Labor growth and land supply are exogenous
Tariff reduction and quota elimination according to the WTO accession protocol; new quota for textiles and apparel based on agreements signed by China, European Union, and the United States
All tax rates are fixed at base-year level
Balance of payments gradually declines to zero in 2010
Government consumption growth is exogenous
Baseline Scenario
Labor moves from agriculture to nonagricultural sectors at the rate of 1.21 percent a year
Technological and intermediate input changes continue the trend of recent years
Total factor productivity (TFP) growth follows the pattern of past 25 years, at 2.0–2.5 percent
Optimistic Scenario
Labor moves from agriculture to nonagricultural sectors at the rate of 1.36 percent a year
Technological and intermediate inputs reflect increased demand for service and high technology goods; the rate of value-added increases
TFP growth rate of service sectors is 1 percent higher than the baseline in the period 2005–2010 and 0.5 percent higher in the period 2010–2020
Energy utilization efficiency is 0.2–0.5 percent higher than the baseline
Risk Scenario
Labor moves from agriculture to nonagricultural sectors at the rate of 0.91 percent a year
Household savings rate is lower than the baseline
Growth rate of governmental consumption is higher than the baseline
TFP growth rate is lower than the level of the past 25 years, at 1.5–2.0 percent

The baseline scenario further assumes that future trends in the reallocation of resources and technological development will follow the pattern of recent decades. It is assumed that agricultural labor will continue to migrate to higher-productivity nonagricultural industries, with the share of the labor force in agriculture declining at the rate of 1.21 percent a year. Urbanization will continue to move forward at an average annual pace of 0.8 percent, with 55 percent of the population living in urban areas by 2020. Technological change and industrial restructuring to higher-value-added industries will continue trends of the recent past.[10] The interaction of all these factors will result in TFP growth in the range of 2 to 2.5 percent a year for the forecast period, continuing the trend of the past twenty-five years. The savings behavior of households will not change dramatically from past trends, but it will decline slightly after 2010, reflecting the aging of the population.

The second scenario, termed the optimistic scenario, assumes changes in several trends that are more positive from the perspective of growth and development. This scenario would arise from a combination of a benign international environment, in which China's exports and imports grow at higher rates than in recent years, and a domestic environment in which a smooth implementation of reforms of various systems gives rise to more efficient resource allocation and faster technological advance. The movement of labor out of agricultural to nonagricultural industries would accelerate to a rate of 1.36 percent a year. The use of intermediate inputs from high-technology and service sectors by other industries would grow faster, leading to the upgrading of a wide range of industries. Value added in high-technology industries would grow at a higher rate. Together, these changes would improve the growth of TFP by an additional 1 percent from 2006 through 2010, compared with the baseline scenario growth, and by 0.5 percent from 2011 to 2020. The efficiency of energy utilization would be 0.2 to 0.5 percentage points higher.

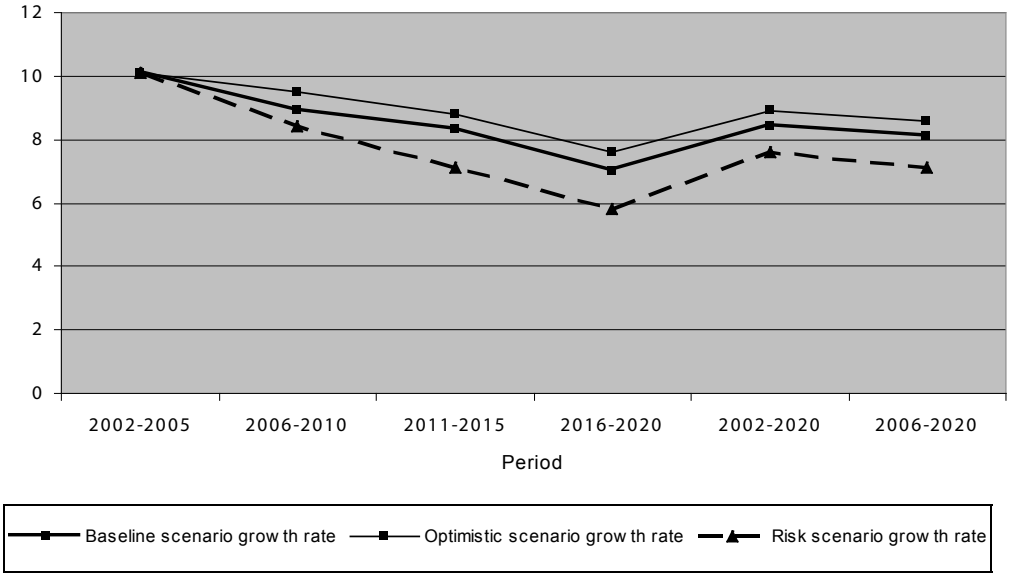
The third scenario, which we call the risk scenario, would arise from a more protectionist international environment and a failure of domestic reforms to improve resource allocation, infrastructure, and energy efficiency. The movement of labor from agriculture to higher-productivity industries would slow to a rate of 0.91 percent a year as a result of less robust trade growth, a failure at the domestic level to provide sufficient urban and transport infrastructure, or a combination of international and domestic forces. Lower household savings rates (6.8 percent lower by 2020) would result from a more uncertain or slower growth environment, and would lead to slower capital accumulation. Unsuccessful domestic reforms would mean that available capital was used less efficiently. Together, changes such as these would reduce the growth of TFP to an average annual rate of 1.5 to 2 percent, lower than the average for the past twenty-five years.

Results

China's economy grows somewhat more slowly under all the scenarios than it has in the past twenty-five years, as seen in figure 3.1.

Figure 3.1 Average GDP Growth Rates for China, 1980–2020 (percent)

	2002-2005	2006-2010	2011-2015	2016-2020	2002-2020	2006-2020
Baseline scenario growth rate	10.1	8.9	8.3	7	8.4	8.1
Optimistic scenario growth rate	10.1	9.5	8.8	7.6	8.9	8.6
Risk scenario growth rate	10.1	8.4	7.1	5.8	7.6	7.1



Source: National Bureau of Statistics of China (2005, 2006); the DRC-CGE 2004 Model was used to project future growth.

Baseline Scenario

Table 3.2 shows the sources of projected economic growth for the 2002–2020 period in the baseline scenario. The periods after 2005 are calibrated to the five-year-plan periods used by the Chinese government. The baseline scenario indicates that the GDP growth rate during 2006–2010 will be 8.9, slightly lower than the 9.5 percent growth of the previous five-year-plan period. Economic growth will be 8.3 percent and 7.0 percent, respectively, for the 2011–2015 and 2016–2020 periods.

Table 3.2 Projected Sources of Growth in the Baseline Scenario, 2002–2020 (percent change)

GDP Growth and Its Sources	2002–2005	2006–2010	2011–2015	2016–2020	2002–2020	2006–2020
GDP	10.1	8.9	8.3	7	8.4	8.1
Source of growth						
Labor	0.4	0.4	0.2	0	0.2	0.2
Capital	7.7	6.5	6.1	5	6.2	5.9
Total factor productivity	2	2	1.9	2	2	2

Source: DRC-CGE 2004 Model.

The main force driving rapid economic growth from 2002 to 2020 is projected to continue to be rapid capital accumulation. Although the contribution of capital input to GDP growth will progressively decline, it will continue to account for 71 to 76 percent of overall growth. The continued rapid capital accumulation arises from the high rate of domestic savings and fast-growing foreign direct investment. The domestic savings rate will decline somewhat, to about 35 percent by 2020, as the structure of the population ages.

In comparison with capital, the contribution arising from the growth of labor supply will be small. This is determined by the changes in the age structure of China's population. The working-age population will continue to grow at the current rate of 0.4 percent until 2010, and the contribution of labor growth to GDP growth will remain at about 5 percent. With more rapid aging of the population after 2010, labor force growth will slow, and its contribution to GDP will also decline. By 2020, the contribution of labor force growth to economic growth will be close to zero. The continued strong growth of TFP will account for an increasing share of GDP growth during the period.

China is still a developing country making the transition out of agriculture, and rapid changes in the industrial structure will continue to be an important feature throughout the period. The simulation results indicate that the ratios of the primary, secondary, and tertiary sectors will be 8.1:46.2:45.7 in 2010. By 2020, the ratios are projected to change to 4.8:45.6:49.6. Table 3.3 presents the changes for more disaggregated industries. The agricultural sector will decline throughout the period to 2020. The secondary sector's share in the economy will continue to rise during the next five years, mainly continuing current trends that are dominated by a rising demand for capital goods (reflecting the high rate of investment) and the expansion of the energy sector (reflecting increased energy demand).

Table 3.3 Projected Industrial Structure of China under the Baseline Scenario, 2002–2020 (percent)

	GDP			Employment		
Sector	**2002**	**2010**	**2020**	**2002**	**2010**	**2020**
Primary sector	13.6	8.1	4.8	50.0	40.1	34.6
Agriculture	13.6	8.1	4.8	50.0	40.1	34.6
Secondary sector	45.2	46.2	45.6	21.4	22.9	21.5
Mining	4.9	4.3	3.4	0.9	1.0	0.9
Coal	1.9	1.6	1.1	0.6	0.6	0.6
Crude oil and natural gas	1.9	1.7	1.4	0.1	0.1	0.1
Metal ore mining	0.5	0.5	0.6	0.1	0.1	0.1
Nonferrous mineral mining	0.6	0.5	0.4	0.1	0.1	0.1
Manufacturing	34.9	36.1	37.1	14.1	14.3	13.3
Consumer goods	9.7	8.4	7.0	4.2	3.7	3.1
Food	3.7	3.2	2.7	1.2	1.1	0.9
Textiles	1.8	1.4	1.0	1.3	1.0	0.8
Apparel	1.3	1.2	1.0	0.9	0.8	0.7
Sawmills and furniture	0.9	0.8	0.7	0.2	0.2	0.2
Paper, printing, and related	1.9	1.8	1.6	0.6	0.6	0.6
Intermediate goods	13.8	14.6	16.9	5.0	4.9	4.5
Petroleum	0.9	1.4	3.2	0.3	0.3	0.3
Chemicals	4.8	4.4	4.7	2.0	1.8	1.6
Nonmetal mineral products	1.6	1.3	1.1	1.0	1.0	0.8
Metals smelting and pressing	3.1	2.9	2.9	1.2	1.2	1.1
Electricity	3.3	4.2	4.6	0.4	0.5	0.4
Gas	0.1	0.1	0.1	0.0	0.0	0.0
Water	0.2	0.3	0.3	0.1	0.1	0.1
Capital goods	11.4	13.1	13.2	4.9	5.7	5.7
Metal products	1.2	1.1	1.1	0.4	0.4	0.4
Machinery and equipment	3.0	2.5	2.2	1.5	1.5	1.4
Transport equipment	2.1	2.1	1.9	1.1	1.2	1.2
Electric equipment and machinery	1.4	1.5	1.6	0.7	0.7	0.8
Electronic, telecommunications equipment	2.2	4.0	4.4	0.7	1.3	1.3
Instruments, meters, and office machinery	0.4	0.4	0.4	0.2	0.3	0.3
Other manufacturing	1.2	1.4	1.5	0.3	0.3	0.3
Construction	5.4	5.7	5.1	6.4	7.6	7.3
Tertiary sector	41.1	45.7	49.6	28.6	37.0	43.9
Transport	5.6	6.1	7.1	4.1	4.7	5.1
Post and telecommunication	2.7	3.0	3.1	1.3	1.4	1.2
Commerce	7.6	8.3	8.8	9.6	12.6	15.8
Restaurant	2.4	3.1	3.4	2.3	3.2	3.3
Finance and insurance	3.8	4.5	5.1	0.8	0.9	0.8
Real estate	4.4	5.1	5.7	0.3	0.3	0.3
Social services	5.1	5.9	7.0	2.8	3.7	4.6
Education, social welfare, health services	5.5	5.7	5.2	5.0	6.7	7.9
Public administration and other sectors	4.0	4.0	4.3	2.6	3.5	4.9

Note: GDP data for 2002 were projected from the 2000 input/output schedule, so the sector structure of GDP may be slightly different than the actual structure published in the Statistical Yearbook.

Source: DRC-CGE 2004 Model.

In addition, the restraints imposed on textile and apparel exports in 2005 by the United States and European Union will end by 2009. This will stimulate an expansion of these sectors. However, compared with 2010, the proportion of the secondary sector will decline slightly by 2020, mainly due to declining proportions of the mining and low-technology industries. As energy demand continues to expand, the share of the energy sector will rise further. Because of technological advances, electronic communications and other high-technology sectors will continue to grow. As incomes gradually rise, the tertiary sector (service industries) will grow in response to both personal consumption of services and demand for services as inputs to other industries as they move up the technology ladder. The service sector's share of the economy will rise through 2020.

As the industrial structure changes, the structure of employment will also undergo dramatic adjustments. The movement of labor out of agriculture and other primary industries will be fairly rapid through 2020. The proportion of employment in the primary sector is projected to drop from 45 to 40.1 percent by 2010 and further to 34.6 percent by 2020—nearly 15 percentage points lower than the 2000 level. The proportion of employment in the secondary sector will likely rise slightly during the next five years. During the period 2010–2020, however, the sector's share of employment will fall slightly. This reflects the gradual growth of the services sector relative to the secondary sector and also a higher capital/labor ratio within the secondary sector. Compared with the secondary sector, the service industries have a greater capacity for labor absorption, and the service sector is projected to account for 43.9 percent of employment by 2020.

Because of the impact of WTO accession and the upgrading of the industrial structure toward higher-technology manufactures and services, the structure of trade will also change over the period (table 3.4). With the full phasing in of China's WTO commitments by 2006, reduced tariffs on farm products and the introduction of the tariff quota system will reduce the share of agriculture in exports and increase imports of agricultural goods. Reduced tariffs on industrial goods will increase the proportion of these goods in trade. Over the period, the export competitiveness of capital- and technology-intensive industries will grow as a result of the rise in the capital/labor ratio and improvements in human capital. The share of electronic and telecommunications equipment and other high-technology manufactures in exports will increase. In the long run, the relative scarcity of land and rising price of food, combined with the declining share of the population in the labor force, will increase the cost of labor and therefore of labor-intensive goods and reduce their share in exports. By 2020, the leading export sectors will be electronic and telecommunications equipment, instruments and office machinery, electrical equipment, chemicals, and traded services.

Table 3.4 Projected Structure of Chinese Trade under the Baseline Scenario, 2002–2020 (percent)

Sector	Exports			Imports		
	2002	2010	2020	2002	2010	2020
Primary sector	1.5	0.1	0	2.5	6.2	12.1
Agriculture	1.5	0.1	0	2.5	6.2	12.1
Secondary sector	77	82.2	83.4	90.4	86.7	80.4
Mining	1.5	0.6	0.5	6.2	6	5.2
Coal	0.5	0.1	0.1	0.1	0.1	0.1
Crude oil and natural gas	0.4	0.2	0.1	4.1	4.1	3.7
Metal ore mining	0.1	0.1	0.1	1.4	1.1	0.9
Nonferrous mineral mining	0.5	0.2	0.2	0.7	0.6	0.5
Manufacturing	75.2	81.4	82.8	83.9	80.5	74.8
Consumer goods	25.3	15.6	9.4	10.7	11.9	12.9
Food	2.9	0.5	0.2	2	2.7	3.3
Textiles	8.5	5.4	2.8	4.5	3.8	3.7
Apparel	8.5	7.2	4.8	1.6	2.3	2.5
Sawmills and furniture	2.2	0.8	0.4	0.7	1.1	1.4
Paper, printing, and related	3.2	1.7	1.3	2	2	1.9
Intermediate goods	11	9.2	11.5	22.6	18.9	15.1
Petroleum	0.9	1	2.2	1.5	1.2	0.8
Chemicals	7.1	5.2	5.9	13	10.7	8.9
Nonmetal mineral products	1.4	0.9	0.8	0.7	0.6	0.4
Metals smelting and pressing	1.5	2.1	2.5	5.9	5.2	4
Electricity	0	0	0	0.9	0.8	0.6
Gas	0.2	0.1	0.1	0	0	0
Water	0	0	0	0.5	0.5	0.4
Capital goods	38.9	56.6	61.9	50.6	49.7	46.9
Metal products	3.5	2.9	3.2	2	2.1	1.7
Machinery and equipment	4.3	3.6	3.5	11.6	10.1	8.3
Transport equipment	2.1	2.2	2.1	3.7	4.4	4.1
Electric equipment and machinery	6.6	5.3	5.9	6.2	6.3	5.8
Electronic, telecommunications equipment	16.2	35.5	40.1	20.7	21.7	22.3
Instruments, meters, and office machinery	4.8	6.1	6.3	6	4.6	4.3
Other manufacturing	1.4	0.9	0.8	0.4	0.5	0.5
Construction	0.3	0.2	0.1	0.3	0.3	0.3
Tertiary sector	21.4	17.7	16.6	7.1	7.1	7.6
Transport	4.6	4.6	5.4	1	0.8	0.8
Post and telecommunication	0.5	0.4	0.4	0.5	0.4	0.3
Commerce	8.3	7.2	5.8	0	0	0
Restaurant	1.2	0.5	0.4	0	0	0
Finance and insurance	0.1	0.1	0.1	1	0.8	0.8
Real estate	0	0	0	0	0	0
Social services	6	4.2	4.1	4	4.4	5
Education, social welfare, health services	0.7	0.7	0.4	0.4	0.5	0.5
Public administration and other sectors	0.1	0	0	0.1	0.1	0.2

Source: DRC-CGE 2004 Model.

Optimistic Scenario

The optimistic scenario yields higher overall growth than the scenario which projects current trends into the future. Table 3.5 shows the pace and sources of economic growth during the 2002–2020 period under this scenario. For all periods, the economic growth rate is higher than in the baseline scenario. GDP growth rate during the current period reaches 9.5 percent and, while declining somewhat thereafter, averages 8.6 percent over the period 2006–2020.

Table 3.5 Projected Economic Growth and Sources under the Optimistic Scenario, 2002–2020 (percent change)

Measure	2002–2005	2006–2010	2011–2015	2016–2020	2002–2020	2006–2020
GDP	10.1	9.5	8.8	7.6	8.9	8.6
Source of growth						
Labor	0.4	0.4	0.2	0	0.2	0.2
Capital	7.8	6.6	6.1	5.1	6.2	5.9
Total factor productivity	2	2.5	2.4	2.5	2.4	2.5

Source: DRC-CGE 2004 Model.

The main source of economic growth, as in the baseline scenario, is continued rapid capital accumulation. However, the contribution of TFP will be higher than in the baseline scenario. This would be more conducive to a sustainable growth path, because capital accumulation is unlikely to maintain its recent pace. Constraints on continued rapid capital accumulation include the aging of the population, which will lead to less saving and diversification to other countries by foreign investors. In addition, the marginal rate of return to capital will decline with the deepening of capital.

Under the optimistic scenario, service industries develop rapidly as domestic reforms continue and services play increasingly important roles in other industries. This in turn provides more development opportunities for the service sector and especially the more technologically advanced service industries that serve manufacturing and other production industries. The efficiency of the service sector itself rises as a result of these stimuli. The structure of the primary, secondary, and tertiary sectors would be 7.8:45.0:47.2 at the end of 2010 and 4.3:43.6:52.2 by 2020. The service sector's share of GDP in 2020 is about 3 percentage points higher than in the baseline scenario.

The optimistic scenario foresees the prices of resources (particularly energy) rising to reflect supply and demand and envisions additional restrictions on energy consumption and pollution. This leads to more efficient utilization of resources and slows development of energy-consuming and polluting industries compared with the baseline scenario. Conversely, some high-technology industries, such as electronics and telecommunications, grow faster than in the baseline scenario.

To reflect the impact of economic development on the environment in the above scenarios, we simulated the discharge of four major pollutants: sulfur dioxide (SO_2), nitrogen oxides (NO_X), total suspended solids (TSS), and smog. Table 3.6 shows the changes in pollutant discharges for the optimistic scenario compared with the baseline scenario, indicating that the discharge of all four major pollutants will be lower than in the baseline scenario. The discharges of SO_2 and NO_X will post the greatest changes. These two pollutants are related to energy inputs. With changes in the industrial structure and the enhancement of energy utilization efficiency, the discharges of these two

pollutants in 2020 are projected to be, respectively, 10.2 and 12.3 percent lower than in the baseline scenario. Overall, the optimistic scenario will see faster economic growth and lower environmental pollution when compared with the baseline scenario.

Table 3.6 Projected Pollutant Discharge, Optimistic Scenario Compared with the Baseline Scenario (percent change)

Pollutant	2010	2020
Sulfur dioxide	–2.4	–10.2
Nitrogen oxides	–2.2	–12.3
Total suspended solids	–4.2	–5.6
Smog	–1.7	–2.7

Source: DRC-CGE 2004 Model.

Risk Scenario

Table 3.7 presents economic growth and its sources under the risk scenario, from 2002 to 2020. During the current period, GDP growth rate slows to 8.4 percent, a half percentage point lower than in the baseline scenario. The economic growth rate is projected to slow substantially to 5.8 percent by the period 2016–2020, a fairly pessimistic prospect.

Table 3.7 Projected Economic Growth and Sources under the Risk Scenario, 2002–2020 (percent change)

Measure	2002–2005	2006–2010	2011–2015	2016–2020	2002–2020	2006–2020
GDP	10.1	8.4	7.1	5.8	7.6	7.1
Source of growth						
Labor	0.4	0.4	0.2	0	0.2	0.2
Capital	7.8	6.5	5.4	4.2	5.7	5.3
Total factor productivity	2	1.5	1.5	1.6	1.6	1.5

Source: DRC-CGE 2004 Model.

In comparison with the baseline scenario, both capital accumulation and TFP slow in the risk scenario. A larger share of employment remains in the agricultural sector, with 36.2 percent of the labor force still in agriculture in 2020, compared with 34.6 percent in the baseline scenario and 33.8 percent in the optimistic scenario. Employment in high-technology manufacturing and services grows more slowly.

The share of exports represented by manufactured goods declines slightly compared with the baseline scenario, but the share of lower-technology exports such as textiles and apparel remains substantially higher than in the baseline scenario (table 3.8). The share of exports of capital goods is lower. Agricultural goods make up a substantially smaller share of imports than under the baseline scenario, reflecting the larger share of the labor force still involved in agricultural production.

Table 3.8 Projected Structure of Chinese Trade under the Risk Scenario, 2002–2020 (percent)

Sector	Exports			Imports		
	2002	2010	2020	2002	2010	2020
Primary sector	1.5	0.1	0.0	2.5	5.6	7.9
Agriculture	1.5	0.1	0.0	2.5	5.6	7.9
Secondary sector	77.0	82.3	82.5	90.4	87.4	83.6
Mining	1.5	0.6	0.5	6.2	5.9	5.3
Coal	0.5	0.1	0.1	0.1	0.1	0.1
Crude oil and natural gas	0.4	0.2	0.1	4.1	4.1	3.8
Metal ore mining	0.1	0.1	0.1	1.4	1.1	0.9
Nonferrous mineral mining	0.5	0.2	0.2	0.7	0.6	0.5
Manufacturing	75.2	81.5	81.9	83.9	81.1	78.0
Consumer goods	25.3	16.5	13.0	10.7	11.8	13.1
Food	2.9	0.6	0.4	2.0	2.6	3.1
Textiles	8.5	5.8	4.4	4.5	3.8	3.9
Apparel	8.5	7.5	6.2	1.6	2.3	2.8
Sawmills and furniture	2.2	0.9	0.6	0.7	1.1	1.2
Paper, printing, and related	3.2	1.7	1.4	2.0	2.0	2.1
Intermediate goods	11.0	9.3	12.0	22.6	19.1	16.2
Petroleum	0.9	1.0	2.4	1.5	1.2	0.8
Chemicals	7.1	5.3	6.2	13.0	10.8	9.6
Nonmetal mineral products	1.4	0.9	0.8	0.7	0.6	0.5
Metals smelting and pressing	1.5	2.1	2.4	5.9	5.3	4.2
Electricity	0.0	0.0	0.0	0.9	0.8	0.6
Gas	0.2	0.1	0.1	0.0	0.0	0.0
Water	0.0	0.0	0.0	0.5	0.5	0.5
Capital goods	38.9	55.6	56.9	50.6	50.2	48.7
Metal products	3.5	2.9	3.1	2.0	2.1	1.8
Machinery and equipment	4.3	3.6	3.2	11.6	10.4	8.8
Transport equipment	2.1	2.2	2.0	3.7	4.5	4.6
Electric equipment and machinery	6.6	5.3	5.6	6.2	6.4	6.2
Electronic, telecommunications equipment	16.2	35.0	36.5	20.7	21.7	22.4
Instruments, meters, and office machinery	4.8	5.9	5.5	6.0	4.6	4.4
Other manufacturing	1.4	0.9	0.9	0.4	0.5	0.5
Construction	0.3	0.3	0.2	0.3	0.3	0.3
Tertiary sector	21.4	17.6	17.4	7.1	7.0	8.5
Transport	4.6	4.6	5.6	1.0	0.8	0.9
Post and telecommunication	0.5	0.4	0.4	0.5	0.4	0.4
Commerce	8.3	7.1	6.2	0.0	0.0	0.0
Restaurant	1.2	0.5	0.6	0.0	0.0	0.0
Finance and insurance	0.1	0.1	0.1	1.0	0.8	0.9
Real estate	0.0	0.0	0.0	0.0	0.0	0.0
Social services	6.0	4.1	4.2	4.0	4.4	5.6
Education, social welfare, health services	0.7	0.7	0.4	0.4	0.5	0.6
Public administration and other sectors	0.1	0.0	0.0	0.1	0.1	0.2

Source: DRC-CGE 2004 Model.

Changes in Returns to Capital, Labor, and Households under the Different Scenarios

The experiment shows divergent returns to capital and labor in all scenarios. As seen in table 3.9, returns to capital fall modestly in all three scenarios. This is a function of the accumulation and deepening of capital. As the supply of capital relative to the supply of labor increases, it is to be expected that the premium associated with capital scarcity would decline.

Table 3.9 Projected Changes in Returns to Capital and Labor in 2020 Relative to 2002, under Different Scenarios (percent change)

Factor	Baseline Scenario	Optimistic Scenario	Risk Scenario
Capital	–20.4	–16.2	–16.8
Agricultural labor	1514.2	1675.7	998.9
Production workers	317.8	342.5	285.1
Professionals	445.7	440.1	412.1

Source: DRC-CGE 2004 Model.

For labor, the largest increase in returns is to agricultural labor under all scenarios. It should be noted that the high percentage increases start from a low base. However, the difference in gains for this group between the optimistic and risk scenarios is dramatic. Agricultural labor gains almost twice as much in the optimistic scenario, greater than the variance between scenarios for any other group of workers. In the risk scenario, less labor moves out of agriculture as other industries expand more slowly. The abundance of agricultural labor keeps downward pressure on rural wages.

Urban workers enjoy smaller gains, with less variation between the three scenarios. Workers in production positions (roughly equivalent to unskilled and semiskilled labor) see the most modest gains of any group under each scenario. This reflects both the gradual decline of secondary sector industries as a share of the economy and the gradual substitution of higher-technology production processes that reduce relative demand for unskilled and semiskilled labor. Professional workers (including those with high skills and degrees) see somewhat more robust gains under the three scenarios than less-skilled workers and less variation in the different scenarios.

The distribution of returns to households differs substantially under the various scenarios, with rural households having the most to gain in the optimistic scenario and the least to gain in the risk scenario, as is shown in table 3.10. In the baseline scenario, gains are distributed relatively evenly between rural and urban households, with the lowest-income urban and highest-income rural households gaining the most. In the optimistic scenario, all rural households and the lowest-income urban households are the main winners, as a growing and diversifying economy creates jobs and drives up unskilled wages. Rural workers move to the cities in response to opportunities, and the shrinking rural labor force leads to increases in agricultural wages for those who remain. (Note that the three scenarios are based on a full-employment assumption.) In the risk scenario, growth and labor mobility are weaker and all households see lesser gains, with rural households faring least well.

Table 3.10 Projected Changes in Household Income in 2020 Relative to 2002, under Different Scenarios (percent change)

Household Characteristics		Baseline Scenario	Optimistic Scenario	Risk Scenario
Urban by income	Lowest	458.1	488.4	367.0
	Low	342.5	362.2	317.4
	Medium-low	348.9	367.2	325.0
	Medium	359.8	377.7	334.9
	Medium-high	362.4	379.9	335.7
	High	393.4	409.8	363.4
	Highest	324.4	337.5	296.1
Rural by income	Lowest	375.9	425.4	257.8
	Low	393.4	448.5	264.9
	Medium-low	392.1	449.3	259.9
	Medium	395.5	455.5	257.5
	Medium-high	413.6	478.0	264.4
	High	378.7	441.0	237.3
	Highest	480.0	557.7	302.1

Source: DRC-CGE 2004 Model.

CONCLUSIONS AND KEY CHALLENGES

The experiments conducted with the two models shed light on the range of outcomes that the Chinese economy may face in coming years as a result of WTO accession, broader changes in the global environment, and different domestic policy choices by the government.

At the broadest level, accession to the WTO has had clear benefits for the Chinese economy, and these benefits will continue to increase over the next five years. The imposition of textile and apparel restraints will reduce the benefits somewhat during the years 2005–2008, but production in those sectors is expected to rebound in 2009. China's accession makes the international trade environment in which exporters and importers will operate somewhat more predictable, although not entirely so, as demonstrated by the textile and apparel restraints.

In the macroeconomic experiments, the baseline scenario shows the economy maintaining fairly rapid growth over the next five years, at an average annual rate of about 8 percent. At 2002 constant prices, the aggregate GDP would reach $3.6 trillion in 2010, slightly smaller than that of Japan in 2002. Per capita GDP would be about $2,670, comparable to the current per capita incomes of Brazil, South Africa, and Turkey. From 2010 to 2020, growth is projected to slow somewhat, to an annual average of about 7.6 percent for the period. By 2020, GDP would be about $7.5 trillion and per capita GDP would be about $5,300, comparable to per capita incomes in Hungary and Poland today. In the more optimistic scenario, China would experience growth of well over 8 percent on average until 2020, while in the risk scenario growth slows to an average of about 6 percent for the period 2011–2020.

The most important force driving growth in any scenario for the next five years will continue to be rapid capital accumulation, contributing 72.6 percent of growth in the baseline scenario, 68.8 percent in the optimistic scenario, and 75.3 percent in the risk scenario. At the same time, the simulation results also indicate that the contribution of TFP to economic growth will be increasingly important, driven by urbanization, human capital investment, economic restructuring, and technological innovation. The contribution rate during the 2015–2020 period will be about 10 percentage points higher than during the current period.

The industrial structure will continue to adjust throughout the next fifteen years. The main changes in industrial structure during the earlier years of this period will be the continuing decline of agriculture, with modest rises in the secondary and tertiary sectors' share of the economy. From 2015 to 2020, the main changes will be greater efficiency and a growing role for the service sector.

The experiments serve to illustrate the employment challenge facing China. Though its accession to the WTO brought new opportunities to export and thereby created jobs, it seems likely that at most 13 million new positions were created (under the assumption that surplus labor exists and was absorbed). Compared with the estimated 300 million jobs needed to achieve full employment in China, it is clear that growth in trade alone cannot solve the employment challenge faced by the country. Thus, the experiments lead to the finding that domestic demand will likely be the main source of employment creation.

This finding suggests policy responses in several areas. First, policies that raise household incomes widely, particularly those of rural and lower-income urban households, will be needed to generate broad-based demand. At the same time, such policies would reduce the economy's reliance on trade, help to address current account imbalances, and contribute to more balanced development between urban and rural areas. Fiscal policies and labor market policies have a major role to play. Second, an emphasis on service sector development, particularly in personal services such as education and health care, could generate more labor-intensive jobs, both in urban and rural areas, to absorb surplus labor from the agricultural sector.

The simulation results indicate that under optimal policies (the optimistic scenario), the damage of economic growth to the environment could be significantly reduced. By 2020, the discharge of the four major pollutants would be 2.7 to 12.3 percent lower than in the baseline scenario. Policies currently under consideration, such as a fuel tax, could encourage a pattern of development that is both more efficient and more environmentally friendly.

China's continued development will require a reasonably benign international environment if recent rates of growth are to be maintained. However, policy choices by the Chinese government will determine whether living standards rise throughout the country, whether productivity increases to smoothly compensate for the aging of the population, and whether the economy evolves in a balanced and sustainable manner.

APPENDIX A. TOTAL FACTOR PRODUCTIVITY

Many factors have contributed to rapid growth of TFP in China during the past twenty years, including the reconfiguration of factors (land, capital, and labor) between industries with different productivity levels; systemic reforms that released growth potential and improved efficiency, such as different ownership structures; opening to foreign capital and technological innovations; and improvements in the level and coverage of education that improved the quality of labor.

The reconfiguration of factors will continue over the projection period, and ongoing systemic reforms in finance, trade, and fiscal administration should also contribute to TFP. China's accession to the WTO has institutionalized its opening to trade, and the competitive environment will force enterprises to improve management, innovate technologically, and accelerate technology transfer. These factors will combine with ambitious investments in and the rapid development of modern service industries to contribute to TFP growth in the foreseeable future.

APPENDIX B. DESCRIPTION OF THE CGE MODEL USED FOR THE WTO ACCESSION SIMULATIONS

This appendix first gives a general description of the CGE model used for the WTO accession simulations. It then goes on to describe the model's dimensions and specifications for production and factor markets, foreign trade, income distribution and demand, macroeconomic closure, recursive dynamics, and data.

General Description

The model we employ in this study is one of the existing DRC-CGE models. The Chinese CGE models are closely related to other applied CGE models used extensively over the past two decades to analyze the impact of trade policy reform (see Dervis, de Melo, and Robinson 1982; de Melo 1988; Shoven and Whalley 1992; de Melo and Tarr 1992; and Hertel 1997). The starting point for the structure of the DRC-CGE model is the prototype CGE model developed for the Trade and Environment Program of the OECD Development Center (Beghin et al. 1994). However some significant modifications were made in order to capture major features of trade and tax systems in the Chinese economy. This section summarizes the main features. They are discussed in more detail below.

An important feature of the DRC-CGE model is the explicit treatment of two separate foreign trading regimes. As pointed out by Naughton (1996), China had established two separate trading regimes by 1986–1987. One is the export-processing or export-promotion regime, which is extremely open. Most foreign-invested firms and some domestic firms participate in it. The other is the traditional ordinary trade regime, which itself has been increasingly reformed. Since the mid-1990s, export processing has grown rapidly, and it now accounts for more than half of all exports. An analysis of trade behavior and the impact of alternative changes to trade policy in such an economy requires an explicit treatment of this dualistic regime in the model.

Production is modeled using nested constant elasticity of substitution (CES) functions, and constant returns to scale are assumed. Household demand is modeled using the Extended Linear Expenditure System (ELES). Other final demands assume a fixed-coefficient expenditure function.

Trade is modeled using the Armington assumption for import demand, and a constant elasticity of transformation (CET) function for export supply. The small-country assumption is made for imports; hence, world import prices are exogenous in foreign currency. Exports are demanded according to constant-elasticity demand curves, the price elasticities of which are high but less than infinite.

All commodity and factor markets are assumed to clear through prices. For each labor occupation type, labor is assumed to be perfectly mobile across sectors, and thus there is a nationwide equilibrating wage rate for each labor type. Capital is assumed to be partially mobile, reflecting differences in the marketability of capital goods across sectors.

The current version of the DRC-CGE model has a simple recursive dynamic structure. The dynamics in the model originate from an accumulation of productive factors and productivity changes. The base year of the data and the model is 1997. The model is solved for subsequent years from 1998 to 2010. The growth rate of population, labor force, and labor productivity are exogenous. The growth of capital is endogenously determined by the saving/investment relation.

Model Dimensions

The model has 53 sectors, including 10 agricultural sectors, 5 mining sectors, 29 manufacturing sectors, 1 utility sector, and 8 services sectors. The detailed disaggregation of agricultural and food sectors makes it possible to explicitly model the quantitative restrictions on agricultural commodities and food.

There are 3 production factors: land, labor, and capital. Labor is disaggregated into 7 types by occupation.[11] There are 14 representative households by area and income level.[12] Among the factors, labor and capital are used by all sectors, whereas land is used only for agricultural activities.

Production and Factor Markets

The model assumes that there are two types of competitive firms—ordinary firms and export-processing firms—that produce the same products. The products of ordinary firms are assumed to be sold on the domestic market or to be exported to the rest of the world by a CET function. The products of export-processing firms are for export only.

All sectors are assumed to operate under constant returns to scale and cost optimization. Production technology is represented by a nesting of CES functions. At the first level, firms are assumed to use a composite of primary factors plus energy inputs—that is, value added plus the energy bundle—and other intermediate inputs. At the second level, the division of other intermediate demand is assumed to follow the Leontief specification; that is, there is no substitution among other intermediate inputs. The component of value added plus energy is divided into aggregate labor and energy-capital bundles, which are further split into energy and capital-land bundles. Finally, the energy bundle is made up of seven types of base fuel components, and capital-land is split into capital and land in the agricultural sector.

Agricultural laborers work in the farm sector and production workers work in nonfarm sectors. This segmented labor market is modeled by incorporating partial mobility using a CET function; that is, this transfer is determined by the relative wage of agricultural and production workers, as well as the constant elasticity of transformation. Otherwise, labor is fully mobile across sectors and the two types of firms.

The model distinguishes between old and new capital goods. This assumption of vintage capital allows the substitution elasticity in the production function to differ according to the vintage of capital. The model also includes adjustment rigidities in the capital market. It is assumed that new capital goods are homogeneous and old capital goods supply secondhand markets. The installed old capital in a sector can disinvest when this sector is in decline. The supply curve of old capital is a simple constant elasticity function of the relative rental rates. The higher the rental rate on old capital, the higher the supply of old capital. But the rental rate on old capital is not allowed to exceed the rental rate on new capital. Within sectors, the capital is fully mobile among ordinary firms and export-processing firms.

Foreign Trade

The rest of the world supplies imports and demands exports. Given China's small trade share in the world, import prices are exogenous in foreign currency (an infinite price elasticity). Exports are demanded according to constant-elasticity demand curves, the price elasticities of which are high but less than infinite.

The ordinary firms allocate their output between exports and domestic sales to maximize profits, subject to imperfect transformation between the two alternatives. All the output of export-processing firms is sold to overseas markets. We assume that the exports by ordinary firms and export-processing firms are heterogeneous. In other words, we assume that the buyers of the rest of the world choose a mix between the two types of exports to minimize their cost.

Three types of imports are differentiated in the model. The first is ordinary trade imports, which operate under the ordinary trade regime, subject to import tariffs and NTBs. The second is duty-free imports of raw materials and components used as intermediate inputs by export-processing firms. However, some of these imports are transferred to the domestic market. The third is duty-free imports of investment goods for foreign-invested enterprises and other export-processing enterprises.

Agents are assumed to regard domestic products and imports as imperfect substitutes, that is, the Armington assumption (Armington 1969). A two-level nesting CES aggregation function is specified for each Armington composite commodity. At the top level, agents choose a mix of domestic goods and import aggregates, determined by cost minimization and the degree of substitutability. At the second level, the import aggregate is further split into ordinary imports; duty-free imports of investment goods; and imports for the processing trade, which can be transferred into the domestic market, again as a function of relative import prices and the degree of substitution across different import types. Note that import prices are specific by import type because of the duty-free nature of the last two types of imports.

We treat the difference between domestic prices and world prices in two parts, that is, the tariff rate and NTBs, which is modeled as the tariff equivalent and generates rents to households. The quantitative restriction on agricultural products is modeled explicitly through a Leontief specification, where imports cannot exceed the quota allocation. The rates of agricultural quota rents are solved endogenously.

In the textile and apparel sectors, China faced quotas in the markets of the United States, Canada, European Union, and other countries until January 1, 2005. In our model, we treat this quota as an export tax equivalent that is added to the domestic export price. The quota premium is assumed

to be obtained by households. In the simulations, the quotas are exogenous, with export tax rates adjusted endogenously. We incorporate the export restraints that were negotiated between China and the United States and European Union in 2005.

Income Distribution and Demand

Factor income is distributed to firms, households, the government, and the extra-budget public sector. Capital revenues are distributed among households and firms. Firm income equals a share of gross operating surplus minus corporate income taxes paid to government and profits distributed to households that own shares. Another part of net company income is allocated to extra-budget public sectors as fees. Retained earnings—that is, corporate savings for new investment and capital depreciation replacement—equals a residual of after-tax income minus the distributed profits and fees.

Household income consists of labor earnings and returns to capital and land. Additionally, households receive transfers from the government and the rest of the world. All import and export quota rents are also allocated to households. Household disposable income equals total household income less taxes. Household disposable income is allocated to goods, services, and savings. Households maximize utility using the extended linear expenditure system (ELES), which is an extension of the Stone-Geary demand system. Saving enters the utility function, which is evaluated using the consumer price index. Social consumption and investment final demand follow a fixed share expenditure function.

The government collects taxes from firms, households, and the foreign sector (import tariffs), and it transfers money to the household sector and purchases public goods. Extra-budget public sectors collect fees from enterprises and households. Their incomes are allocated to consumption and saving. The consumption of extra-budget public sectors and government spending constitute one type of final demand, that is, public consumption.

Macroeconomic Closure

Macroeconomic closure in CGE models determines the manner in which three accounts are brought into balance: (1) the government budget, (2) aggregate savings and investment, and (3) the balance of payments. Real government spending is exogenous in the model. All tax rates and transfers are fixed, whereas real government savings is endogenous. The total value of investment expenditures must equal total resources allocated to the investment sector: retained corporate earnings, total household savings, government savings, extra-budget savings, and foreign capital flows. In this model, aggregate investment is the endogenous sum of the separate savings components.

The value of imports, at world prices, must equal the value of exports at border prices, that is, inclusive of export taxes and subsidies, plus the sum of net transfers and factor payments and net capital inflows. An exchange rate is specified to convert world prices—for example, in dollars—into domestic prices. Either this exchange rate or total foreign capital inflow can be fixed, while the other is allowed to adjust providing alternative closure rules. With foreign saving set exogenously, the equilibrium would be achieved through changing the relative price of tradables to nontradables, or the real exchange rate.

Because the purpose of this paper is to estimate the impact of trade liberalization, we keep the trade balance fixed in foreign currency terms. Thus, any changes in real absorption do not result from changes from lending to, or borrowing from, overseas. This makes it possible to compare the efficiency effects of different simulations.

Recursive Dynamics

The current version of the DRC-CGE model has a simple recursive dynamic structure, with agents assumed to be myopic and to base their decisions on static expectations about prices and quantities. The dynamics in the model originate from an accumulation of productive factors and productivity changes. The base year of the data and the model is 1997. The model is solved for subsequent years from 1998 to 2010. The time periods are linked together through factor growth (labor/land) and accumulation (capital), and changes in productivity.

The growth rates of population, labor forces, and labor productivity are exogenous. The growth of capital is endogenously determined by the saving/investment relation. In the aggregate, the basic capital accumulation function equates the current capital stock to the depreciated stock inherited from the previous period plus gross investment. At the sectoral level, the specific accumulation functions may differ because the demand for old and new capital can be less than the depreciated stock of old capital. We assume the producer decides the optimal way to divide the production of total output across vintages. If sectoral demand exceeds what can be produced with the sectoral installed old capital, the producer will demand new capital. Otherwise, the producer will disinvest some the installed capital.

In defining the reference (baseline) simulation, a single economy-wide Hicks neutral efficiency factor (TFP) and sector-specific agricultural productivity are determined endogenously to get a prespecified growth path of real GDP and agricultural output. When alternative scenarios are simulated, the TFP growth rate is exogenous, and the growth rate of real GDP is endogenous.

Data

The model is calibrated to the 1997 Chinese Social Accounting Matrix (SAM) developed from the 1997 national input/output tables. The SAM provides a consistent framework for organizing the relevant flow of value statistics for China's economy to satisfy the requirements of a benchmark data set for CGE modeling. Some key parameters of the model—essentially substitution elasticity and income elasticity—were derived from a literature search. All other parameters—mainly shift and share parameters—were calibrated in the base year using the key parameters and the base data.

APPENDIX C. DESCRIPTION OF THE CGE MACROECONOMIC MODEL

This appendix first gives a general description of the CGE macroeconomic model. It then goes on to describe the various aspects of the model: production and factor markets, foreign trade, income distribution and demand, macroeconomic closure, recursive dynamics, and data.

General Description

The model used for the simulations is DRC-CGE 2004, the CGE model (2004 edition) developed by the Development Research Center of the State Council of China. The model includes 34 production sectors; 14 representative households by area and income level; and 5 primary production factors: land, capital, agricultural labor, productive workers, and professionals. The 34 production sectors include 1 agricultural sector, 24 industrial sectors, and 9 services sectors.

Product and Factor Markets

All sectors are assumed to operate under constant returns to scale and cost optimization. Production technology is represented by a nesting of CES functions. At the first level, output results from two composite goods: a composite of primary factors plus energy inputs—that is, value added plus the energy bundle—and aggregate nonenergy intermediate input. At the second level, the split of nonenergy intermediate aggregate into intermediate demand is assumed to follow the Leontief specification; that is, there is no substitution among nonenergy intermediate inputs. The component of value added plus energy is decomposed into aggregate labor and an energy-capital bundle. Aggregate labor is further split into three types of labor. And energy-capital bundles are decomposed into energy and capital-land bundles. Finally, the energy bundle is made up of three types of base fuel components, and capital-land is split into capital and land in the agricultural sector.

The model distinguishes two types of capital—new and old. This assumption of capital vintage structure allows the elasticity of substitution in the production function to vary for different capital vintages. The model also reflects adjustment rigidity in the capital market. The model assumes that new capital goods are homogeneous while old capital goods are provided by the secondhand market. In dynamic simulation, when one sector is in shrinkage, the capital deployed in this sector can be partially taken out. The supply curve of such old capital is the constant elasticity function of the relative return of old capital. The higher the return of old capital relative to new capital, the more supply will be available. But the return rate on old capital shall not exceed that of new capital. In this model, the supplies of three types of labor and land are fixed exogenously.

Foreign Trade

The rest of the world supplies imports and demands exports. Given China's relatively small trade share in the world, import prices are exogenous in foreign currency (an infinite price elasticity). Exports are demanded according to constant-elasticity demand curves, the price elasticities of which are high but less than infinite.

The price of imports and their difference from international prices result from two factors, tariff rates and NTBs. In the model, the quota rent (denoted with tariff equivalent in NTBs) is assumed to be distributed to households. The quota rent is derived from the model endogenously. In the

textile and apparel sectors, China faces the Agreement on Textiles and Clothing (ATC) quota in the markets of the United States, Canada, European Union, and other countries until 2005. In our model, we treat this voluntary export restraint quota as an export tax equivalent that is added to the domestic export price. The quota premiums are assumed to be obtained by households.

Income Distribution and Demand

Household income comes from capital, labor, and land, as well as profit distributed by enterprises and transfer payments from the government and overseas. The quota rent for all imports and exports is distributed to households. The model assumes that rural households get all land rent, and that rural households get labor income through agricultural labor and productive workers, while urban households get labor income from productive workers and professional technicians. Capital income is distributed to households and enterprises. The disposable income of households is used in savings and consumption for commodities and services. Under the condition of meeting their budgets, households will maximize their own utility. The function can be described with the Stone-Geary utility function, and the derived household demand function is the ELES.

Capital revenues are distributed among households and enterprises. Enterprise earnings equal a share of gross capital revenue minus corporate income taxes. A part of enterprise earnings is allocated to households as distributed profits based on fixed shares, which are the assumed shares of capital ownership by households. Another part of net company income is allocated to extra-budget public sectors as fees. Retained earnings—that is, corporate savings for new investment and capital depreciation replacement—equals a residual of after-tax enterprise income minus the distributed profits and fees.

The government collects taxes from producers, households, and foreign sectors; transfers it to households; and buys public products. Government income includes the value-added tax, business tax, other indirect production taxes, household income tax, corporate income tax, and import tariffs. Subsidies and export taxes are dealt with as negative income of the government. The income source for extra-budget public sectors is fees collected from enterprises; part of it is used in consumption and another part forms savings. Consumption by extra-budget public sectors and government forms the total societal consumption. Total societal consumption and investment demand is described by the function of fixed expenditure ratio. The model assumes that all increased stock is the demand for domestic products. The composite commodity part of intermediate inputs, household consumption, and other final demand forms the total demand in the same category of Armington composite commodity.

Macroeconomic Closure

Macroeconomic closure determines the manner in which three accounts are brought into balance: (1) the government budget, (2) aggregate savings and investment, and (3) the balance of payments. Real government spending is exogenous in the model. All tax rates and transfers are fixed, whereas real government savings is endogenous. The total value of investment expenditures must equal total resources allocated to the investment sector: retained corporate earnings, total household savings, government savings, extra-budget savings, and foreign capital flows. In this model, aggregate investment is the endogenous sum of the separate savings components. This specification corresponds

to the "neoclassical" macroeconomic closure in the CGE literature. The exchange rate is chosen as the model numéraire.

Recursive Dynamics

The current version of China's CGE model has a simple recursive dynamic structure in which agents are assumed to be myopic and to base their decision on static expectations about prices and quantities. The dynamic characteristics of the model are reflected through three factors: (1) quantitative growth in production factors, (2) TFP improvement and partiality of technological progress, and (3) the vintage structure of capital. In such a model structure, the basic factor driving structural change is the income demand elasticity of households for different commodities (Engel's effect), the structural change of intermediate input demand resulting from technology change, and factor composition change resulting from different factor accumulation speeds.

The growth rates of population, labor, and productivity are exogenous. The growth rate of capital is determined endogenously by the savings/investment relationship of the model. On the level of total quantity, the current capital stock equals the capital stock in the previous period minus depreciation plus total investment. But on the sectoral level, because the demand for capital (including new capital and old capital) for some sectors is less than the depreciated old capital of the sector, their capital accumulation functions may vary. We assume that producers use an optimal method to decide the vintage structure of production. When the demand for the products of a certain sector exceeds its production capability with existing capital, the producers in the sector will need new capital inputs. If demand is less than production capability, part of the existing capital will be shifted to other sectors.

Data

The model is calibrated to the 2000 Chinese Social Accounting Matrix (SAM) developed from the 2000 national input/output table. (All data relect the 2005 revision of Chinese economic statistics.) The SAM provides a consistent framework to organize the relevant flow of statistics for China's economy to satisfy the requirements of a benchmark data set for CGE modeling. Some key parameters of the model—essentially substitution elasticity and income elasticity—were derived from a literature search. All other parameters—mainly shift and share parameters—were calibrated in the base year using the key parameters and the base data.

NOTES

1 World Bank, http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp.

2 *Chinese Statistical Yearbook 2006.*

3 Many WTO members had granted China MFN treatment before its WTO accession. Thus the change in market access was more limited than it might appear.

4 The major importing countries were permitted to apply a "textile-specific safeguard clause" (WTO Working Group Report, paragraph 242).

5 According to the agreement, investigations by the E.U. on ten categories of textiles and apparel imports from China (including cotton cloth, T-shirts, pullovers, trousers, women's shirts, bed sheets, one-piece dresses, corsages, table cloth, and flax yarn) were terminated. China and the E.U. agreed that from June 11, 2005, to the end of 2007, the quantity of Chinese exports to the E.U. in those categories will be determined by setting a reasonable base and an annual growth rate from 8 to 12.5 percent. The E.U. also committed to restrain its use of "paragraph 242" of China's WTO Accession Protocol against Chinese textiles other than the agreed-on ten categories.

6 The analysis does not take into account other major aspects of WTO membership, such as reduction of barriers in service trade and foreign investment, protection of intellectual property rights, securing market access, enforcement of commitment, and cooperation in dispute settlement.

7 The reduction rates of industrial import tariffs are aggregated from Harmonized Commodity Description and Coding System (HS) tariff schedules for the period 2000–2008, based on the tariff schedule in the China–United States WTO accession agreement, weighted by 1997 ordinary trade data.

8 These estimates were made by the Chinese vice premier Wu Yi, speaking at the first meeting of the Strategic Economic Dialogue between China and the United States, December 14, 2006.

9 The recursive dynamic version of the model is used.

10 Technological advances and changes in intermediate inputs are assumed to continue at the rate of change reflected in China's input/output tables for the period 1987–2000. For the rest of the world, change trends reflect recent trends in the United States.

11 The production factors are labor, land, and capital. Labor is divided into seven types by occupation: (1) persons in charge of government and party agencies, social organizations, enterprises and institutions; (2) specialized technical personnel; (3) office workers and related persons; (4) persons engaged in commerce; (5) persons engaged in farming, forestry, animal husbandry, fishing, and water conservancy; (6) workers engaged in facilities operation, production, transportation, and related persons; and (7) others.

12 All households are divided into urban and rural households, by location. Then urban and rural households are each divided into seven groups by income level: lowest-income, low-income, medium-low-income, medium-income, medium-high-income, high-income, and highest-income.

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