(2)

A RAND NOTE

MAGIC: Models of Aggregate Growth in China

Donald Putnam Henry

RAND

The research described in this report was sponsored by the Director of Net Assessment, Office of the Secretary of Defense, under RAND's National Defense Research Institute, a federally funded research and development center supported by the Office of the Secretary of Defense and the Joint Staff, Contract No. MDA903-90-C-0004.

Published 1991 by RAND
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138

A RAND NOTE

N-2945-NA

MAGIC: Models of Aggregate Growth in China

Donald Putnam Henry

Prepared for the
Director of Net Assessment,
Office of the Secretary of Defense

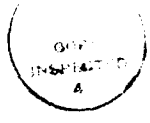
RAND

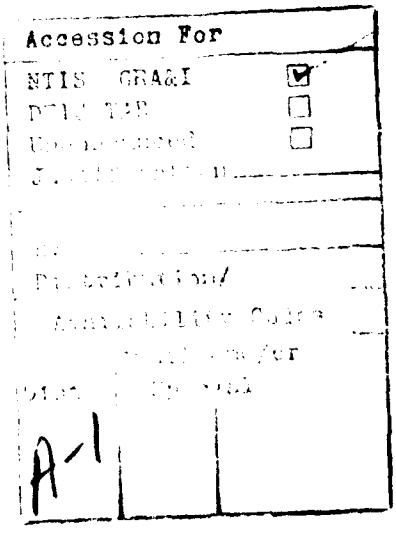
PREFACE

This Note describes three models of the Chinese economy that emphasize various aspects of China's growth prospects. The results presented here should interest analysts and policymakers concerned with China's growth, in terms of both its economic development and national power.

These models have been built with simplicity and transparency in mind. An economic model should guide an analyst to a result that he or she can explain, at least qualitatively, without the model. Model results that cannot readily be explained are often suspect: they may arise from the mathematical peculiarities of the model rather than the economic processes that the model seeks to explain. The models described here should thus be of interest to economic modelers.

This research was conducted within RAND's International Economic Policy Program. It was sponsored by the Director of Net Assessment in the Office of the Secretary of Defense (OSD) under the auspices of the National Defense Research Institute, RAND's federally funded research and development center sponsored by the OSD and the Joint Staff.





SUMMARY

The economy of the People's Republic of China has sustained extremely high rates of economic growth since liberalizing reforms were introduced during the 1970s. The prospects for continued growth in the Chinese economy are important because growth will be a major determinant of the material well-being of about one quarter of the world's population. These prospects also have important implications for the national security of the United States. China provides both a regional and global counterweight to Soviet military power. In the past, Chinese forces have tied down Soviet forces in Asia—forces that otherwise might have faced NATO forces in Europe—thus favorably affecting U.S. security. More recently, Soviet perceived needs to counter Chinese military force probably constrain the possibilities for overall conventional arms negotiations between the superpowers, with a much more ambiguous overall effect on the United States and its allies. China's ability to tie down Soviet forces and constrain Soviet actions depends largely on China's economic ability to support its military. The Chinese leadership has further strengthened this link between its economic performance and its military strength by announcing that military modernization will largely be postponed until after economic modernization is well under way.

This Note develops three small aggregate models of growth in China. Each of these models is designed to highlight different aspects of China's growth prospects. Model I is a simple capital accumulation model that calculates the rates of population growth, capital formation through savings, and technological progress necessary to meet the economic goals announced by the Chinese leadership. In this model, capital accumulation (an increase in productive resources) and technological progress (more efficient utilization of resources) are substitutes for each other. The first model shows that the combinations of the savings rate and the rate of technological progress needed to meet the goals announced by the Chinese leadership are extremely unlikely to occur. Sustained growth at the rates planned by the leadership would require both savings rates near or above the highest in the world and sustained technological progress well above rates seen in even the most successful economies. These goals are thus unlikely to be met.

Model II examines the interactions between the rural and urban sectors of the Chinese economy. The model includes an agricultural sector, a rural manufacturing sector, and an urban manufacturing sector. The agricultural and rural manufacturing

sectors compete for rural labor, while the urban manufacturing sector draws on urban labor. Among the variables that can be adjusted in this model are the rural and urban labor force growth rates, the population growth rate, and the productivity growth rates in each of the three sectors. Labor force growth skewed toward urban areas will generally lead to higher levels of economic growth than will population growth skewed toward rural areas. This result may be less than robust because it assumes that the urban manufacturing sector remains much more efficient than the rural manufacturing sector (as it is today) even after continued fast growth in the urban areas. Productivity growth need not occur evenly across sectors. In fact, changing research and development policies can, to some extent, affect the rate of change in various sectors. Improving the efficiency of rural manufacturing activities appears to be the most promising emphasis. This sector produces manufactured goods with considerably less efficiency than its urban counterpart does. Inadequate infrastructure and lack of access to materials and markets are probably important factors in current poor performance. Finally, international trade can significantly enhance the economic performance of a nation. Two different assumptions were made about world trade prices: the price of manufactures relative to agricultural goods was either $\frac{3}{4}$ or $\frac{4}{3}$ of prices at autarky. Entering trade with either price would increase the value of gross national product (GNP) by about 10 percent.

Model III examines the roles of foreign borrowing and the military sector in economic growth. Two foreign-borrowing scenarios were considered: China would borrow $10 billion per year for the next 30 years, or China could borrow $10 billion per year for the next 15 years and then repay $10 billion per year over the following 15 years. In both cases, the outstanding debt is serviced at a 5 percent real interest rate. By 2010, GNP would be 8.1 percent higher in the first case and 1.6 percent higher in the second case. Consumption, however, would be 3.3 percent higher over the 30 years in the first case and 1.6 percent higher in the second case. While none of these results show spectacular increases in economic activity from capital inflows, the effects are positive in terms of both output and consumption even when the inflows are repaid.

Defense also has an effect on economic growth. In the baseline projection, defense spending is set at 7.5 percent of GNP. Raising the defense share to 10 percent or lowering it to 5 percent lowers or raises GNP (respectively) by the year 2010 by somewhat less than 2 percent. This result holds whether military personnel levels are altered or the changes are strictly in military investment and operations and support. In other words, the size of the military manpower pool has only a very small effect on the overall economy.

The models developed in this Note are built with minimal reliance on the reliability, quality, and consistency over time of Chinese economic statistics. If, as some suspect, Chinese real growth rates have been inflated through undercounting inflation, such distortions will have minimal effect on the models.

Overall, these models are probably optimistic. Economic growth proceeds at high rates for China both historically and compared with the rest of the world, and it proceeds without the political turmoil that has regularly paralyzed the Chinese economy in the past. Almost any nation would have reason to be proud of the growth trends predicted here. Even if these projections are achieved, they will fall well short of the announced goals of the Chinese leadership. Is this shortfall important? If the results shown in these models are achieved, probably not. Yet several potential problems may emerge from overly optimistic goals. Rosy economic projections may engender expectations of unsustainable levels of economic growth. Shortfalls might disappoint the population, leading to political unrest. Major problems arising from this disappointment are unlikely: the population probably will not take the goals that seriously, the achieved performance is likely to satisfy most, and the political consequences of mild economic disappointment are unlikely to be severe in China. More serious injury might result from overly optimistic projections if real long-term infrastructure investments are made based on the goals. Scarce and real investment resources may be squandered through building infrastructure before they can be sensibly used. Finally, the military modernization that China is planning after economic modernization may be postponed into the more distant future.

The models also reinforce another truth of the economic development process: no tricks or gimmicks will quickly boost economic output. Sectoral shifts, capital inflows, and military spending are unlikely to yield a sea change in China's economic prospects. Savings and technological progress remain the primary instruments of growth for capital accumulation. Population growth may increase overall output at the expense of per capita output. To be sure, capital inflows, sectoral policies, and lower military spending may have positive effects on economic growth, but these effects are likely to be swamped by policies that encourage savings and promote efficient production. It is far from certain that large gains in efficiency can be maintained—the Chinese leadership has, at best, provided weak support for continued economic reform.

If the economic projections derived from the three models in this Note accurately portray plausible limits on Chinese economic growth, then a substantial Chinese military modernization effort would have to either precede economic modernization or be

postponed for quite some time. In fact, the declared policy that economic modernization precede military modernization is implausible. Military modernization is likely to be an ongoing process driven, at least in part, by economic modernization. Even if the Chinese economy experienced a sharp acceleration of its growth rate, and even if that growth rate were reflected in military spending, military modernization includes upgrading and replacing existing weapons systems as well as acquiring new ones. This cannot happen overnight. Given the more conservative estimates of growth produced by the models, any sharp increase in the size or quality of Chinese military forces is unlikely to be driven or supported by a sudden surge in economic activity. The impact of Chinese economics on the superpower balance is thus likely to be small in the near term but potentially large over time.

CONTENTS

PREFACE iii
SUMMARY v
FIGURES xi
TABLES xiii

Section
I. INTRODUCTION 1
Purpose of the Models 1
Review of Other Models 2
Limitations to Models of China 4
Approach 5
II. MODEL I: A SIMPLE ACCUMULATION MODEL 6
Variables 6
Equations 7
Data 8
Results 9
III. MODEL II: THE RURAL SECTOR; PATHS TO BALANCED GROWTH 14
Variables 15
Equations 16
Determining Variables by Using Efficiency Criteria 19
Data 20
Results 21
IV. MODEL III: CIVIL-MILITARY INTERACTIONS 32
Variables 32
Equations 33
Data 37
Results 37
V. THE PROGNOSIS 47

Appendix
A. MODEL II PROJECTIONS 49
B. MODEL III PROJECTIONS 60
REFERENCES 77

FIGURES

1. Importance of productivity growth 11
2. Necessary savings and population growth 13
3. Effect of population growth on economic performance in the year 2010 24
4. Effect of population on composition of output in the year 2010 25
5. Effect of productivity growth on economic performance in the year 2010 25
6. Effect of productivity on composition of output in the year 2010 26
7. Effect of skewed population growth on economic performance in the year 2010 27
8. Effect of skewed population growth on composition of output in the year 2010 27
9. Effect of skewed productivity growth on economic performance in the year 2010 28
10. Effect of skewed productivity growth on composition of output in the year 2010 29
11. Effect of trade on economic performance in the year 2010 30
12. Effect of trade on composition of output in the year 2010 31
13. Effect of population growth on economic performance in the year 2010 40
14. Effect of productivity on economic performance in the year 2010 40
15. Effect of savings on economic performance in the year 2010 41
16. Effect of capital flows on economic performance in the year 2010 42
17. Growth through savings and borrowing from 1980 to 2010 44
18. Effect of military establishment on economic performance in the year 2010 45
19. Composite projections and economic consequences in the year 2010 46

TABLES

1. Baseline Model I 10
2. Productivity growth and savings necessary to reach U.S. $800 by the year 2000 10
3. Necessary savings rates for selected productivity and population growth rates 12
4. Baseline Model II 22
5. Model II forecasts for the year 2010: GNP and wealth 23
6. Model II forecasts for the year 2010: GNP shares and growth rates 24
7. Baseline Model III 38
8. Summary of Model III projections for the year 2010 39

A-1. High population growth 49
A-2. Low population growth 50
A-3. High productivity growth 51
A-4. Low productivity growth 52
A-5. Labor migration to cities 53
A-6. Labor migration from cities 54
A-7. High urban manufacturing productivity 55
A-8. High agricultural productivity growth 56
A-9. High rural manufacturing productivity growth 57
A-10. Trade with low agricultural price 58
A-11. Trade with high agricultural price 59

B-1. High population growth 60
B-2. Low population growth 61
B-3. High productivity growth 62
B-4. Low productivity growth 63
B-5. High savings 64
B-6. Low savings 65
B-7. Capital inflows 66
B-8. Capital inflows with payback 67
B-9. More defense, constant manpower 68
B-10. Less defense, constant manpower 69
B-11. More defense, more manpower 70
B-12. Less defense, less manpower 71
B-13. High productivity, high savings 72
B-14. High productivity, low population 73
B-15. High savings, low population 74
B-16. Using all favorable indicators 75

I. INTRODUCTION

PURPOSE OF THE MODELS

Since the death of Mao Zedong, the People's Republic of China has embraced economic reform as a means of greatly increasing the gross national product (GNP) and thereby raising China's place in the world. For the time being, economic modernization has taken precedence over other goals including military modernization:

> Everybody should proceed from the general interest; always bear in mind and help develop the national economy by all possible means. A developed economy will make things easier for us. Once the general situation is improved and our national strength greatly increased, it will not be too difficult for us to produce a few more atom bombs, missiles, and modern equipment, whether for air, sea, or land (Deng Xiaoping, 1985, p. 73).

Economic modernization is seen not solely as an end in itself but rather as a versatile means toward a variety of ends:

> To step up socialist modernization, to strive for China's reunification and particularly for the return of Taiwan to the Motherland, and to oppose hegemonism and work to safeguard world peace—these are the three major tasks of our people in the 1980s. Economic construction is at the core of these tasks: it is the basis for the solution of our external and internal problems (Deng Xiaoping, 1985, p. 4).

China thus sees its economic performance as pivotal in meeting its national security objectives. It is unclear whether this economic emphasis on national security matters will continue through China's recent economic and political retrenchment.

The military balance between West and East also swings with China's economic success. The Soviet Union has kept 53 (mostly understrength) divisions stationed in the Far East, largely to counter Chinese forces in the area (U.S. Department of Defense, 1986, p. 13). Chinese military capabilities can cut both ways for the West. To the extent that Chinese forces fetter Soviet forces in the Far East, Soviet forces will be less threatening elsewhere. Soviet perceptions of a Chinese threat, however, constrain the possibilities for conventional arms control with the Soviet Union: the USSR may insist on keeping substantial conventional capabilities to counter the Chinese; the West may insist on retaining substantial forces to counter Soviet forces that may become unnecessary to counter the Chinese. Over the longer term, Chinese conventional military forces may gain the capability to directly challenge the United States and its allies somewhere besides in the Korea peninsula.

This Note tries to show the likely and feasible developments in the Chinese economy over the next 15 years. Because military capabilities are derived largely from economic trends over long periods rather than short-run economic fluctuations, the analysis presented here will look at the long run. In any case, it is unlikely that short-run economic changes can be predicted with better than random accuracy for more than a year or two into the future.

REVIEW OF OTHER MODELS

Others have built models of the Chinese economy. These models fall into two general categories: aggregate models and input-output–driven sectoral models. The aggregate models often have sectoral detail, but they do not focus on the material flows between the sectors (and possible bottlenecks). While these models have been constructed for numerous reasons, they are evaluated here on their value in producing long-term projections.

The input-output sectoral models are probably inappropriate for longer-term forecasts for two reasons. First, an input-output model focuses on sectoral constraints. In the long run, targeted investment can overcome sectoral constraints. Limitations on the economy become aggregate rather than specific. Second, most sectoral constraints can be overcome through increased international trade. For long-run projections, an input-output model is less than ideal because much effort is needed to model nonbinding constraints. An input-output sectoral model may have some value in analyzing a centrally planned economy because the input-output process mimics the central planning process in many ways. The match is not perfect, however, and the Chinese economy is moving away from central planning in many ways.

Aggregate Models

In an early effort, Dernberger proposed a model that included defense products, consumer and producer goods, and agricultural production (Dernberger, 1975). The model has fixed proportions production functions, which seem inappropriate for long-term modeling.

Lau and his colleagues built a 23 equation, 43 variable model of the Chinese economy (Lau, Choa, Lin, and Shea, 1978). Their model is based on a Cobb-Douglas production function and focuses on agriculture and trade. The primary difficulties with using this model are its complexity and its trade sector. While the model is small compared with other models, it masks a simple underlying structure, largely driven by

time trends and dummies, with layers of unnecessary complexity. The trade sector is also unstable: exports can grow without any corresponding rise in imports. This is largely the result of excluding a wealth effect from large capital inflows.

Data Resources Incorporated (DRI) also has developed an economic model of China (Burke, 1980). No detailed publication on the model is available, but from the available equations serious questions arise about what possible economic model might be contemplated. For example, agricultural production depends on time, total population, and the production of fertilizer. Industrial output depends on time, agricultural output, electricity production, and total population. The model seems to be built on correlation rather than causality.

Wharton Econometrics and SRI International collaborated in producing another model of the Chinese economy in an effort led by Sung Kwack (Kwack, Fromm, and Tu, 1980). This model builds on the Lau model, compounding its complexity by adding more sectoral detail. New problems crop up in this model: some of the sectoral production equations depend on correlates rather than causal factors such as labor and capital, the service sector grows supra-proportionally to the industrial sector, and a method of deriving net output from gross output is theoretically unsatisfying. Net output is an estimated log-linear function of gross output. Net output is much more likely to be proportional to gross output, a hypothesis consistent with constant returns to scale. Previous problems remain in the trade sector.

Haruki Niwa has built a Chinese model with agricultural goods, industrial goods, and other sectors (Haruki Niwa, 1985). This model suffers from exogenous investment, an unstable trade sector, and unusual production relationships. For example, industrial production depends on the domestic supply of agricultural products (including imports) and three dummy variables.

James Tsao has developed a small model of the Chinese economy, but his model lacks a production relationship and depends almost entirely on extrapolation techniques to produce his results (Tsao, 1987).

Input-Output Sectoral Models

The World Bank has developed a model that includes 20 sectors of the Chinese economy (World Bank, 1985a). For purposes of long-term forecasting, 20 distinct sectors are unlikely to matter. The data needed for this model are likely to exceed the supply of dependable economic statistics. Finally, the model needs numerous

"adjustment factors" to keep the forecasts stable and internally consistent even in the short run.

Gregory Chow developed an outline for a dynamic input-output model for the Chinese economy (Chow, 1981). The outline shows how to devise a planning model, but Chow does not actually develop such a model.

LIMITATIONS TO MODELS OF CHINA

Any economic model of the Chinese economy is constrained by the quantity and quality of information about the economy. Economic data collection methods in China have not been as extensive as those usually found in developed market economies. China's geographic size coupled with underdeveloped transportation and communications systems exacerbate the problems of data collection common to all developing countries. A further problem is the lack of unity within China's domestic economy. Provinces have held a great deal of autonomy in economic matters, and trade among provinces has been subject to numerous obstacles beyond the natural barriers of terrain and transport. China is probably less unified economically than the European Economic Community. These internal divisions of the Chinese economy only add to the difficulties of consistent data collection. Even when economic data have been collected consistently and accurately, the concepts measured are often inappropriate for modeling. For example, most Chinese statistics have been based on the socialist Material Product System (MPS) rather than the more widely used System of National Accounts (SNA). The MPS excludes noncommercial services. Data series that follow the SNA, and even many that are based on the MPS, are often available for only a few years or have major interruptions. Even if good data were available for the correct economic concepts, problems would still persist. China's economy has undergone several major structural shifts since the revolution that make econometric estimates based on long historical series of limited relevance in predicting the future. It is unlikely that the structure of the Chinese economy has remained the same from the revolution through the Great Leap Forward, the Cultural Revolution, the reforms and liberalizations of the 1980s, and the present evolving period that seems to be marked by economic and political drift if not stagnation.

The models developed in this Note place only minimal demands on the accuracy of Chinese data. Chinese statistics are used primarily to scale the overall economy and its components. Good data about generic economies in some cases might more accurately describe the Chinese economy today than poor data specifically collected on China.

Relationships derived from other nations' more complete data are thus imposed on the Chinese economy in some cases. No economic modeling techniques can make the Chinese-data difficulties go away; a major effort has been made here to work around them.

APPROACH

Rather than constructing one large and potentially unwieldy model of the Chinese economy for the analysis, several smaller models have been developed, each to demonstrate a particular aspect of China's economic prospects. While this strategy may, at first glance, seem more complicated and time consuming than constructing one model, this is not the case. Much of the information and analysis developed for one model has been used in the other models, and the difficulties associated with coordinating numerous sectors of one model are avoided. Also, the results from the smaller models are easier to understand.

Presented first is a capital accumulation model. While this model is very simple, it does provide valuable insights into the conditions necessary for the Chinese economy to meet the goals set by the Chinese leadership: Are these goals feasible? What must be done to meet them? The second model examines the importance of agricultural productivity and rural development in China's overall development strategy. The third model examines the effects of military spending and international trade on the Chinese economy.

These models are no better than the underlying information from which they are built. Consequently, the results derived from them should be viewed as suggestive rather than definitive. While algebraic models can produce numerically precise results, the precision of any economic model, but especially these models of China, is mostly illusion. The most appropriate use of these models is to gain qualitative insights into the factors that have a major impact on China's economic development.

II. MODEL I: A SIMPLE ACCUMULATION MODEL

This first model uses a simple capital accumulation process to assess the overall prospects for the Chinese economy as well as the feasibility of the economic goals of the Chinese leadership. The goals announced by the Chinese leadership require extremely high and sustained levels of economic growth:

> The minimum target of the four modernizations is to achieve a comparatively comfortable standard of living. . . . By that we mean a per capita GNP of U.S. $800 (Deng Xiaoping, 1985, pp. 37, 40).
> We want to quadruple China's 1980 per capita GNP of U.S. $250 by the end of the century. But this goal seems too high. . . . It will settle between U.S. $700 and $800 (*Manichi shimbun*, 1981).

Deng later predicted that per capita GNP would definitely exceed U.S. $800 and might even reach U.S. $1,000 (*TKP*, 1986, p. 1). The focus of Model I is determining the combinations of savings and productivity growth that will be necessary to reach these per capita levels of GNP that the leadership has announced.

The model is relatively straightforward. GNP is determined by a simple labor and capital Cobb-Douglas production function with a disembodied technological progress term. Part of GNP is saved, leading to an increased capital stock in the next period. The two main drivers for per capita GNP growth are thus technological progress and the savings rate.

VARIABLES

Endogenous Variables

Y_t	Gross national product
I_t	Investment
L_t	Labor force (after the year 2003)
P_t	Population
K_t	Capital stock
C_t	Consumption

Exogenous Variables

t	Time (1980 = 0)
L_t	Labor force (until the year 2003)

Parameters

α	Labor share
A	Total factor productivity in year 0
g	Total factor productivity growth rate
P_0	Population in year 0
g	Population growth rate
δ	Depreciation rate
K_0	Capital in year 0
s	Savings rate

EQUATIONS

Gross National Product

$$Y_t = Ae^{g\,t}L_t^{\alpha}K_t^{1-\alpha} \tag{1}$$

This Cobb-Douglas production function determines the level of urban output from labor, capital, and productivity variables.

Population

$$P_t = P_o e^{\gamma t} \tag{2}$$

Population grows exponentially at a rate of γ from a base of P_0.

Labor

$$L_t = \begin{cases} \bar{L}_t & t < 23 \\ L_{23}\ e^{\gamma (t-23)} & t \geq 23 \end{cases} \tag{3}$$

The labor force grows exogenously so long as new entrants to the labor force have already been born. Thereafter, it grows exponentially at the same growth rate as population γ from a base of L_{23}.

Investment

$$I_t = s\,Y_t \tag{4}$$

Investment is equal to the savings rate times GNP.

Consumption

$$C_t = Y_t - I_t \tag{5}$$

Consumption is determined by the national income identity.

Capital Stock

$$K_t = K_{t-1} - \delta K_{t-1} + I_{t-1} \tag{6}$$

The capital stock is equal to the capital stock in the preceding period, less depreciation and augmented by investment during the preceding period.

DATA

The data requirements for this model are relatively modest. A labor share of 55 percent of total product was used in this analysis. No hard data are available on factor shares in China. Even if such data did exist, they would be undependable because China does not have a market economy and shares actually received by factors need not resemble their marginal product.[1] Instead, 55 percent has been chosen because it is representative of the labor share in low-income market economies. Working age population is used as a proxy for the labor force, ages 15 through 64.[2] Because those who will become of working age through the beginning of the next century have already been born, the working age population can be projected with a good deal of accuracy well into the future. Thus the projected working age population is used as the labor force until 2003. After that time, population growth can affect the size of the labor force. The

---

[1] It is possible to estimate factor shares using quantities of output, capital, and labor. This method is often unsatisfactory because estimates of factor shares are often negative or greater than one. Changing the estimation period slightly can also lead to wide swings in the estimated shares.

[2] Working-age-population figures were provided by the U.S. Census Bureau. These numbers were based on data through 1988, and thus additional births will not influence these projections until 2003.

population size in 1980 is taken from the *Statistical Yearbook of China, 1984*, and its subsequent growth rate is 1.2 percent per annum, based on planned growth through the year 2000 (State Statistical Bureau, 1986, p. 3; *Beijing Xinhua*, 1986, p. K33; Wang Huijiong, 1985, P. 18; State Statistical Bureau, 1984). There is no "right" way to translate Chinese economic aggregates into dollars. Rather, a multitude of possible methods yields vastly differing estimates of Chinese GNP in dollars.[3] Since the primary purpose of this exercise is to test the announced goals of the leadership, GNP in the base year was scaled to the level pronounced as a starting point by the leadership, U.S. $250 per capita GNP in 1980 or $246.8 billion (which results from multiplying the per capita GNP level by population). Using this figure as a base, GNP for other years was estimated using as a proxy the index of real national income in the *Statistical Yearbook of China, 1984* (State Statistical Bureau, 1984, p. 30). The 1980 capital stock was derived from the "accumulation" series in State Statistical Bureau (1984, p. 32). This accumulation series was used as an approximation for net investment, was converted to constant yuan using the implicit net material product (NMP) price deflator, and was summed to construct a capital stock measure. Then the capital stock estimate in yuan was converted to dollars using the same ratio as that for GNP. A 5 percent depreciation rate is used prospectively on this series. While 1980 was used as a base year, actual income, savings, and population were available through 1983, and the capital stock could be calculated through 1984 using actual data. The productivity level for the base year (1980) was calculated by inverting the production equation with known GNP, labor, and capital.

RESULTS

The low end of the GNP range announced in 1986 by Deng Xiaoping was U.S. $800 per capita by the year 2000 (*TKP*, 1986). Is this likely? Table 1 shows a baseline projection of Model I using reasonable assumptions about technological progress and savings. These assumptions give rise to a per capita GNP of just under U.S. $600 by the end of the century, well short of the goal. What would be necessary to achieve this goal? Increased capital growth or faster productivity growth is necessary to further raise per capita GNP. Table 2 and Fig. 1 show the combinations of savings and productivity growth necessary to reach this target. Also shown is per capita consumption in the year 2000 at each level of factor productivity growth. Consumption is used in a very wide

[3]Purchasing power parities and "market" exchange rates are two possible ways of converting Chinese product to dollars.

Table 1

BASELINE MODEL I

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force	604.3	678.3	760.3	810.8	854.4	904.8	960.4
			Billions of 1980 U.S. Dollars				
Capital stock	905.8	1,243.4	1,586.6	2,037.2	2,608.6	3,328.6	4,242.6
GNP	246.8	350.0	459.1	587.6	746.4	949.0	1,207.6
Investment	112.8	122.5	160.7	205.7	261.2	332.2	422.7
Consumption	134.0	227.5	298.4	382.0	485.1	616.9	785.0
			1980 U.S. Dollars				
GNP per capita	250.0	333.4	412.0	496.9	594.5	712.2	853.8
Consumption per capita	135.8	216.7	267.8	323.0	386.5	462.9	555.0
			Growth Rates in Percent				
GNP	—	7.2	5.6	5.1	4.9	4.9	4.9
Consumption	—	11.2	5.6	5.1	4.9	4.9	4.9

Table 2

PRODUCTIVITY GROWTH AND SAVINGS NECESSARY TO REACH U.S. $800 BY THE YEAR 2000

Productivity Growth (In percent)	Savings Rate (In percent)	Consumption (In 1983 U.S. $)
0.0	—	—
0.5	—	—
1.0	87.4	100.7
1.5	73.5	211.7
2.0	61.6	307.1
2.5	51.4	389.0
3.0	42.6	459.3
3.5	35.1	519.5
4.0	28.6	571.0
4.5	23.1	615.1

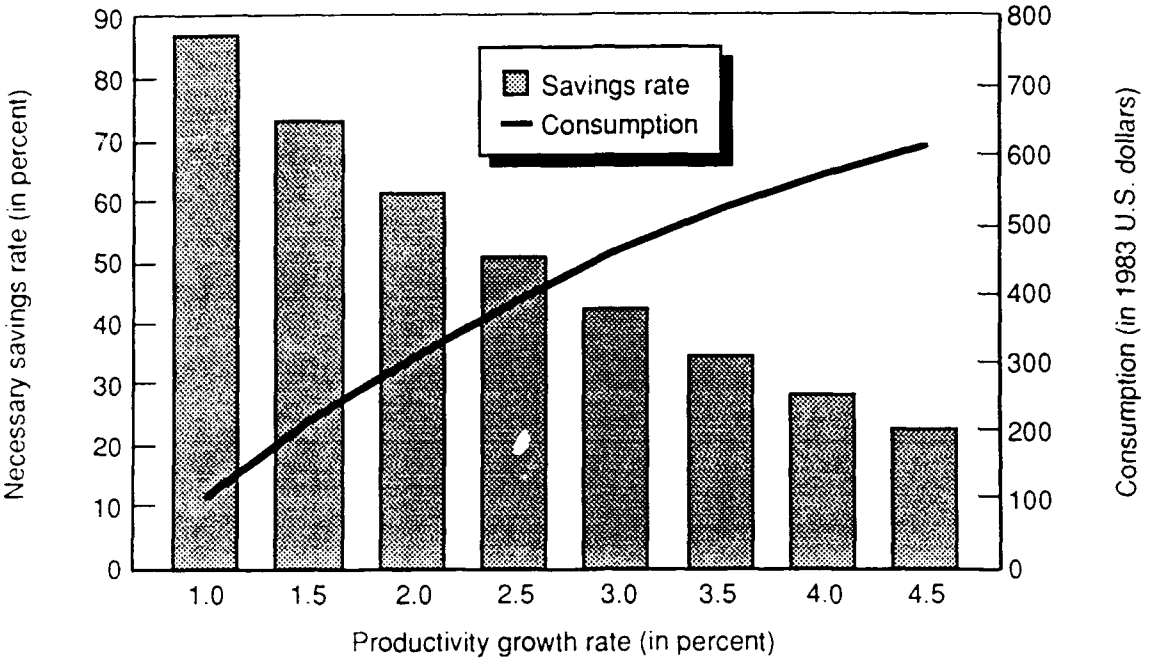


Fig. 1—Importance of productivity growth

sense here to include both public and private consumption. Since investment cuts into current consumption, consumption will be higher when the target is met primarily through higher rates of total factor productivity rather than through higher savings rates.

Are these rates feasible? As shown in Fig. 1, the goals can be met at about a 30 percent savings rate and a 3.5 percent productivity growth rate. By comparison, South Korea maintained a 2.18 percent productivity growth rate from 1963 through 1982 (Henry, 1986, p. 45), and its savings rate has been somewhat below 30 percent. To meet its targets, China will have to exceed the performance of South Korea, one of the fastest growing economies of the world. Can China better South Korea? Such performance will require a very high level of productivity growth. China may be able to maintain high productivity growth because its economy is relatively inefficient at present, and economic reforms hold the potential for surges in productivity. Nevertheless, the economic goals of the government are at the optimistic end of possible outcomes.

The projections in Table 2 and Fig. 1 are based on population growth rates of 1.2 percent per year. How would these projections change if population growth was significantly greater or smaller? Faster population growth would increase the labor force, thereby increasing GNP, but the increase in GNP would be spread over a larger

population. These effects are not simultaneous. New mouths must be fed as soon as they are born, while it could be decades (15 years are assumed here) between birth and entry into the labor force. Especially in the short run, high levels of population growth would tend to depress per capita levels of GNP. Table 3 and Fig. 2 show the savings-productivity tradeoff with a baseline population growth of 0 percent per year, 1.2 percent per year, and 2.4 percent per year. While the economic goals of the Chinese leadership may be difficult to attain with a 1.2 percent population growth, they quickly approach the realm of impossibility as the population growth rate rises further.

Table 3

NECESSARY SAVINGS RATES FOR SELECTED PRODUCTIVITY AND POPULATION GROWTH RATES
(In percent)

	Savings Rates		
Productivity Growth	0.0% Population Growth	1.2% Population Growth	2.4% Population Growth
0.0	88.4	—	—
0.5	74.2	—	—
1.0	61.9	87.4	—
1.5	51.4	73.5	—
2.0	42.4	61.6	86.1
2.5	34.7	51.4	72.6
3.0	28.1	42.6	61.1
3.5	22.5	35.1	51.1
4.0	17.7	28.6	42.6
4.5	13.6	23.1	35.2

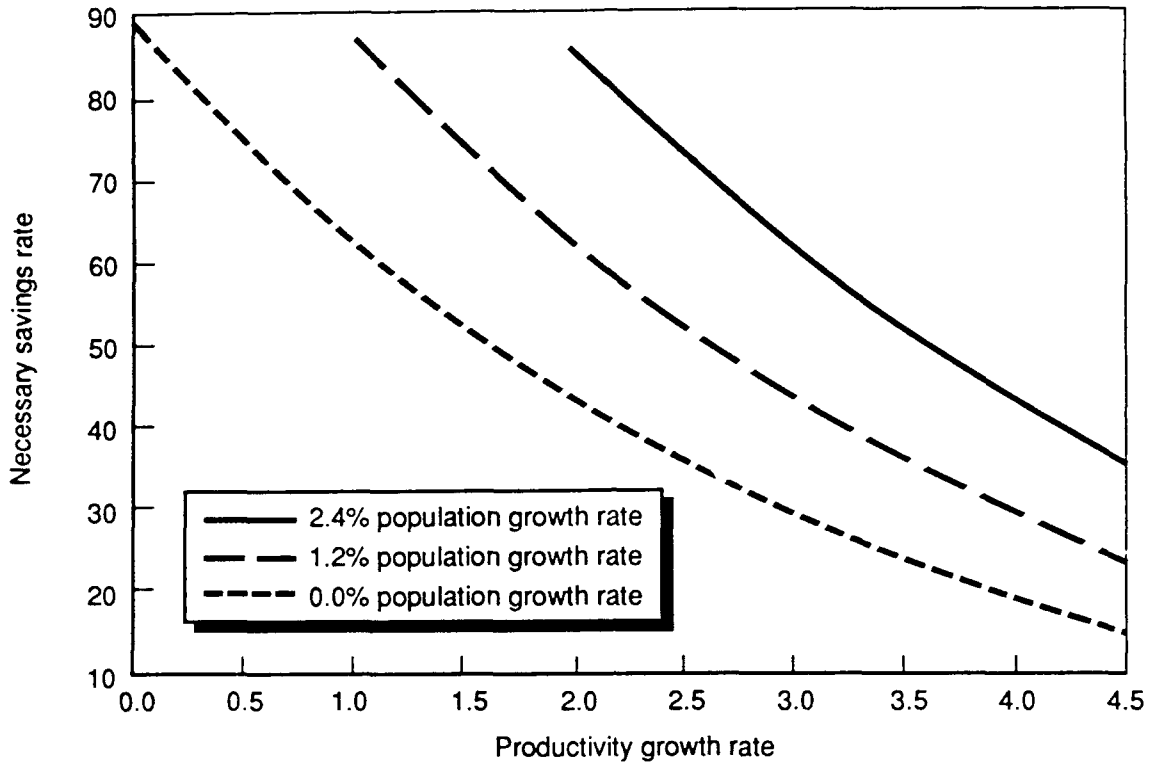


Fig. 2—Necessary savings and population growth (in percent)

III. MODEL II: THE RURAL SECTOR; PATHS TO BALANCED GROWTH

The second model examines the agricultural sector and the industrialization process in China. In 1980, over 80 percent of the Chinese population lived in rural areas, and over 70 percent of the work force was involved with agriculture (State Statistical Bureau, 1984, pp. 81, 104). Improvements in agricultural productivity may release vast amounts of labor for use in other economic activities. On the other hand, poor agricultural performance coupled with high population growth may stymie efforts toward industrialization by continuing the current large commitment of labor to producing food.

This model is meant to highlight the important factors necessary for growth and industrialization. While it demonstrates important consequences of varying population and productivity growth rates, the estimates that it generates should not be regarded as precise quantifications of these consequences. Industrialization is emphasized here because military capability may be related more closely to manufacturing capabilities than to overall development.

Although the industrialization process in any country is extremely complex, this model tries to capture some of the important elements. The Chinese economy is divided into three sectors: an agricultural sector producing food, an urban sector producing manufactures, and a nonagricultural rural sector also producing manufactures. The labor force is segmented into urban and rural components. Urban workers can work only in the urban manufacturing sector, while the rural workers can work either in the agricultural sector or the rural manufacturing sector. A second input, a completely fungible and mobile capital good, can be used in all three sectors. Both manufacturing sectors produce the same good, and both have constant returns to scale. This single manufactured good serves as a stand-in for all nonagricultural production. The agricultural sector has decreasing returns to scale, one way of simulating a third input necessary for this sector alone: land.

Allocation of resources to each sector creates efficiency based on productivity of the sector and the price of agricultural products relative to manufactures. Productivity of

each sector is determined by a Cobb-Douglas production function with a total factor productivity term.[1] Relative prices are determined by an inverted demand function.[2]

VARIABLES

Endogenous Variables

Y_t	Gross national product
Yu_t	Urban output
Yr_t	Rural manufacturing output
Ya_t	Agricultural output
Lu_t	Urban labor force
Lc_t	Countryside labor force
La_t	Agricultural labor force
Lr_t	Rural manufacturing labor force
L_t	Total labor force (after the year 2003)
P_t	Population
K_t	Capital stock
Ku_t	Urban capital stock
Ka_t	Agricultural capital stock
Kr_t	Rural manufacturing capital stock
I_t	Investment
Pa_t	Relative price of agricultural products to manufactures

Exogenous Variables

t	Time (1980 = 0)
L_t	Total labor force (until the year 2003)

Parameters

α	Labor share (relative to capital) in all sectors
β	Returns to scale in agriculture

[1] The agricultural-sector production function is further modified by an economy-of-scale term. This is mathematically and conceptually equivalent to the factor shares, summing to less than one.

[2] Later, prices are determined in world markets rather than solely through domestic demand.

A_a	Agricultural productivity in year 0
A_r	Rural industrial productivity in year 0
A_u	Urban productivity in year 0
g_a	Agricultural productivity growth rate
g_r	Rural industrial productivity growth rate
g_u	Urban productivity growth rate
Lc_o	Countryside labor force in year 0
Lu_o	Urban labor force in year 0
g_u	Urban labor force growth rate
g_c	Countryside force labor growth rate
d	Depreciation rate
K_o	Capital in year 0
s	Savings rate
e_p	Price elasticity of demand for agricultural products
e_y	Income elasticity of demand for agricultural products
D	Demand level parameter
m	Rate of migration from rural to urban areas

EQUATIONS

Gross National Product

$$Y_t = Y_{u_t} + Y_{r_t} + Y_{a_t} P_{a_o} \tag{1}$$

This equation is an identity: GNP is the sum of its components. The components here are urban, rural industrial, and agricultural output.

Urban Output

$$Y_{u_t} = A_u e^{g_u t} L_{u_t}^{\alpha} K_{u_t}^{1-\alpha} \tag{2}$$

This Cobb-Douglas production function determines the level of urban output from urban labor, urban capital, and productivity variables.

Rural Industrial Output

$$Y_{r_t} = A_r e^{g_r t} L_{r_t}^{\alpha} K_{r_t}^{1-\alpha} \tag{3}$$

This Cobb-Douglas production function determines the level of rural industrial output from rural industrial labor, rural industrial capital, and productivity variables.

Agricultural Output

$$Y_{a_t} = A_a e^{g_a t} \left(L_{a_t}^{\alpha} K_{a_t}^{1-\alpha} \right)^{\beta} \tag{4}$$

This Cobb-Douglas production function determines the level of agricultural output from agricultural labor, agricultural capital, and productivity variables. Unlike the other sectors in this model, the agricultural sector has diminishing returns to scale. This formulation is consistent with constant returns to scale for a production equation with land as an argument. Since the amount of land is fixed, diminishing returns will be encountered as the other two factors are increased.

Population

$$P_t = P_0 e^{\gamma t} \tag{5}$$

Population grows exponentially at a rate of γ from a base of P_0.

Labor Force

$$L_t = \begin{cases} \overline{L}_t & t < 23 \\ L_{23}\, e^{\gamma (t - 23)} & t \geq 23 \end{cases} \tag{6}$$

The labor force grows exogenously so long as new entrants to the labor force have already been born. Thereafter, it grows exponentially at the same growth rate as population γ from a base of L_{23}.

Urban Labor

$$L_{u_t} = L_t\left(\frac{L_{u_o}}{L_{t_o}}\right) + \begin{cases} m\,L_{c_{t-1}} & m \geq 0 \\ m\,L_{u_{t-1}} & m < 0 \end{cases} \tag{7}$$

Urban labor grows at the same rate as the overall labor force.

Countryside Labor

$$L_{c_t} = L_t\left(\frac{L_{c_o}}{L_{t_o}}\right) - \begin{cases} m\,L_{c_{t-1}} & m \geq 0 \\ m\,L_{u_{t-1}} & m < 0 \end{cases} \tag{8}$$

Countryside labor grows at the same rate as the overall labor force.

Rural Manufacturing Labor

$$L_{r_t} = L_{c_t} - L_{a_t} \tag{9}$$

Labor in the rural industrial sector is total countryside labor less labor in the agricultural sector.

Capital Stock

$$K_t = K_{t-1} - \delta K_{t-1} + I_{t-1} \tag{10}$$

The capital stock is equal to the capital stock in the preceding period, less depreciation, and augmented by investment during the preceding period.

Urban Capital Stock

$$K_{u_t} = K_t - K_{r_t} - K_{a_t} \tag{11}$$

The urban capital stock is equal to the total capital stock less the capital stock in the rural industrial and agricultural sectors.

Investment

$$I_t = sY_t \tag{12}$$

Investment is equal to the savings rate times GNP.

Demand for Agricultural Products

$$\frac{Y_{a_t}}{L_t} = D\left(\frac{\left(\frac{Y_{u_t} + Y_{r_t} + Y_{a_t} P_{a_t}}{L_t}\right)}{\left(\frac{Y_{u_o} + Y_{r_o} + Y_{a_o} P_{a_t}}{Y_{u_o} + Y_{r_o} + Y_{a_o} P_{a_o}}\right)}\right)^{e_y} P_{a_t}^{e_p} \tag{13}$$

Per capita demand for agricultural products depends on real per capita GNP and the price of agricultural goods. Real GNP is calculated using a Laspeyres index with 1980 weights. This demand function can be inverted to provide an expression for the relative price of agricultural products.

Efficiency Conditions

$$K_{a_t},\ K_{r_t},\ \text{and}\ L_{a_t}$$

DETERMINING VARIABLES BY USING EFFICIENCY CRITERIA

In addition to the formulation of the equations described above, efficiency conditions are used to determine several core factor input variables; that is, the variables are determined by how they should be allocated to achieve the maximum value of production. The variables include the agricultural labor force, the agricultural capital stock, and the rural manufacturing capital stock. The remaining input variables can be determined by the identities shown after these core variables are determined. The choice of which variables to determine by efficiency criteria and which by identity is, of course, arbitrary. The rural manufacturing labor force rather than the agricultural labor force could have been determined by efficiency conditions. Similarly, the urban manufacturing capital stock rather than the agricultural or rural manufacturing capital stocks could also have been determined by efficiency conditions.

The actual methods of determining the most efficient allocation of resources will not be discussed in depth. Conceptually, they are simple: the marginal products of capital in all sectors are set equal, as are the marginal products of labor in the agricultural and rural manufacturing sectors. In practice, this model is sufficiently nonlinear that solving for the efficient allocation of factors is rather complicated.

DATA

Data requirements for this model are comparatively modest. Population is used as a proxy for the labor force. The split between rural and urban population is described in *Statistical Yearbook of China, 1984*. In 1980, 80.6 percent of the Chinese population, 795,650,090 out of 987,050,000, lived in rural areas. Agricultural workers made up 72.02 percent of the total work force (State Statistical Bureau, 1984, pp. 82, 104). This rate was applied to the total population to find "agricultural labor." The remainder of rural residents become "rural manufacturing labor," while non-rural residents become "urban manufacturing labor." During 1980, 37 percent of Chinese output was for agricultural goods (World Bank, 1984, Table 3, p. 222). GNP in 1980 is estimated at $246.8 billion, and the capital stock is calculated as $531.9 billion.[3] These were the only data taken from the actual Chinese economy. Next, values were assigned for several production and demand function parameters. The labor share of output was 55 percent in both of the manufactured goods sectors and 55 percent of the total labor and capital shares in agriculture. Returns to scale decline by 5 percent in agriculture: a doubling of capital and labor increase agricultural output by only 95 percent. The income elasticity of demand for agricultural goods was .5, while the price elasticity of demand for these goods was –.1, reflecting the fact that agricultural products are usually inferior[4] goods with low price elasticities.

Given the values and parameters outlined above, many of the other parameters and values can be calculated. Only one set of efficiency coefficients will generate a consistent set of solutions for GNP, the agricultural share of output, and the labor input into agriculture. Efficiency coefficients that meet these criteria were derived. These coefficients in turn generate capital stocks for each of the three sectors and the split of

---

[3]This model uses the same values as the first model for the national income and capital stock in 1980.

[4]The term "inferior" is used here in the economic sense. The share of income spent on an inferior good declines as income rises.

output between the two manufacturing sectors.[5] The constant term in the demand equation was chosen so that the price of agricultural goods in 1980 would be 1. This price is arbitrary, but a value of 1 makes comparisons across goods and calculation of real GNP easier.

Several additional parameters are used in the model. Population growth was set to 1.2 percent, total factor productivity growth was set to 2 percent, the savings rate was set to 35 percent, and the depreciation rate was set to 5 percent. These parameter values were incorporated into a baseline simulation shown below.

RESULTS

Results of a baseline projection of Model II are shown in Table 4, while other projections are summarized in Tables 5 and 6.

Population Growth

The effects of increased or decreased population growth on the overall economy are similar to those predicted by Model I. Figure 3 shows real GNP, real per capita GNP, and the capital stock in the year 2010 using the baseline assumption of 1.2 percent population growth, a low estimate of no growth, and a high estimate of 2.4 percent population growth. Higher population growth leads to a higher terminal capital stock, and both these factors lead to a higher level of GNP. This higher level of economic growth is insufficient to offset the higher population growth, so per capita GNP falls from baseline levels. Figure 4 shows the sectoral breakdown for each of these projections. Population growth assumptions have little effect on the relative size of the urban manufacturing sector (which is not surprising as labor cannot be transferred into or out of the urban sector), but higher levels of population growth lead to an increased share of output in agriculture and a correspondingly smaller share in the rural manufacturing sector. High (low) population growth rates increase (decrease) the demand for food, thereby slowing (hastening) the release of labor from agriculture to manufacturing. (Details of the various population projections as well as other projections of Model II can be found in App. A.)

[5]Note that these values are calculated from the structure of the model rather than through any accounting identity. These calculated values will differ from actual values to the extent that production is not Cobb-Douglas, to the extent that the other initial values assumed in the model are incorrect (it is unlikely that these values can be derived directly from actual data), and to the extent that the allocation of production factors in the Chinese economy is less than optimal.

Table 4

BASELINE MODEL II

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	435.0	446.7	440.3	429.2	419.3	409.7
Labor force, rural manufacturing	51.8	111.7	166.1	213.2	259.4	309.9	364.3
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,222.4	1,444.8	1,743.9	2,126.8	2,612.2	3,230.8
Capital stock, urban	542.8	732.5	865.7	1,044.9	1,274.4	1,565.2	1,935.9
Capital stock, agricultural	324.4	389.8	422.1	470.9	531.3	602.0	685.4
Capital stock, rural manufacturing	38.6	100.1	157.0	228.0	321.1	445.0	609.5
Gross national product, total	246.8	331.6	419.7	521.8	647.7	808.7	1,014.3
Real gross national product	246.8	331.1	418.6	520.2	645.2	804.9	1,008.6
Real production, urban	145.1	195.4	247.7	308.3	383.1	478.8	601.1
Real production, agricultural	91.3	109.0	126.3	145.0	166.3	191.3	220.6
Real production, rural manufacturing	10.3	26.7	44.9	67.3	96.5	136.1	189.2
Investment	112.8	99.5	125.9	156.6	194.3	242.6	304.3
			1980 Dollars				
Real per capita GNP	250.0	315.4	375.7	439.8	513.9	604.0	713.1
Real per capita manufactures	157.5	211.6	262.6	317.6	382.1	461.5	558.8
Real per capita agricultural goods	92.5	103.9	113.3	122.6	132.5	143.6	156.0
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.004	1.007	1.009	1.011	1.013	1.015
			Growth Rates in Percent				
GNP	—	6.1	4.8	4.5	4.4	4.5	4.6
GNP per capita	—	4.8	3.6	3.2	3.2	3.3	3.4
Urban output	—	6.1	4.9	4.5	4.4	4.6	4.7
Agricultural output	—	3.6	3.0	2.8	2.8	2.8	2.9
Rural manufacturing	—	20.9	10.9	8.4	7.5	7.1	6.8
			Percentage of Total Output				
Urban share	58.8	58.9	59.0	59.1	59.1	59.2	59.3
Agricultural share	37.0	33.0	30.3	28.0	26.0	24.0	22.1
Rural manufacturing share	4.2	8.1	10.7	12.9	14.9	16.8	18.7

Table 5

MODEL II FORECASTS FOR THE YEAR 2010: GNP AND WEALTH[a]

Category	GNP (In billions 1980 $)	Capital Stock (In billions 1980 $)	GNP per Capita (In 1980 $)
Baseline population growth	1,008.6	3,230.8	713.1
High population growth	1,059.6	3,273.2	544.9
Low population growth	959.9	3,189.9	936.5
High productivity growth	1,643.8	4,389.5	1,162.2
Low productivity growth	623.2	2,435.1	440.6
Labor migration to cities	1,363.7	3,918.1	964.1
Migration from cities	919.8	3,059.1	650.3
High urban manufacturing productivity	1,046.4	3,299.3	739.8
High agricultural productivity growth	932.8	2,827.1	659.5
High rural manufacturing productivity growth	1,143.8	4,037.7	808.7
Trade with low agricultural price	1,096.9	3,175.8	775.5
Trade with high agricultural price	1,097.0	3,813.6	775.6

NOTE: GNP and GNP per capita for trade scenarios are based on consumption bundles rather than on lower production bundles.

[a]Current GNP is assumed at $246.8 billion; 1980 capital stock is assumed at $905.8 billion; and current GNP per capita is assumed at $250. All are in 1980 dollars.

Productivity Growth

Productivity growth changes of similar scale to the population growth changes discussed above have much more pronounced effects on the overall economy. Capital accumulation and GNP rise sharply as productivity increases, leading to sizable increases in per capita GNP. (See Fig. 5.) The sectoral effects of productivity growth are also substantial. Figure 6 again shows little change in the urban share of the economy; however, increased productivity overall in the economy allows a substantial diversion of labor and other resources from agriculture, where demand is comparatively inelastic to changes in income, into other endeavors. On the other hand, low productivity requires a continued large share of resources devoted to agriculture.

Location of Population Growth

Population growth need not be uniform throughout the country. In fact, differing birth rates in rural and urban areas are the rule rather than the exception. Population

Table 6

MODEL II FORECASTS FOR THE YEAR 2010:
GNP SHARES AND GROWTH RATES[a]

	Shares of GNP			Growth Rates			
Category	Agr.	Rural	Urban	Agr.	Rural	Urban	Overall Total
Baseline population growth	22.1	18.7	59.3	3.0	10.2	4.9	4.8
High population growth	25.4	15.4	59.2	3.6	9.7	5.0	5.0
Low population growth	19.2	21.5	59.3	2.4	10.5	4.7	4.6
High productivity growth	17.2	23.3	59.4	3.8	12.8	6.6	6.5
Low productivity growth	28.2	12.7	59.1	2.2	7.1	3.2	3.1
Labor migration to cities	19.1	2.3	78.7	3.5	3.8	6.9	5.9
Migration from cities	23.1	25.5	51.4	2.8	11.0	4.0	4.5
High urban manufacturing productivity	21.8	4.4	73.8	3.0	5.1	5.8	4.9
High agricultural productivity growth	17.8	22.8	59.4	3.0	10.1	4.1	4.5
High rural manufacturing productivity growth	26.8	38.6	34.6	3.0	14.3	4.3	5.2
Trade with low agricultural price	0.1	40.0	59.9	-15.0	12.9	4.8	5.1
Trade with high agricultural price	51.8	0.0	48.2	5.7	-100.0	4.8	5.1

[a]The 1980 agricultural share of GNP is assumed to be 37.0 percent; the 1980 rural share of GNP is assumed to be 4.2 percent; the 1980 urban share of GNP is assumed to be 58.8 percent.

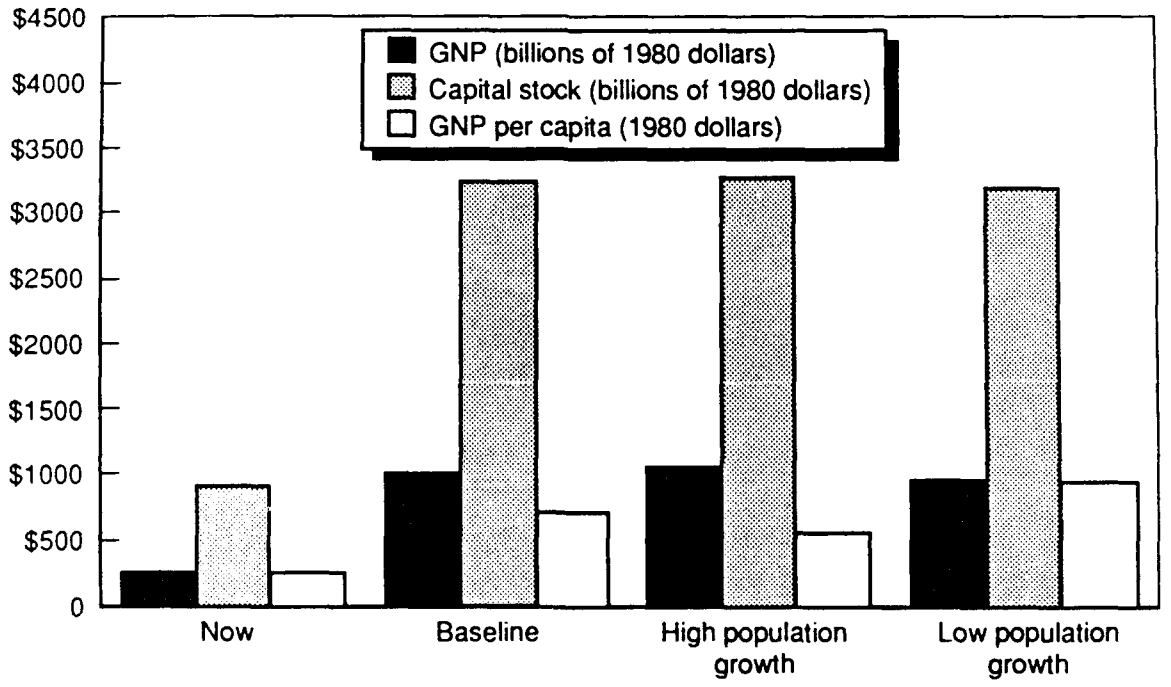


Fig. 3—Effect of population growth on economic performance in the year 2010

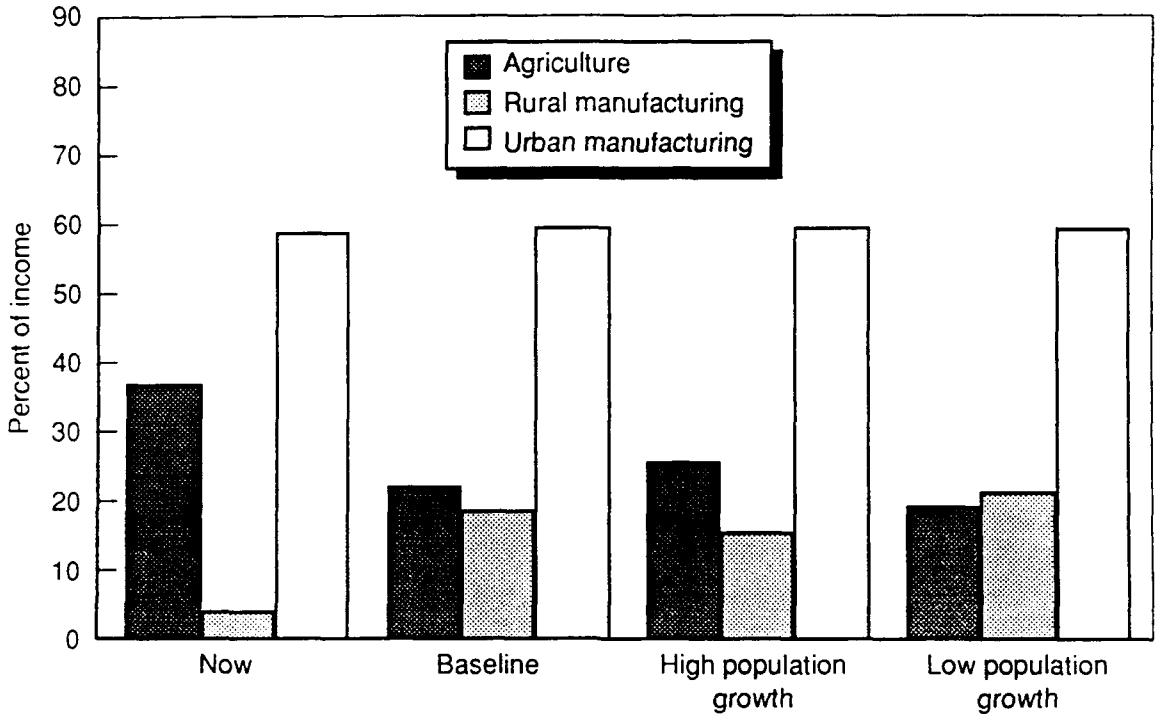


Fig. 4—Effect of population on composition of output in the year 2010

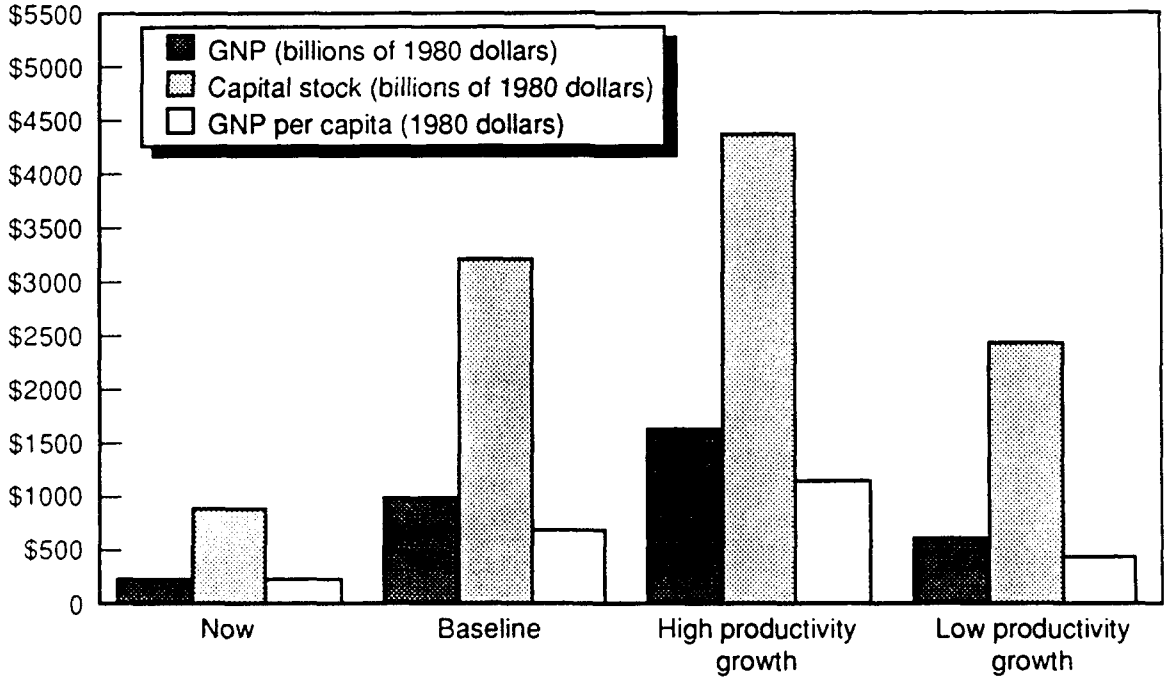


Fig. 5—Effect of productivity growth on economic performance in the year 2010

growth rates may also be skewed toward rural or urban areas through migration. Differences in population distribution lead to differences in labor force distribution. Two alternatives are considered to the baseline case. In both alternatives, the overall labor

force remains the same (projected rates through the year 2003 followed by population growth at the baseline rate of 1.2 percent), but the breakdown between rural and urban growth shifts. In one alternative, .5 percent of the rural labor force migrates from rural to urban areas each year. In the other alternative, .5 percent of the urban labor force migrates to rural areas each year.[6] Higher urban population growth generally improves economic performance because urban laborers are generally more efficient than rural workers. (See Fig. 7.) It is not certain, however, that this higher level of efficiency would persist with substantially higher population growth in the cities. Figure 8 shows the sectoral breakdown for the population growth alternatives. The agricultural share remains roughly constant for all the projections. Population shifts thus change the balance between the rural and urban manufacturing sectors.

Sectoral Productivity Differences

Homogeneous, disembodied technological change constant across sectors is a useful simplifying assumption in economic modeling, but productivity changes in the real world are unlikely to occur so evenly. Three alternatives to the baseline were considered

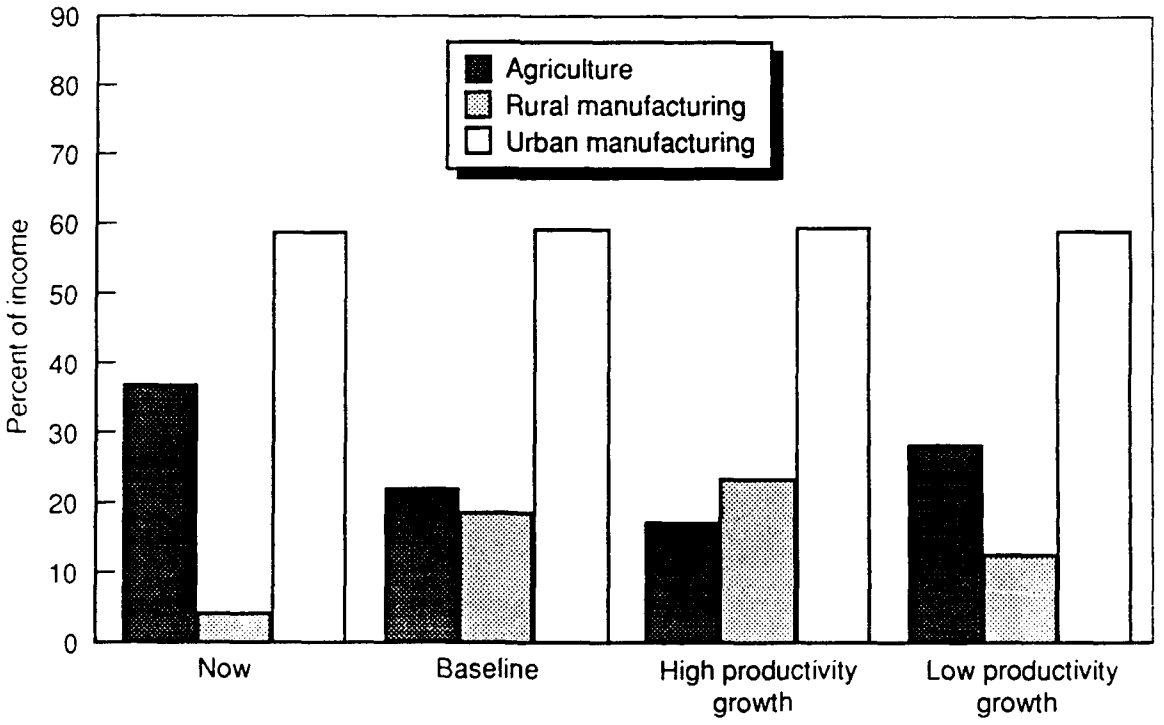


Fig. 6—Effect of productivity on composition of output in the year 2010

[6]Note that the migration flow is smaller in the second alternative because the urban labor force is smaller than the countryside labor force.

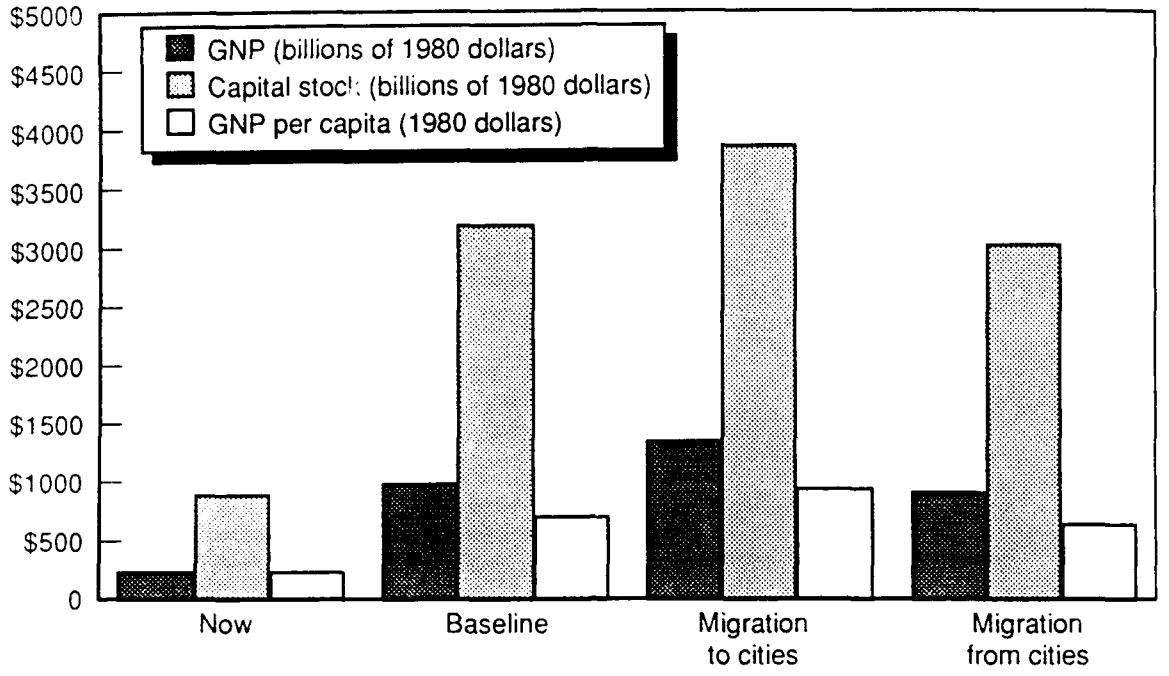


Fig. 7—Effect of skewed population growth on economic performance in the year 2010

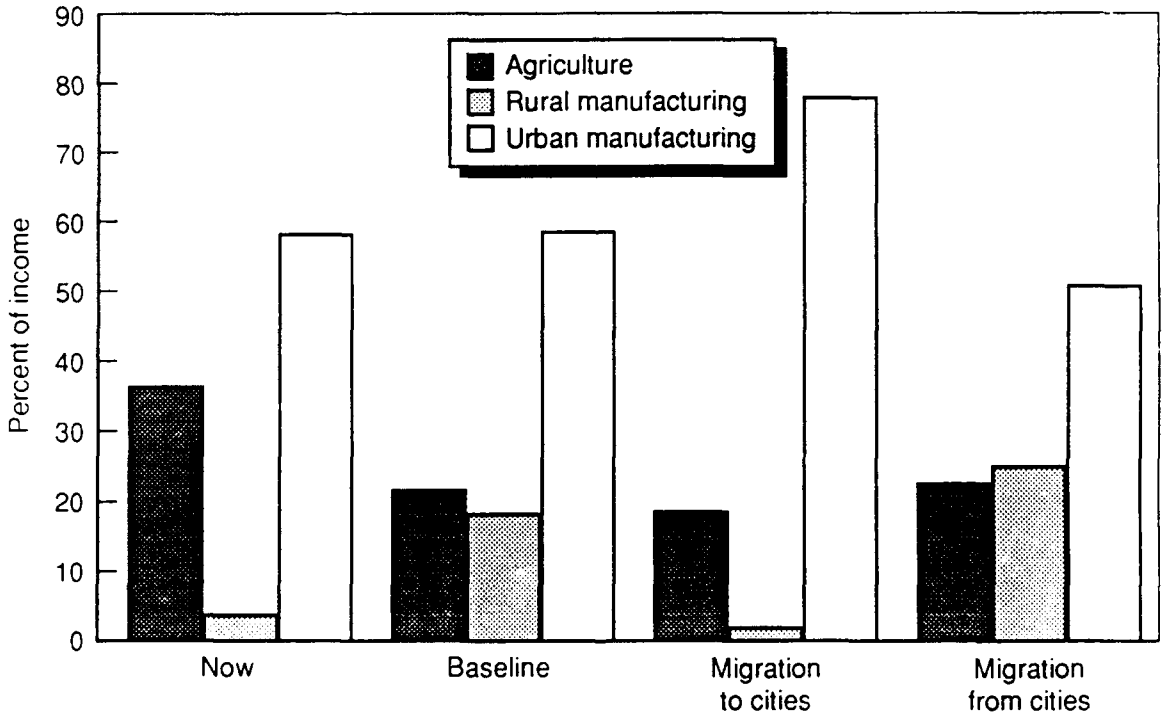


Fig. 8—Effect of skewed population growth on composition of output in the year 2010

that had different productivity growth rates across sectors (see Fig. 9). One alternative exaggerated growth in each of the three sectors, making productivity grow twice as fast in the preferred sector as in the other two sectors. The weighted productivity growth remains the same as the baseline in each of these alternatives.[7] The sectoral structure of production is shown in Fig. 10. The agricultural sector is the key to understanding these alternatives.

If agricultural productivity increases faster than productivity in the other sectors, production of agricultural goods increases very little because the price elasticity of these goods is low. Instead, larger quantities of labor can be released from agriculture. Productivity in the sector that these laborers are released to, rural manufacturing, is low to begin with and growing slowly. GNP thus falls from the baseline level.

A comparatively high growth rate in urban manufacturing, on the other hand, means a lower productivity growth rate in the agricultural sector. Again, agricultural production will remain relatively constant, but with lower productivity, additional labor

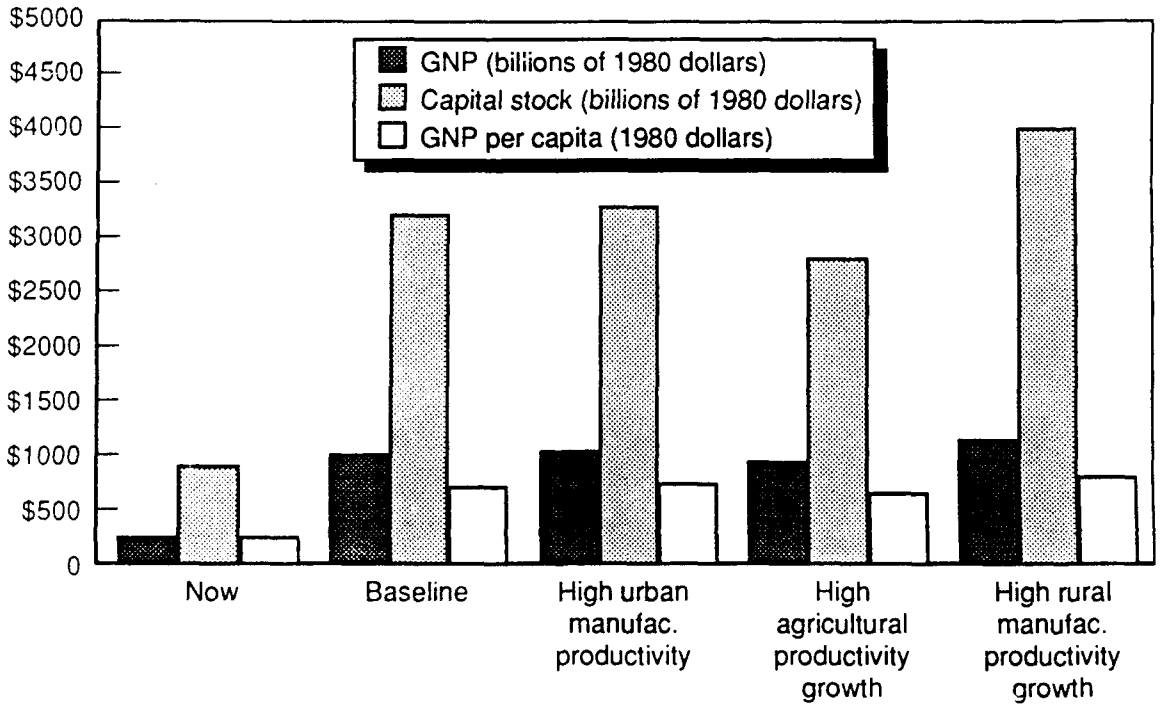


Fig. 9—Effect of skewed productivity growth on economic performance in the year 2010

[7]Productivity growth is weighted by the share of output in the base year, 1980.

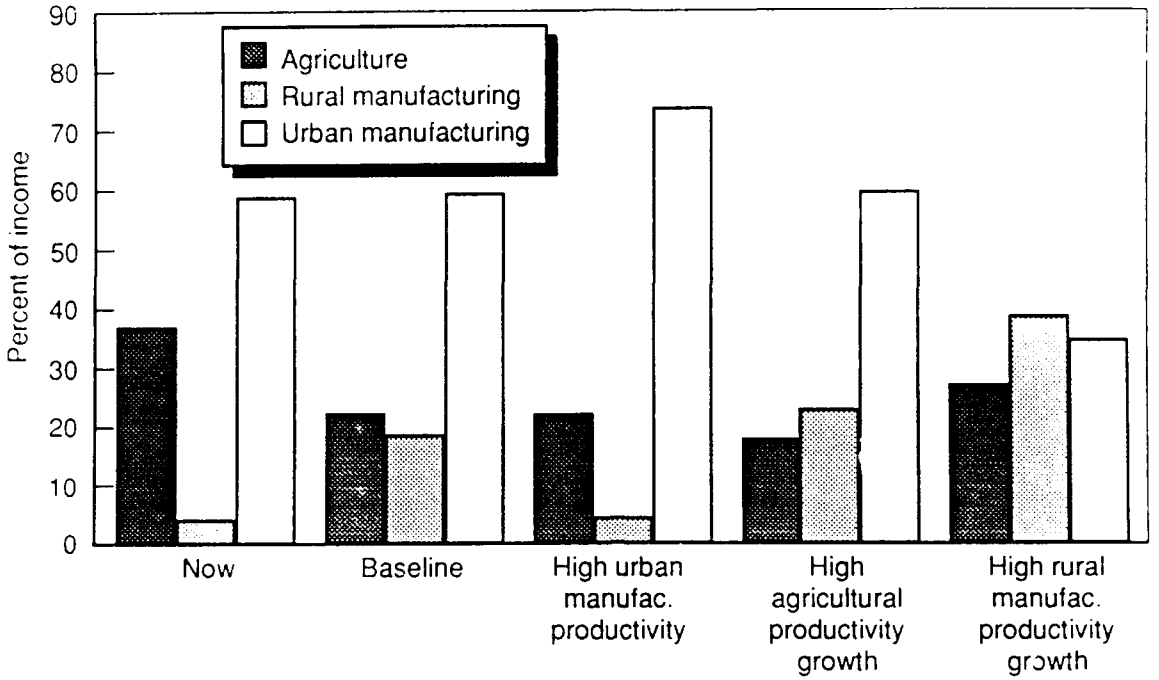


Fig. 10—Effect of skewed productivity growth on composition of output in the year 2010

and capital are drawn into agriculture. The only way to exploit the higher productivity in the urban sector is also to increase the flow of capital to that sector. The rural manufacturing sector is hit hard: production falls to about one quarter of the baseline level. Overall, GNP increases modestly from the baseline case.

A comparatively high productivity growth rate in rural manufacturing leads to the highest level of GNP of these alternatives. Agricultural production increases slightly but agricultural production becomes less labor intensive and much more capital intensive. The rural manufacturing sector drains labor away from agriculture and capital away from the urban manufacturing sector. By 2010, rural manufacturing grows from the smallest sector to the largest sector.

Trade

Foreign trade can significantly improve a nation's welfare. The previously discussed projections showed production and consumption without trade, and the price mechanism equilibrated the supply and demand of agricultural and nonagricultural goods. There are many ways in which trade can improve a nation's well-being,[8] but this model

[8]Trade can provide new technologies to an economy, it can provide a nation with products it cannot produce indigenously, it can help alleviate sectoral bottlenecks, etc.

focuses on production specialization that trade allows. Two alternative projections are constructed. For the first, the relative price of agricultural goods in the world economy is set to 75 percent of the relative price of these goods at autarky. For the second, the relative price of agricultural goods is set to 133 percent of its autarky price. These projections are shown in Figs. 11 and 12 . The projections are purely illustrative, and no attempt is made to scale these projections to the actual gains from trade available to the Chinese economy.[9]

China is assumed to be a price taker in these projections: it adjusts its production to maximize GNP at these prices and adjusts its consumption bundle to maximize consumer well-being. If the quantities of goods produced differ from the quantities of goods demanded (as they will), trade results. Overall, production and consumption, valued at the world prices, must match.

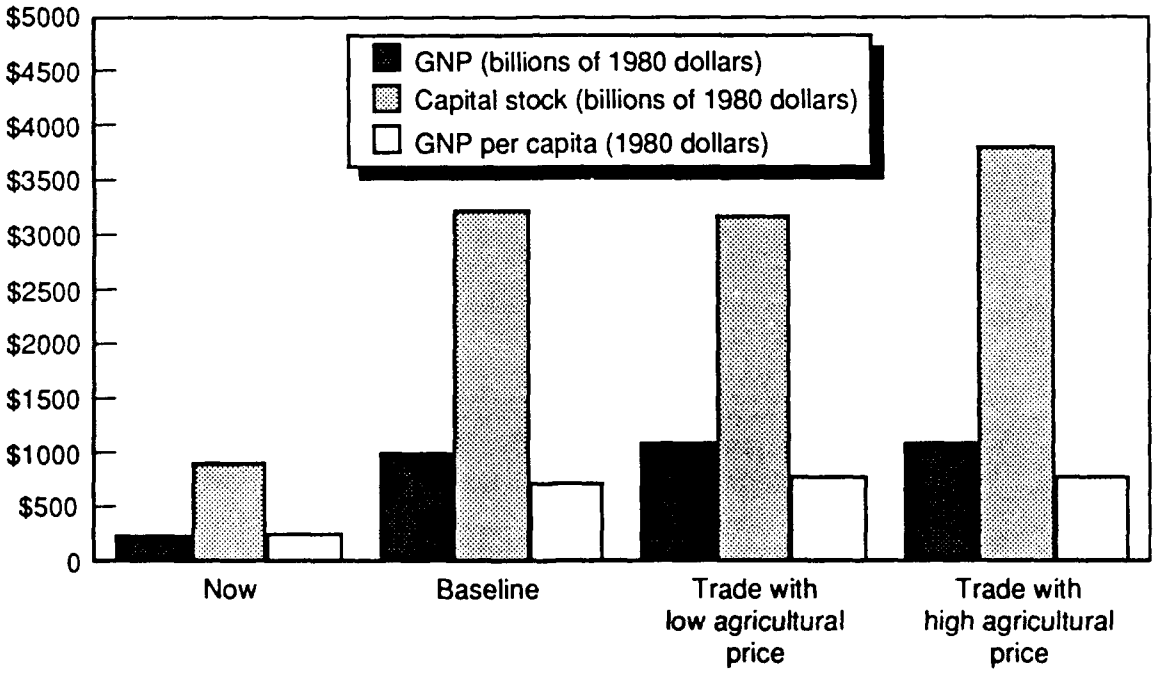


Fig. 11—Effect of trade on economic performance in the year 2010

[9]It is probably impossible to determine whether or not China is currently involved in international trade at any sort of optimal level. China trades less (8.3 percent of GNP) than the world average (13.7 percent) or the average for developing countries (17.9 percent). Compared with other nations large in population and land mass, China trades more: India (6.3 percent), the Soviet Union (4.2 percent), and the United States (7.4 percent). These ratios all are derived from the Arms Control and Disarmament Agency (1986). The ratio is constructed by dividing the sum of exports and imports (Table II) by twice GNP (Table I). All figures are for 1984.

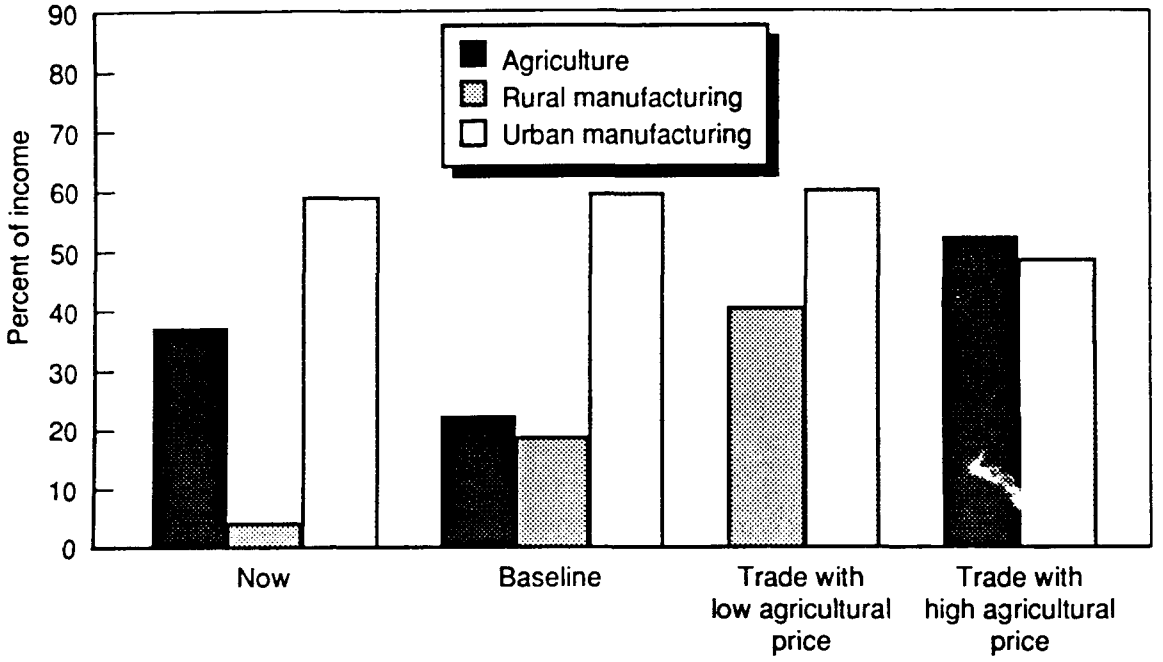


Fig. 12—Effect of trade on composition of output in the year 2010

As shown in Fig. 11, trade will lead to higher levels of GNP whether it occurs at higher or lower relative prices for agricultural goods than are available in a non-trading economy. Figure 12 shows that at a low agricultural price, the economy will specialize in manufactured goods importing food, and that at a higher agricultural price, the economy will specialize more in agricultural goods importing manufactures.

IV. MODEL III: CIVIL-MILITARY INTERACTIONS

The third model of the Chinese economy follows closely, in most respects, SMOKE (A Small Model of the Korean Economy) (Henry, 1986, p. 45). Unlike the other two models, this model explicitly incorporates the military sector of the Chinese economy. Military spending is divided into three categories: military manpower costs (wages), operation and support (O&S) costs, and military investment. The model also allows capital flows into the economy. Several parameters that appear in the first two models appear again here: population growth, productivity growth, and the savings rate.

VARIABLES

Endogenous Variables

P_t	Population
L_t	Total labor force (after the year 2003)
Lc_t	Civilian labor force
Kc_t	Civilian capital stock
Km_t	Military capital stock
Y_t	Domestic production (GDP—gross domestic product)
GNP_t	Gross national product
Yc_t	Civilian output
w_t	Wage rate
Ym_t	Military income
$O\&S_t$	Operation and support costs for military
DEF_t	Military spending
Im_t	Military investment
Ic_t	Civilian investment
CON_t	Civilian consumption
$Debt_t$	Debt owed internationally
R_t	Interest paid on international debt

Exogenous Variables

t	Time
CAP_t	Capital inflows
Lm_t	Military labor force
L_t	Total labor force (until the year 2003)

Parameters

α	Labor share
g	Productivity growth rate
Lt_0	Total labor force in year 0
γ	Labor growth rate
d	Depreciation rate
Kc_0	Civilian capital in year 0
Km_0	Military capital in year 0
s_y	Savings rate out of GNP
s_f	Savings rate out of capital inflows
m	Defense share of GNP
r	International interest rate

EQUATIONS

Population

$$P_t = P_o e^{\gamma t} \tag{1}$$

Population grows exponentially at a rate of γ from a base of P_0.

Labor Force

$$L_t = \begin{cases} \bar{L}_t & t < 23 \\ L_{23}\ e^{\gamma (t-23)} & t \geq 23 \end{cases} \tag{2}$$

The labor force grows exogenously so long as new entrants to the labor force have already been born. Thereafter, it grows exponentially at the same growth rate as population γ from a base of L_{23}.

Civilian Labor Force

$$L_{c_t} = L_t - L_{m_t} \tag{3}$$

Civilian labor is the difference between total labor and military labor.

Civilian Capital Stock

$$K_{c_t} = K_{c_{t-1}} - \delta K_{c_{t-1}} + I_{c_{t-1}} \tag{4}$$

The capital stock is equal to the capital stock in the preceding period, less depreciation and augmented by investment during the preceding period.

Military Capital Stock

$$K_{m_t} = K_{m_{t-1}} - \delta K_{m_{t-1}} + I_{m_{t-1}} \tag{5}$$

The military capital stock is equal to the capital stock in the preceding period, less depreciation and augmented by military investment during the preceding period.

Domestic Production

$$Y_t = Y_{c_t} + Y_{m_t} \tag{6}$$

This equation is an identity: total domestic production is the sum of its components, civilian production, and military wages.

Gross National Product

$$GNP_t = Y_t - R_t \tag{7}$$

Gross national product is gross domestic product less net factor payments made abroad. In this model, interest on internationally owed debt is the only factor payment made abroad.

Civilian Output

$$Y_{c_t} = A_o e^{gt} L_{c_t}^{\alpha} K_{c_t}^{1-\alpha} \tag{8}$$

This Cobb-Douglas production function determines the level of domestic production from labor, capital, and a productivity variable representing disembodied technological change.

Wage Rate

$$w_t = \alpha A_o e^{gt} \frac{K_{c_t}^{1-\alpha}}{L_{c_t}^{1-\alpha}} \tag{9}$$

The wage rate in the economy can be calculated by differentiating civilian production with respect to civilian labor—its marginal product.

Military Income

$$Y_{m_t} = w_t L_{m_t} \tag{10}$$

Military salaries are calculated as the number of people in the military multiplied by the civilian wage rate. This equation explicitly costs military labor at its scarcity value, implicitly assuming that the civilian productivity of those drawn into the military reflects the average productivity of the overall population.

Military Operations and Support

$$O\&S_t = -0.27471 + 0.0985828\, K_{m_t} + .737958\, Y_{m_t}$$
$$(-2.5) \qquad (3.4) \qquad (4.6) \quad R\text{-squared: } .956 \tag{11}$$

Military O&S levels depend upon the military capital stock and military wages. This equation was estimated for South Korea where data were available for a number of years (Henry, 1986, p. 14).

Military Spending

$$DEF_t = \mu\, Y_t \tag{12}$$

Defense spending is a fixed share μ of GNP.

Military Investment

$$I_{m_t} = DEF_t - Y_{m_t} - O\&S_t \tag{13}$$

Military investment is, by identity, the residual of military spending after military wages and O&S costs have been deducted.

Civilian Investment

$$I_{c_t} = s_y GNP_t + s_f CAP_t \tag{14}$$

Civilian investment is equal to the savings rate from GNP times GNP plus the savings rate from capital inflows times the level of capital inflows.

Consumption

$$CON_t = GNP_t + CAP_t - DEF_t - I_{c_t} \tag{15}$$

Civilian consumption is what remains of national product and capital inflows after military spending and civilian investment have been deducted.

Debt Owed Internationally

$$Debt_t = Debt_{t-1} + CAP_{t-1} \tag{16}$$

Capital inflows add to the stock of internationally owed debt.

Interest Paid on International Debt

$$R_t = \rho\ Debt_{t-1} \tag{17}$$

Interest paid on international debt is equal to the interest rate multiplied by the stock of outstanding international debt.

DATA

Much of the data needed for Model III has already been developed for Models I and II: population, GNP, and the civilian capital stock for 1980. The size of the armed forces and the defense share of output come from the Arms Control and Disarmament Agency (1986, Table I, p. 70). The size of the military force was based on the 1980 estimate of 4.7 million people. The defense share of output, however, was based on the 1984 estimate of 7.5 percent rather than on the 1980 figure of 10.5 percent. The former estimate was used because China has steadily reduced its defense share since 1979 and therefore that figure is likely to be more indicative of the future. The level of military capital for 1980 was derived by using the military capital stock estimate of Wolf et al. (1989) and applying their ratio of military capital to GNP for 1980 to the GNP estimate used in the three models here (Wolf et al., 1989). The components of military spending for the base year were all calculated: personnel costs from the force size multiplied by the wage rate, O&S from the relationship in Eq. 10, and military investment from total defense spending less the other two components. Foreign debt is set to zero in the base year. The same production parameters used in Models I and II were used in this model: 55 percent of output to labor, 45 percent to capital. The real international interest rate is set at 5 percent. Baseline productivity growth, population growth, and savings are set to 2 percent, 1.2 percent, and 35 percent, respectively.

RESULTS

Results of a baseline forecast of Model III are shown in Table 7, while other projections are summarized in Table 8. In the baseline projection, GNP quadruples to over $1 trillion by 2010. The stock of military capital more than triples over 1980 levels. Still, per capita GNP falls short; even by 2010 it falls short of the announced goal for the year 2000 of $800 per person.

Population Growth

Changes in the population growth rate can have significant effects on the overall economy. (See Fig. 13.) The high population growth projection assumes a 2.4 percent growth rate in the population compared with the baseline rate of 1.2 percent. The low population growth projection actually has no change in population from 1980 levels. The higher population growth rate leads to a 5 percent higher GNP than the baseline case, while the lower growth rate leads to a 5 percent reduction. Similar changes appear in defense spending and in the level of military capital (not shown in figure). While higher population growth leads to a larger economy and a better defended nation, per capita

Table 7

BASELINE MODEL III

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,136.5	1,454.3	1,872.2	2,403.1	3,073.3	3,925.5
Capital stock, military	65.7	100.7	140.1	186.6	242.3	310.8	397.9
Gross national product	246.8	321.9	423.2	542.8	690.9	880.2	1,122.3
Real gross national product	246.8	321.7	422.8	542.2	689.9	878.8	1,120.3
Civilian output	245.7	320.6	421.8	541.1	688.8	877.7	1,119.3
Defense spending	18.5	24.1	31.7	40.7	51.8	66.0	84.2
Military income (wages)	1.0	1.2	1.4	1.7	2.1	2.5	3.0
Operations and support	7.0	10.6	14.6	19.4	25.1	32.2	41.2
Investment, military	10.5	12.4	15.7	19.6	24.6	31.3	40.0
Investment, civilian	86.4	112.6	148.1	190.0	241.8	308.1	392.8
Consumption, civilian	141.9	185.1	243.3	312.1	397.3	506.1	645.3
			1980 Dollars				
Wage rate	225.4	261.8	307.0	369.2	445.8	536.3	644.1
Real GDP per capita	250.0	306.5	379.5	458.4	549.5	659.5	792.1
			Growth Rates in Percent				
GNP	—	6.1	4.8	4.5	4.4	4.5	4.6
GNP per capita	—	4.8	3.6	3.2	3.2	3.3	3.4

GNP is lower as capital formation lags behind population growth. Per capita GNP in 2010 falls about 23 percent below the baseline level in the high population growth case and rises about 31 percent above baseline in the low population growth case.

Productivity Growth

The growth rate of productivity has an even more pronounced effect on performance, as shown in Fig. 14. The high productivity projection assumes a 3.2 percent growth rate in productivity compared with the 2 percent baseline growth rate. The low productivity growth projection uses a 0.8 percent productivity growth rate. The changes in these parameters were scaled to match the range of the population growth changes. The higher productivity growth rate leads to a 70 percent increase in GNP by

Table 8

SUMMARY OF MODEL III PROJECTIONS FOR THE YEAR 2010

Category	GNP (In billions 1980 $)	Consumption (In billions 1980 $)	Defense Spending (In billions 1980 $)	Civilian Capital (In billions 1980 $)	Military Capital (In billions 1980 $)	GNP per Capita (In 1980 $)
Baseline	1,120.3	645.3	84.2	3,925.5	397.9	792.1
High population growth	1,178.9	678.9	88.6	3,973.1	407.1	606.3
Low population growth	1,064.1	613.1	80.0	3,879.0	388.9	1,038.2
High productivity growth	1,866.4	1,075.5	140.3	5,488.0	600.1	1,319.6
Low productivity growth	680.7	391.9	51.1	2,883.4	268.3	481.3
High savings	1,325.7	630.9	99.6	5,708.2	463.9	937.3
Low savings	905.6	612.2	68.0	2,445.1	329.2	640.2
Capital inflows	1,211.2	667.0	92.1	4,798.6	435.0	856.3
Capital inflows with payback	1,138.4	655.7	85.5	4,067.5	411.7	804.8
More defense, constant manpower	1,100.5	616.7	110.2	3,772.3	530.5	778.0
Less defense, constant manpower	1,140.1	674.5	57.1	4,081.4	260.9	806.1
More defense, more manpower	1,099.8	616.7	110.2	3,772.4	521.3	777.6
Less defense, less manpower	1,140.6	674.5	57.1	4,081.4	267.9	806.4
High productivity, high savings	2,222.2	1,057.9	167.0	8,088.5	704.8	1,571.1
High productivity, low population	1,771.4	1,020.9	133.2	5,413.3	585.6	1,728.2
High savings, low productivity	1,258.9	599.2	94.6	5,637.6	453.3	1,228.3
High productivity and savings, low population	2,108.5	1,004.0	158.5	7,974.5	687.6	2,057.2

2010 compared with the baseline, while the low productivity projection shows a 40 percent decline. Changes in military capital (not shown in figure) are somewhat smaller: a 50 percent rise in the high productivity projection and a 33 percent decline in the low productivity projection. Unlike increases in population growth, increases in productivity growth can raise both total GNP and per capita GNP. In the high productivity growth

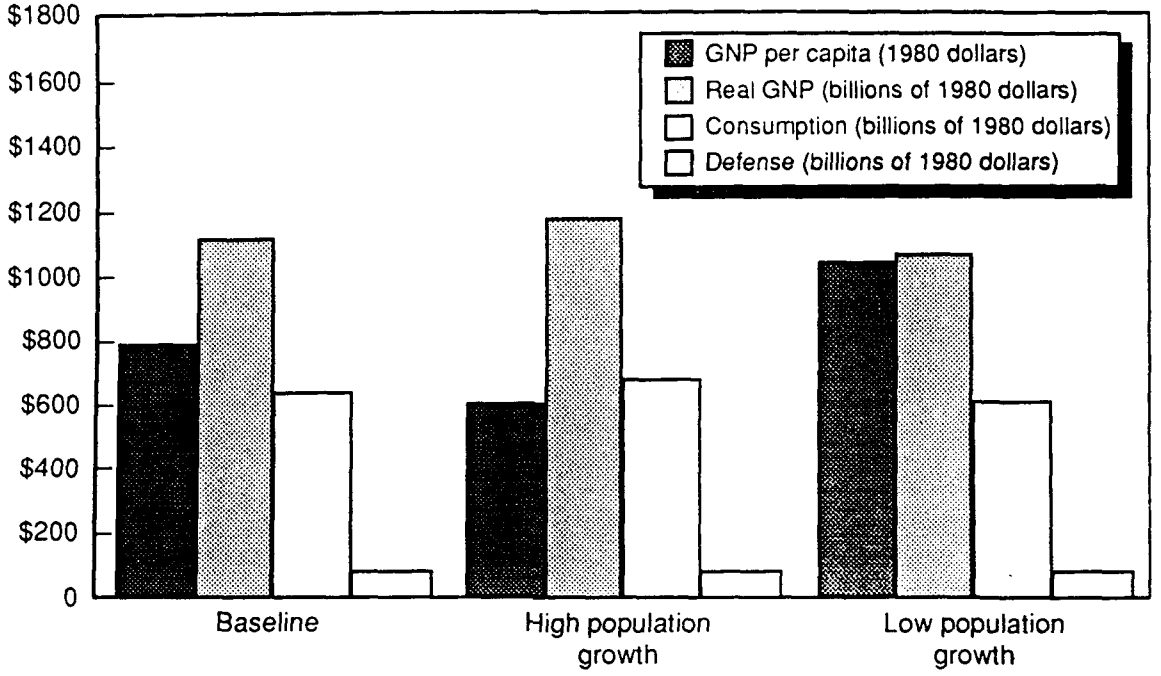


Fig. 13—Effect of population growth on economic performance in the year 2010

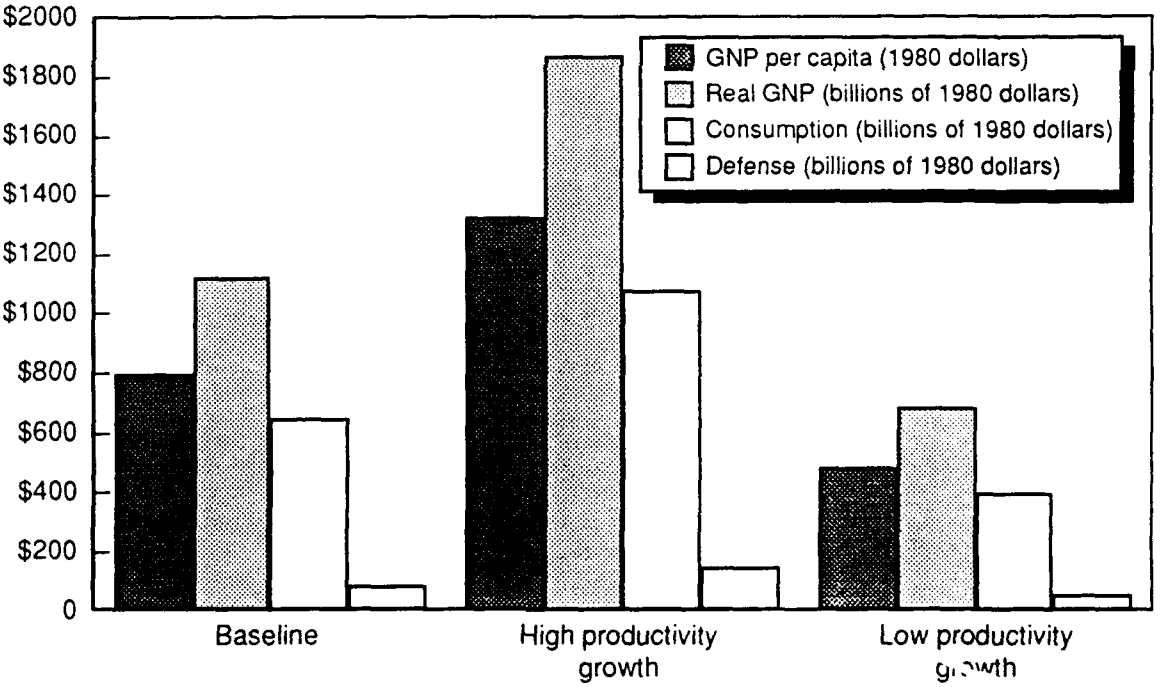


Fig. 14—Effect of productivity on economic performance in the year 2010

projection, per capita GNP is 70 percent higher than in the baseline by 2010, and the goal of $800 per person by 2000 is met in 2001, only one year late.

Savings and Capital Inflows

The savings rate and capital inflows can influence the rate of capital formation and thereby influence overall economic performance. Figure 15 shows the impact of a 10 percent increase or decrease in the savings rate from the baseline rate of 35 percent. These projections show approximately 18 percent increases or decreases from the baseline for GNP, defense spending, military capital (not shown in figure), and per capita GNP. Consumption is lower than the base case with either the lower or higher savings rate. With the low savings rate, GNP does not grow enough to support a high level of consumption, while with the high savings rate, GNP grows splendidly but so much is devoted to investment that consumption again falls below the baseline level. Capital inflows are another way of increasing capital formation. Unlike an increase in the savings rate, capital inflows need not reduce consumption in the short run. In the longer run, international debt (or other international liabilities) will accumulate. The need to service debt (or provide a return on other liabilities) will eventually have an impact on consumption. Figure 16 shows two capital inflow scenarios. In the first, capital inflows

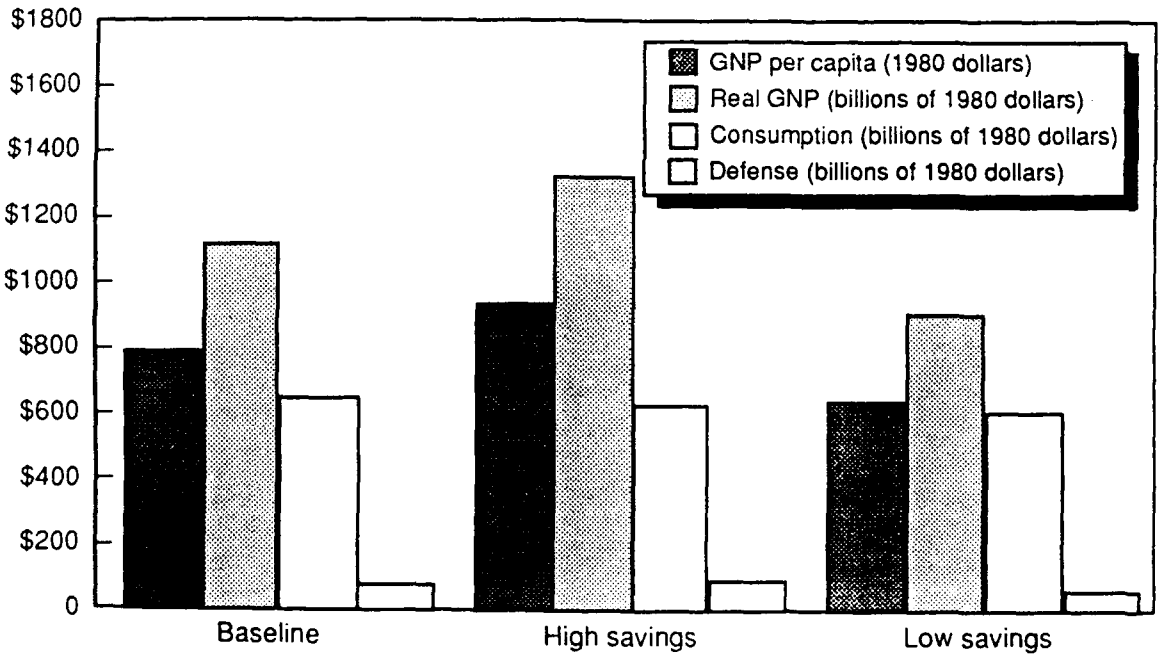


Fig. 15—Effect of savings on economic performance in the year 2010

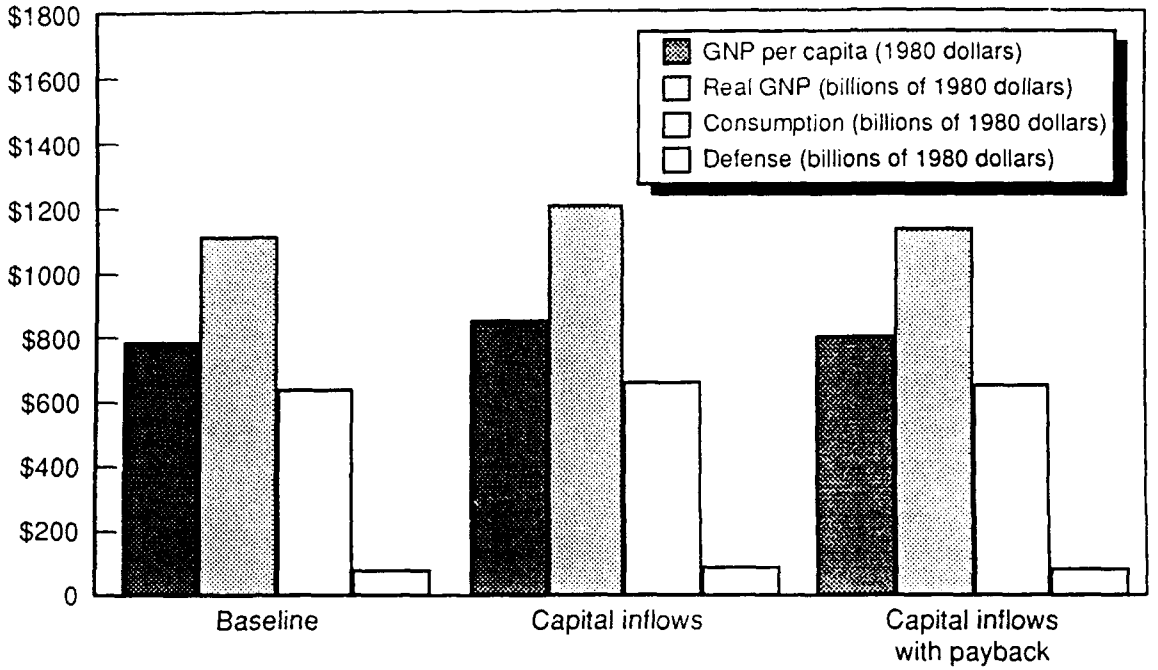


Fig. 16—Effect of capital flows on economic performance in the year 2010

to the economy are $10 billion per year. Accumulated debt is serviced at a 5 percent real interest rate. By the year 2010, China owes $300 billion internationally, just under 25 percent of GNP. This is not a particularly high burden compared with other developing countries today. An alternative strategy is to allow capital inflows for a while and then repay what is owed to international creditors. In the repayment projection, inflows proceed at the pace of $10 billion per year for the first 15 years, and then the process is reversed with all debt repaid by 2010. Outstanding balances are again serviced at a real 5 percent interest rate. The capital inflow projection raises GNP and related flows by 8 percent over baseline by the year 2010, while the inflow with payback increases GNP by 1.6 percent. In the capital inflow projection, interest flows reduce GNP below the level of GDP (not shown in figure). GDP is 9.5 percent higher than baseline levels in this projection. Consumption patterns also differ from the baseline levels. Consumption levels were an average of 2.2 percent higher in the capital inflow projection and 1.7 percent higher in the inflow with repayment projection than in the baseline over the entire projection period. While the effects of capital inflows may not be especially large compared with other variables, inflows do allow a higher level of GDP, GNP, and consumption—even if the inflows are repaid.

Both increased savings and capital inflows allow more rapid capital formation. How do they compare in effectiveness? Figure 17 shows the trade-offs between savings and capital inflows. Figure 17a shows the level of capital inflows that are necessary to match the economic performance provided by increased savings. Since the criterion of matched performance is ambiguous, this figure shows the necessary inflows to match the levels of GNP, GDP, and consumption in the year 2010. Matching consumption requires the lowest level of inflows because savings rate increases are comparatively detrimental to consumption. Matching GNP requires the highest level of inflows because production must rise to meet the change in production from savings and rise further to cover the interest payments on accumulating debt. Figure 17b shows the level of debt that results from each level of capital inflows when the inflows are continued until the year 2010. Figure 17c shows the level of GNP achieved at each level of savings. These three figures can be used together. For example, a 38.5 percent savings rate will result in the same level of GNP as will annual inflows of $8 billion. By 2010, GNP would be $1,200 billion, while accumulated debt would reach $240 billion—almost 20 percent of GNP.

Force Structure

The military force structure that the Chinese procure will have some effect on their economy. Increased spending on defense will reduce resources available for both civilian consumption and civilian investment. The effect of four alternative force structures is shown in Fig. 18. In the first two alternatives, defense spending rises to 10 percent of GNP or falls to 5 percent of GNP without changing the level of military personnel. These projections raise and lower GNP by about 2 percent compared with the baseline.

Consumption is affected somewhat more by both the change in the size of the economy and the share available for consumption. The change in military capital (not shown in figure) accumulated by the end of the projection period is larger still: an increase of 33 percent or a decline of 34 percent. These changes, while large, are smaller than the effect of a change in productivity growth rate of 1.2 percent (see above). Also shown in Fig. 18 are two projections that change both the defense share and the military personnel level. In the increased defense projection, the force level rises to 6.2 million men, while in the decreased defense projection, it falls to 3.5 million. The effects on the overall economy are similar to the constant manpower projections that raise or lower defense spending.

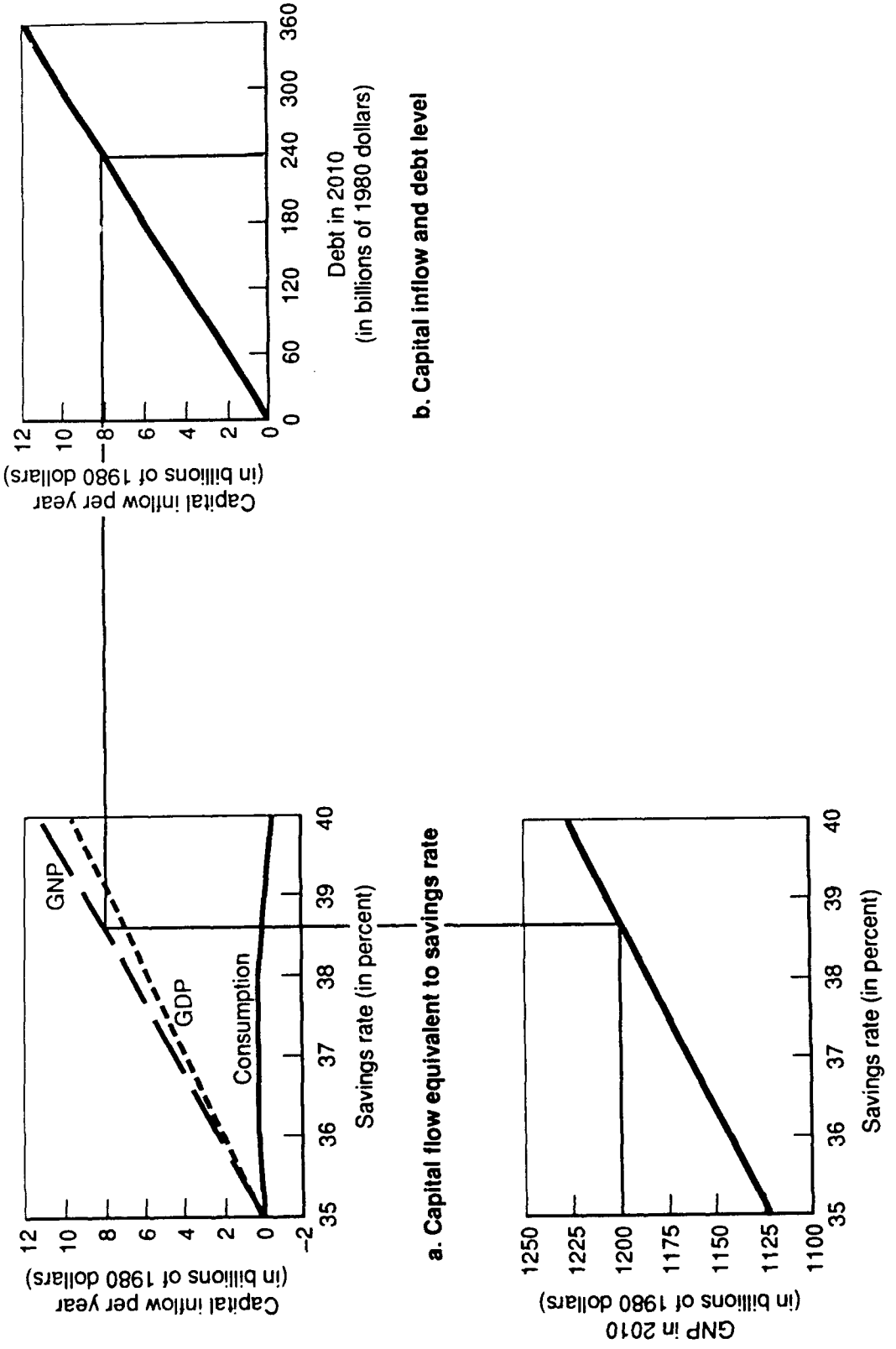


Fig. 17—Growth through savings and borrowing from 1980 to 2010

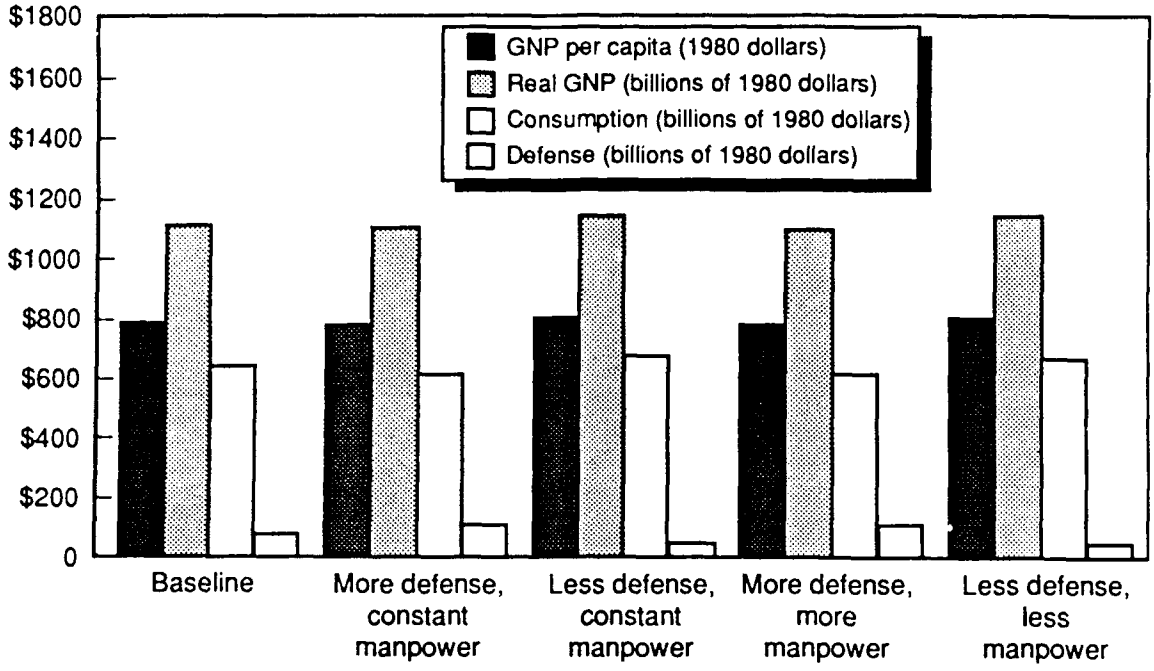


Fig. 18—Effect of military establishment on economic performance in the year 2010

Defense capital changes from the baseline are somewhat smaller when increased resources are devoted partly to paying for additional manpower. (On the other hand, in the reduced defense projection, the declines in capital are offset somewhat because lower levels of resources are needed for the lower levels of manpower.) The trade-off between force levels and military capital is extremely lopsided in the Chinese economy. In the increased defense projection, the level of manpower can be increased by 30 percent in return for a reduction of military capital of about 1.7 percent. This trade-off is stark because the wage rate is low for military forces in China.

Composite Projections

The projections discussed above for Model III consider a single change in the factors affecting the economy. Such changes are unlikely to occur in isolation, and Fig. 19 shows various combinations of changes. The combinations shown combine factors favorable to increases in per capita GNP to emphasize the possibilities rather than merely the results. In the first alternative projection, savings rates rise to 30 percent and productivity grows at 3.2 percent per year. Per capita GNP reaches $1,570 by 2010, almost twice the baseline level. It punches through the $800 per capita level by 1999. In the second alternative projection, high productivity growth is matched with low population growth. Per capita GNP is $1,730 by 2010, and the goal of $800 per capita is

reached in the year 1998. In the third alternative, high savings are combined with low productivity. Per capita GNP is only $1,228 in 2010, still 10 percent higher than the baseline. The $800 per capita level is not reached until 2001. Finally, high productivity growth is combined with high savings and no population growth. Per capita GNP reaches $2,060 by 2010, over twice the baseline level. In this projection, the $800 per capita level is reached in 1996.

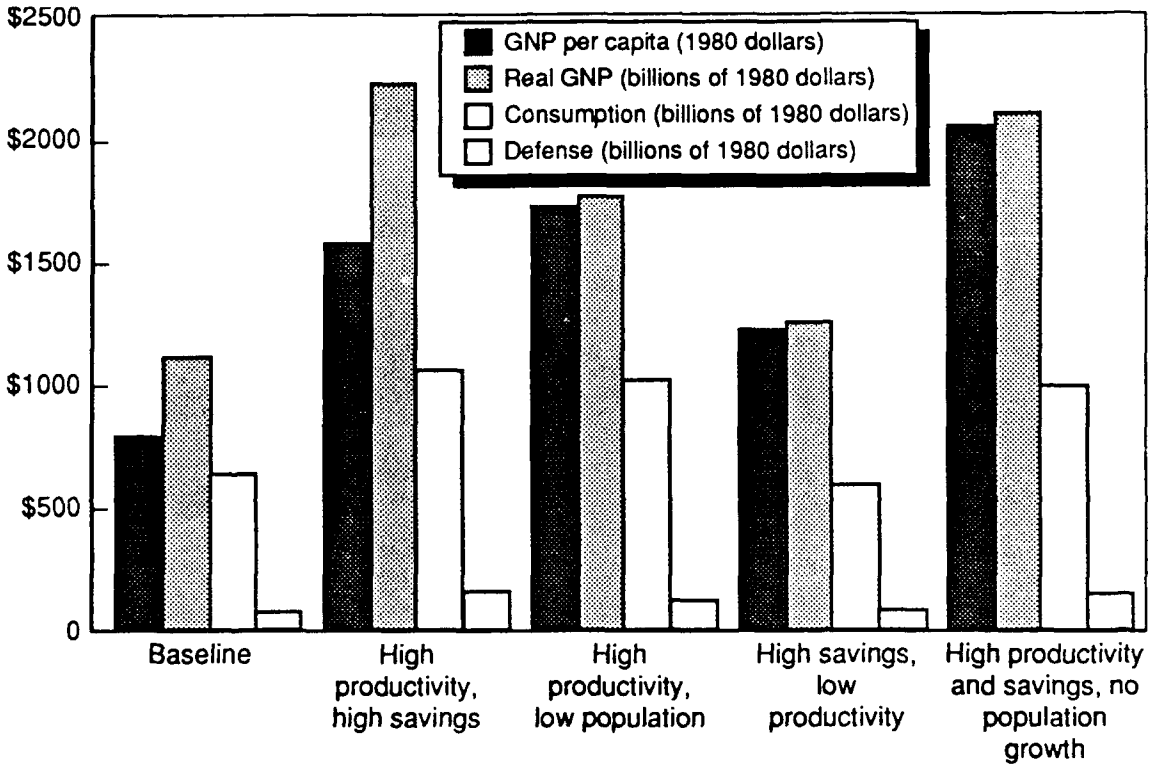


Fig. 19—Composite projections and economic consequences in the year 2010

V. THE PROGNOSIS

Chinese economic prospects may be excellent indeed. The simulations presented in this Note are probably on the optimistic side: the Chinese economy depicted here does not fall victim to the sorts of disruption common in the past. Yet recent political and economic changes in China make continued economic liberalization far from certain. However, even rates of growth below those predicted here would be considered successes by most nations in the world and most probably by the vast majority of the Chinese. Nevertheless, there is a substantial gap between the announced goals of the Chinese leadership and even the most wildly optimistic projections that can be supported by these models.

A major determinant of economic growth in the simulations developed in this Note is improvements in total factor productivity. Improving productivity in many ways is "free growth." Unlike savings and investment, productivity growth does not require sacrifices out of current production for the sake of future production. By other standards, improving productivity may be the most difficult growth factor for governments to deal with. Only a few policy measures have a certain, significant, and short-term positive effect on productivity. Various forms of economic liberalization meet these criteria, but these policies are largely the reversal of previously unsuccessful policies. Nations have only a limited supply of obvious policy mistakes to correct, although China may be particularly well endowed in this respect. In the longer run, productivity growth cannot be imposed but must instead be nurtured (1) through economic regulation that does not burden productive enterprises, (2) through a legal system that resolves economic disputes (even with the government) in a way widely perceived as fair, and (3) through investment in "soft" infrastructure such as education, research, and development.

Even flawlessly constructed economic policies for China are unlikely to bring about the rates of growth that the Chinese leadership has been confidently predicting. Bad policies might lead to stagnation or even economic contraction.

If the economic projections derived from the three models in this Note accurately portray plausible limits on Chinese economic growth, then a substantial Chinese military modernization effort would have to either precede economic modernization or be postponed for quite some time. In fact, the declared policy that economic modernization will precede military modernization is implausible. Military modernization is likely to be an ongoing process driven, at least in part, by economic modernization. Even if the

Chinese economy experienced a sharp acceleration of its growth rate, and even if that growth rate were reflected in military spending, military modernization requires upgrading and replacing existing weapons systems as well as acquiring new ones. This cannot happen overnight. Given the more conservative estimates of growth produced by the models, any sharp increase in the size or quality of Chinese military forces is unlikely to be driven or supported by a sudden surge in economic activity. The impact of Chinese economics on the superpower balance is thus likely to be small in the near term but potentially large over time.

Appendix A
MODEL II PROJECTIONS

Table A-1

HIGH POPULATION GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,074.7	1,210.0	1,362.4	1,533.9	1,727.0	1,944.5
Labor force, total	604.3	678.3	760.3	810.8	854.4	926.3	1,043.0
Labor force, urban	117.2	131.6	147.5	157.3	165.8	179.7	202.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	746.6	840.6
Labor force, agricultural	435.2	440.4	466.4	474.0	476.5	488.2	512.4
Labor force, rural manufacturing	51.8	106.3	146.4	179.5	212.2	258.4	328.2
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,222.4	1,445.0	1,744.7	2,128.6	2,617.0	3,273.2
Capital stock, urban	542.8	732.5	865.9	1,045.4	1,275.5	1,568.1	1,961.4
Capital stock, agricultural	324.4	394.7	440.8	507.2	590.3	685.9	799.7
Capital stock, rural manufacturing	38.6	95.3	138.4	192.1	262.9	363.0	512.2
Gross national product	246.8	331.6	420.0	522.5	648.9	821.3	1,069.5
Real gross national product	246.8	331.1	418.6	520.1	645.1	815.2	1,059.6
Real production, urban	145.1	195.4	247.7	308.4	383.2	485.5	632.7
Real production, agricultural	91.3	110.3	131.6	155.5	183.7	219.1	264.9
Real production, rural manufacturing	10.3	25.4	39.6	56.7	79.0	112.4	165.2
Investment	112.8	99.5	126.0	156.8	194.7	246.4	320.8
			1980 Dollars				
Real per capita GNP	250.0	308.0	345.9	381.8	420.5	472.0	544.9
Real per capita manufactures	157.5	205.5	237.4	267.9	301.3	346.2	410.4
Real per capital agricultural goods	92.5	102.6	108.7	114.2	119.8	126.9	136.2
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.005	1.009	1.012	1.016	1.020	1.025
			Growth Rates in Percent				
GNP	—	6.1	4.8	4.5	4.4	4.8	5.4
GNP per capita	—	4.3	2.3	2.0	2.0	2.3	2.9
Urban output	—	105.1	103.9	103.5	103.4	103.8	104.4
Agricultural output	—	102.9	102.6	102.4	102.4	102.6	102.9
Rural manufacturing	—	118.7	108.3	106.4	105.9	106.3	107.0
			Percentage of Total Output				
Urban share	58.8	58.9	509.0	59.0	59.1	59.1	59.2
Agricultural share	37.0	33.4	31.6	30.1	28.8	27.2	25.4
Rural manufacturing share	4.2	7.7	9.4	10.8	12.2	13.7	15.4

Table A-2

LOW POPULATION GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0
Labor force, total	604.3	678.3	760.3	810.8	854.4	883.4	883.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	171.4	171.4
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	712.0	712.0
Labor force, agricultural	435.2	429.6	427.6	408.6	386.2	359.4	326.7
Labor force, rural manufacturing	51.8	117.1	185.1	244.9	302.5	352.6	385.3
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,222.4	1,444.6	1,743.1	2,125.2	2,607.6	3,189.9
Capital stock, urban	542.8	732.5	865.6	1,044.5	1,273.4	1,562.5	1,911.4
Capital stock, agricultural	324.4	385.0	404.0	436.8	477.6	527.6	586.6
Capital stock, rural manufacturing	38.6	104.9	174.9	261.8	374.1	517.5	691.9
Gross national product, total	246.8	331.5	419.4	521.2	646.7	796.4	961.9
Real gross national product	246.8	331.1	418.7	520.2	645.4	794.7	959.9
Real production, urban	145.1	195.4	247.6	308.2	383.0	472.2	570.8
Real production, agricultural	91.3	107.7	121.1	135.0	150.4	166.9	183.4
Real production, rural manufacturing	10.3	28.0	50.0	77.3	112.5	156.4	206.6
Investment	112.8	99.5	125.8	156.4	194.0	238.9	288.6
			1980 Dollars				
Real per capita GNP	250.0	323.0	408.5	507.6	629.7	775.4	936.5
Real per capita manufactures	157.5	218.0	290.4	376.1	483.4	613.3	758.5
Real per capita agricultural goods	92.5	105.1	118.2	131.7	146.7	162.8	178.9
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.004	1.004	1.005	1.005	1.006	1.005
			Growth Rates in Percent				
GNP	—	6.1	4.8	4.4	4.4	4.3	3.8
GNP per capita	—	5.3	4.8	4.4	4.4	4.3	3.8
Urban output	—	6.1	4.9	4.5	4.4	4.3	3.9
Agricultural output	—	3.4	2.4	2.2	2.2	2.1	1.9
Rural manufacturing	—	22.1	12.3	9.1	7.8	6.8	5.7
			Percentage of Total Output				
Urban share	58.8	58.9	59.1	59.1	59.2	59.3	59.3
Agricultural share	37.0	32.6	29.0	26.0	23.4	21.1	19.2
Rural manufacturing share	4.2	8.4	11.9	14.8	17.4	19.6	21.5

Table A-3

HIGH PRODUCTIVITY GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	421.5	417.0	394.4	367.8	342.9	319.2
Labor force, rural manufacturing	51.8	125.2	195.7	259.0	320.8	386.3	454.8
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,226.9	1,495.6	1,896.4	2,465.2	3,263.6	4,389.5
Capital stock, urban	542.8	735.2	896.2	1,136.3	1,477.2	1,955.6	2,630.2
Capital stock, agricultural	324.4	379.2	408.0	458.8	527.8	615.1	725.5
Capital stock, rural manufacturing	38.6	112.6	191.5	301.3	460.3	692.9	1,033.8
Gross national product, total	246.8	352.0	478.6	644.9	873.0	1,195.0	1,649.7
Real gross national product	246.8	351.6	477.9	643.7	871.0	1,191.5	1,643.8
Real production, urban	145.1	207.5	282.8	381.6	517.3	709.0	980.0
Real production, agricultural	91.3	112.4	134.9	161.3	193.3	232.9	281.8
Real production, rural manufacturing	10.3	31.8	60.4	101.2	161.2	251.2	385.2
Investment	112.8	105.6	143.6	193.5	261.9	358.5	494.9
			1980 Dollars				
Real per capita GNP	250.0	335.0	429.0	544.2	693.8	894.2	1,162.2
Real per capita manufactures	157.5	228.0	308.0	408.2	540.5	720.6	965.2
Real per capita agricultural goods	92.5	107.0	121.1	136.4	154.0	174.8	199.3
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.003	1.004	1.005	1.006	1.008	1.010
			Growth Rates in Percent				
GNP	—	7.4	6.3	6.1	6.2	6.5	6.7
GNP per capita	—	6.0	5.1	4.9	5.0	5.2	5.4
Urban output	—	7.4	6.4	6.2	6.3	6.5	6.7
Agricultural output	—	4.2	3.7	3.6	3.7	3.8	3.9
Rural manufacturing	—	25.2	13.7	10.9	9.8	9.3	8.9
			Percentage of Total Output				
Urban share	58.8	59.0	59.1	59.2	59.3	59.3	59.4
Agricultural share	37.0	32.0	28.3	25.1	22.3	19.6	17.2
Rural manufacturing share	4.2	9.0	12.6	15.7	18.5	21.0	23.3

Table A-4

LOW PRODUCTIVITY GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	449.0	478.6	491.4	500.4	511.8	524.5
Labor force, rural manufacturing	51.8	97.7	134.2	162.1	188.2	217.4	249.6
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,218.1	1,398.1	1,612.0	1,854.2	2,126.2	2,435.1
Capital stock, urban	542.8	729.9	837.8	965.9	1,111.0	1,274.0	1,459.1
Capital stock, agricultural	324.4	401.0	437.7	485.8	540.0	598.1	661.3
Capital stock, rural manufacturing	38.6	87.2	122.7	160.2	203.1	254.1	314.7
Gross national product, total	246.8	312.2	367.8	422.5	481.6	549.8	628.2
Real gross national product	246.8	311.5	366.5	420.5	478.9	546.1	623.2
Real production, urban	145.1	183.9	216.8	249.2	284.2	324.7	371.1
Real production, agricultural	91.3	105.7	118.1	130.3	143.2	157.5	173.3
Real production, rural manufacturing	10.3	22.0	31.7	41.3	52.0	64.8	80.0
Investment	112.8	93.7	110.3	126.7	144.5	165.0	188.5
			1980 Dollars				
Real per capita GNP	250.0	296.8	328.9	355.6	381.5	409.8	440.6
Real per capita manufactures	157.5	196.1	223.1	245.6	267.8	292.2	319.0
Real per capita agricultural goods	92.5	100.7	106.0	110.2	114.1	118.2	122.5
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.006	1.009	1.013	1.015	1.018	1.021
			Growth Rates in Percent				
GNP	—	4.8	3.3	2.8	2.7	2.7	2.7
GNP per capita	—	3.5	2.1	1.6	1.4	1.4	1.5
Urban output	—	4.8	3.3	2.8	2.7	2.7	2.7
Agricultural output	—	3.0	2.2	2.0	1.9	1.9	1.9
Rural manufacturing	—	16.3	7.6	5.4	4.7	4.5	4.3
			Percentage of Total Output				
Urban share	58.8	58.9	58.9	59.0	59.0	59.0	59.1
Agricultural share	37.0	34.1	32.4	31.2	30.2	29.2	28.2
Rural manufacturing share	4.2	7.0	8.6	9.8	10.8	11.8	12.7

Table A-5

LABOR MIGRATION TO CITIES

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	142.1	188.1	230.2	272.2	318.1	367.9
Labor force, countryside	487.0	536.1	572.1	580.6	582.2	586.6	592.5
Labor force, agricultural	435.2	447.7	489.4	507.9	516.5	522.8	526.3
Labor force, rural manufacturing	51.8	88.4	82.7	72.8	65.6	63.8	66.2
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,223.5	1,469.5	1,831.4	2,331.1	3,006.8	3,918.1
Capital stock, urban	542.8	761.2	986.5	1,302.5	1,734.1	2,318.5	3,111.3
Capital stock, agricultural	324.4	386.0	413.2	462.7	529.7	613.4	716.7
Capital stock, rural manufacturing	38.6	76.3	69.8	66.3	67.3	74.9	90.1
Gross national product, total	246.8	338.9	453.9	598.0	786.4		1,375.5
Real gross national product	246.8	338.4	452.4	595.3	781.8	1,031.3	1,363.7
Real production, urban	145.1	207.4	300.3	419.7	578.1	792.5	1,081.8
Real production, agricultural	91.3	110.2	131.2	155.0	183.0	216.5	256.3
Real production, rural manufacturing	10.3	20.8	21.2	21.4	22.4	25.6	31.3
Investment	112.8	101.7	136.2	179.4	235.9	311.6	412.6
			1980 Dollars				
Real per capita GNP	250.0	322.3	406.1	503.4	622.8	774.0	964.1
Real per capita manufactures	157.5	217.4	288.6	372.9	478.4	613.9	787.0
Real per capita agricultural goods	92.5	105.0	117.8	131.1	145.8	162.4	181.2
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.005	1.009	1.012	1.016	1.020	1.023
			Growth Rates in Percent				
GNP	—	6.6	6.0	5.7	5.6	5.7	5.8
GNP per capita	—	5.2	4.7	4.4	4.3	4.4	4.5
Urban output	—	7.4	7.7	6.9	6.6	6.5	6.4
Agricultural output	—	3.8	3.6	3.4	3.4	3.4	3.4
Rural manufacturing	—	15.0	0.4	0.1	1.0	2.7	4.1
			Percentage of Total Output				
Urban share	58.8	61.2	66.2	70.2	73.5	76.3	78.7
Agricultural share	37.0	32.7	29.2	26.2	23.6	21.2	19.1
Rural manufacturing share	4.2	6.1	4.7	3.6	2.9	2.5	2.3

Table A-6

LABOR MIGRATION FROM CITIES

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	129.0	137.7	139.7	140.1	141.2	142.6
Labor force, countryside	487.0	549.2	622.6	671.0	714.3	763.6	817.7
Labor force, agricultural	435.2	431.9	436.1	423.2	406.6	391.9	378.1
Labor force, rural manufacturing	51.8	117.3	186.4	247.8	307.7	371.7	439.6
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,222.2	1,438.8	1,722.2	2,075.9	2,513.6	3,059.1
Capital stock, urban	542.8	725.2	832.7	971.3	1,140.2	1,343.7	1,590.7
Capital stock, agricultural	324.4	390.8	424.6	473.5	532.7	600.4	679.0
Capital stock, rural manufacturing	38.6	106.2	181.5	277.3	403.0	569.4	789.4
Gross national product, total	246.8	329.8	411.2	502.8	613.0	751.2	924.2
Real gross national product	246.8	329.3	410.3	501.4	610.9	748.2	919.8
Real production, urban	145.1	192.5	234.3	279.6	332.2	396.6	475.0
Real production, agricultural	91.3	108.7	125.0	142.3	161.9	184.5	210.7
Real production, rural manufacturing	10.3	28.2	51.1	79.8	117.4	168.1	235.7
Investment	112.8	98.9	123.4	150.8	183.9	225.4	277.3
			1980 Dollars				
Real per capita GNP	250.0	313.7	368.2	423.9	486.7	561.5	650.3
Real per capita manufactures	157.5	210.2	256.2	303.9	358.2	423.8	502.5
Real per capita agricultural goods	92.5	103.6	112.2	120.4	128.9	138.5	149.0
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.004	1.006	1.008	1.009	1.011	1.013
			Growth Rates in Percent				
GNP	—	6.0	4.5	4.1	4.0	4.1	4.2
GNP per capita	—	4.6	3.3	2.9	2.8	2.9	3.0
Urban output	—	5.8	4.0	3.6	3.5	3.6	3.7
Agricultural output	—	3.6	2.8	2.6	2.6	2.7	2.7
Rural manufacturing	—	22.2	12.6	9.3	8.0	7.4	7.0
			Percentage of Total Output				
Urban share	58.8	58.4	57.0	55.6	54.2	52.8	51.4
Agricultural share	37.0	33.1	30.6	28.5	26.6	24.8	23.1
Rural manufacturing share	4.2	8.5	12.4	15.9	19.2	22.4	25.5

Table A-7

HIGH URBAN MANUFACTURING PRODUCTIVITY

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	466.3	514.3	545.5	573.1	604.4	638.4
Labor force, rural manufacturing	51.8	80.4	98.5	108.0	115.5	124.8	135.6
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,222.5	1,446.3	1,749.6	2,142.2	2,646.4	3,299.3
Capital stock, urban	542.8	765.2	942.7	1,184.3	1,501.6	1,915.9	2,460.8
Capital stock, agricultural	324.4	390.1	422.7	471.9	533.2	605.5	691.6
Capital stock, rural manufacturing	38.6	67.3	80.9	93.5	107.4	125.0	146.9
Gross national product, total	246.8	332.1	421.8	527.4	659.9	832.4	1,057.2
Real gross national product	246.8	331.3	420.1	524.6	655.3	825.3	1,046.4
Real production, urban	145.1	204.4	270.8	352.0	456.6	595.4	779.9
Real production, agricultural	91.3	109.0	126.4	145.5	167.5	193.6	224.4
Real production, rural manufacturing	10.3	18.0	23.2	27.8	32.7	38.9	46.6
Investment	112.8	99.6	126.5	158.2	198.0	249.7	317.2
			1980 Dollars				
Real per capita GNP	250.0	315.6	377.1	443.5	522.0	619.3	739.8
Real per capita manufactures	157.5	211.9	263.9	321.1	389.7	476.0	584.3
Real per capita agricultural goods	92.5	103.9	113.5	123.0	133.4	145.3	158.7
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.006	1.011	1.015	1.019	1.023	1.028
			Growth Rates in Percent				
GNP	—	6.1	4.9	4.6	4.6	4.8	4.9
GNP per capita	—	4.8	3.6	3.3	3.3	3.5	3.6
Urban output	—	7.1	5.8	5.4	5.3	5.5	5.5
Agricultural output	—	3.6	3.0	2.8	2.9	2.9	3.0
Rural manufacturing	—	11.7	5.3	3.6	3.3	3.5	3.7
			Percentage of Total Output				
Urban share	58.8	61.6	64.2	66.7	69.2	71.5	73.8
Agricultural share	37.0	33.0	30.3	28.0	25.9	23.8	21.8
Rural manufacturing share	4.2	5.4	5.5	5.3	5.0	4.7	4.4

Table A-8

HIGH AGRICULTURAL PRODUCTIVITY GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	418.2	413.7	393.2	370.0	349.0	329.5
Labor force, rural manufacturing	51.8	128.5	199.1	260.3	318.6	380.2	444.6
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,220.4	1,422.6	1,680.4	1,993.4	2,370.1	2,827.1
Capital stock, urban	542.8	731.3	852.5	1,006.9	1,194.5	1,420.2	1,694.0
Capital stock, agricultural	324.4	374.1	384.9	405.2	429.2	454.7	482.3
Capital stock, rural manufacturing	38.6	115.0	185.3	268.2	369.7	495.3	650.8
Gross national product, total	246.8	322.4	394.8	473.2	564.7	676.5	812.8
Real gross national product	246.8	330.6	414.9	509.2	621.6	760.8	932.8
Real production, urban	145.1	190.1	233.2	280.0	334.6	401.3	482.7
Real production, agricultural	91.3	109.7	127.6	146.6	168.1	193.0	221.8
Real production, rural manufacturing	10.3	29.9	50.7	74.6	103.6	140.0	185.4
Investment	112.8	96.7	118.4	142.0	169.4	203.0	243.8
			1980 Dollars				
Real per capita GNP	250.0	315.0	372.3	430.6	495.1	570.9	659.5
Real per capita manufactures	157.5	209.6	254.8	299.8	349.0	406.2	472.4
Real per capita agricultural goods	92.5	104.6	114.5	124.0	133.9	144.8	156.8
			1980 = 1.000				
Relative price of agricultural goods	1.000	0.933	0.869	0.809	0.753	0.701	0.652
			Growth Rates in Percent				
GNP	—	5.5	4.1	3.7	3.6	3.7	3.7
GNP per capita	—	4.7	3.4	2.9	2.8	2.9	2.9
Urban output	—	5.6	4.2	3.7	3.6	3.7	3.8
Agricultural output	—	3.7	3.1	2.8	2.8	2.8	2.8
Rural manufacturing	—	23.7	11.1	8.0	6.8	6.2	5.8
			Percentage of Total Output				
Urban share	58.8	59.0	59.1	59.2	59.2	59.3	59.4
Agricultural share	37.0	31.8	28.1	25.1	22.4	20.0	17.8
Rural manufacturing share	4.2	9.3	12.8	15.8	18.3	20.7	22.8

Table A-9

HIGH RURAL MANUFACTURING PRODUCTIVITY GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	413.8	404.3	379.6	353.0	329.4	308.0
Labor force, rural manufacturing	51.8	132.9	208.5	273.9	335.7	399.8	466.1
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,225.2	1,476.7	1,841.9	2,350.0	3,053.4	4,037.7
Capital stock, urban	542.8	683.5	761.5	871.8	1,013.6	1,191.7	1,416.2
Capital stock, agricultural	324.4	410.0	471.8	563.5	685.0	841.0	1,043.0
Capital stock, rural manufacturing	38.6	131.7	243.3	406.6	651.4	1,020.7	1,578.5
Gross national product, total	246.8	344.2	457.3	602.9	800.8	1,079.4	1,473.9
Real gross national product	246.8	331.6	423.9	536.5	682.5	878.9	1,143.8
Real production, urban	145.1	188.7	231.9	280.8	340.2	415.3	510.0
Real production, agricultural	91.3	108.1	124.7	143.2	164.8	190.8	222.1
Real production, rural manufacturing	10.3	36.4	74.1	131.0	218.6	355.7	568.5
Investment	112.8	103.2	137.2	180.9	240.2	323.8	442.2
			1980 Dollars				
Real per capita GNP	250.0	315.9	380.5	453.6	543.7	659.6	808.7
Real per capita manufactures	157.5	214.4	274.7	348.2	445.1	578.6	762.5
Real per capita agricultural goods	92.5	103.0	111.9	121.1	131.3	143.2	157.0
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.102	1.213	1.335	1.469	1.617	1.780
			Growth Rates in Percent				
GNP	—	6.9	5.9	5.7	5.8	6.2	6.4
GNP per capita	—	4.8	3.8	3.6	3.7	3.9	4.2
Urban output	—	5.4	4.2	3.9	3.9	4.1	4.2
Agricultural output	—	3.4	2.9	2.8	2.9	3.0	3.1
Rural manufacturing	—	28.6	15.3	12.1	10.8	10.2	9.8
			Percentage of Total Output				
Urban share	58.8	54.8	50.7	46.6	42.5	38.5	34.6
Agricultural share	37.0	34.6	33.1	31.7	30.2	28.6	26.8
Rural manufacturing share	4.2	10.6	16.2	21.7	27.3	33.0	38.6

Table A-10

TRADE WITH LOW AGRICULTURAL PRICE

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	1.3	1.2	1.2	1.1	1.0	1.0
Labor force, rural manufacturing	51.8	545.4	611.5	652.3	687.5	728.2	773.1
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,220.8	1,434.8	1,724.5	2,097.1	2,570.6	3,175.8
Capital stock, urban	542.8	731.5	859.8	1,033.4	1,256.6	1,540.3	1,903.0
Capital stock, agricultural	324.4	1.1	1.2	1.2	1.3	1.5	1.6
Capital stock, rural manufacturing	38.6	488.2	573.9	689.9	839.1	1,028.8	1,271.2
Gross national product, total	246.8	325.9	412.0	512.0	635.3	793.3	995.4
Real gross national product	246.8	359.2	454.0	564.2	700.1	874.2	1,096.9
Real production, urban	145.1	195.3	246.9	306.8	380.7	475.4	596.5
Real production, agricultural	91.3	0.4	0.5	0.5	0.6	0.6	0.7
Real production, rural manufacturing	10.3	130.3	164.8	204.8	254.2	317.5	398.5
Investment	112.8	97.8	123.6	153.6	190.6	238.0	298.6
Agricultural imports	0.0	116.5	135.0	155.0	177.9	204.9	236.5
Manufactured exports	0.0	87.4	101.2	116.3	133.4	153.6	177.3
			1980 Dollars				
Real per capita GNP	250.0	342.2	407.5	477.0	557.7	656.0	775.5
Real per capita manufactures	157.5	310.2	369.5	432.6	505.7	595.0	703.4
Real per capita agricultural goods	92.5	0.4	0.4	0.4	0.5	0.5	0.5
			1980 = 1.000				
Relative price of agricultural goods	1.000	0.750	0.750	0.750	0.750	0.750	0.750
			Growth Rates in Percent				
GNP	—	7.8	4.8	4.4	4.4	4.5	4.6
GNP per capita	—	6.5	3.6	3.2	3.2	3.3	3.4
Urban output	—	6.1	4.8	4.4	4.4	4.5	4.6
Agricultural output	—	-65.8	2.0	2.0	2.0	2.0	2.0
Rural manufacturing	—	66.0	4.8	4.4	4.4	4.5	4.6
			Percentage of Total Output				
Urban share	58.8	59.9	59.9	59.9	59.9	59.9	59.9
Agricultural share	37.0	0.1	0.1	0.1	0.1	0.1	0.1
Rural manufacturing share	4.2	40.0	40.0	40.0	40.0	40.0	40.0

Table A-11

TRADE WITH HIGH AGRICULTURAL PRICE

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population, total	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, urban	117.2	131.6	147.5	157.3	165.8	175.5	186.3
Labor force, countryside	487.0	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, agricultural	435.2	546.7	612.8	653.5	688.6	729.2	774.0
Labor force, rural manufacturing	51.8	0.0	0.0	0.0	0.0	0.0	0.0
			Billions of 1980 Dollars				
Capital stock, total	905.8	1,236.0	1,534.0	1,924.3	2,416.7	3,034.1	3,813.6
Capital stock, urban	542.8	592.8	741.2	935.7	1,182.2	1,493.3	1,888.5
Capital stock, agricultural	324.4	643.1	792.8	988.6	1,234.5	1,540.8	1,925.2
Capital stock, rural manufacturing	38.6	0.0	0.0	0.0	0.0	0.0	0.0
Gross national product, total	246.8	380.5	490.9	619.6	777.5	977.9	1,232.3
Real gross national product	246.8	338.8	437.0	551.6	692.1	870.5	1,097.0
Real production, urban	145.1	177.7	230.9	293.4	370.4	468.8	594.4
Real production, agricultural	91.3	152.2	195.0	244.7	305.3	381.9	478.4
Real production, rural manufacturing	10.3	0.0	0.0	0.0	0.0	0.0	0.0
Investment	112.8	114.2	147.3	185.9	233.2	293.4	369.7
Agricultural exports	0.0	45.0	69.6	99.5	137.8	188.3	254.5
Manufactured imports	0.0	60.0	92.8	132.7	183.7	251.0	339.3
			1980 Dollars				
Real per capita GNP	250.0	322.7	392.2	466.4	551.3	653.3	775.6
Real per capita manufactures	157.5	169.2	207.3	248.0	295.0	351.8	420.3
Real per capita agricultural goods	92.5	145.0	175.0	206.9	243.2	286.6	338.2
			1980 = 1.000				
Relative price of agricultural goods	1.000	1.333	1.333	1.333	1.333	1.333	1.333
			Growth Rates in Percent				
GNP	—	6.5	5.2	4.8	4.6	4.7	4.7
GNP per capita	—	5.2	4.0	3.5	3.4	3.5	3.5
Urban output	—	4.1	5.4	4.9	4.8	4.8	4.9
Agricultural output	—	10.8	5.1	4.6	4.5	4.6	4.6
Rural manufacturing	—	-100.0	0.0	0.0	0.0	0.0	0.0
			Percentage of Total Output				
Urban share	58.8	46.7	47.0	47.3	47.6	47.9	48.2
Agricultural share	37.0	53.3	53.0	52.7	52.4	52.1	51.8
Rural manufacturing share	4.2	0.0	0.0	0.0	0.0	0.0	0.0

Appendix B

MODEL III PROJECTIONS

Table B-1

HIGH POPULATION GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,074.7	1,210.0	1,362.4	1,533.9	1,727.0	1,944.5
Labor force, total	604.3	678.3	760.3	810.8	854.4	926.3	1,043.0
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	921.7	1,038.3
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,136.5	1,454.3	1,872.2	2,403.1	3,075.2	3,973.1
Capital stock, military	65.7	100.7	140.1	186.6	242.3	311.3	407.1
Gross national product	246.8	321.9	423.2	542.8	690.9	892.0	1,180.8
Real gross national product	246.8	321.7	422.8	542.2	689.9	890.6	1,178.9
Civilian output	245.7	320.6	421.8	541.1	688.8	889.5	1,177.9
Defense spending	18.5	24.1	31.7	40.7	51.8	66.9	88.6
Military income (wages)	1.0	1.2	1.4	1.7	2.1	2.5	2.9
Operations and support	7.0	10.6	14.6	19.4	25.1	32.2	42.0
Investment, military	10.5	12.4	15.7	19.6	24.6	32.2	43.7
Investment, civilian	86.4	112.6	148.1	190.0	241.8	312.2	413.3
Consumption, civilian	141.9	185.1	243.3	312.1	397.3	512.9	678.9
			1980 Dollars				
Wage rate	225.4	261.8	307.0	369.2	445.8	530.8	623.9
Real GDP per capita	250.0	299.3	349.4	398.0	449.7	515.7	606.3
			Growth Rates in Percent				
Growth rate, real GDP	—	5.45	5.62	5.10	4.94	5.24	5.77
Growth rate, real GDP per capita	—	3.67	3.14	2.64	2.48	2.77	3.29

Table B-2

LOW POPULATION GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0
Labor force, total	604.3	678.3	760.3	810.8	854.4	883.4	883.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	878.8	878.8
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,136.5	1,454.3	1,872.2	2,403.1	3,071.4	3,879.0
Capital stock, military	65.7	100.7	140.1	186.6	242.3	310.4	388.9
Gross national product	246.8	321.9	423.2	542.8	690.9	868.5	1,066.2
Real gross national product	246.8	321.7	422.8	542.2	689.9	867.0	1,064.1
Civilian output	245.7	320.6	421.8	541.1	688.8	866.0	1,063.1
Defense spending	18.5	24.1	31.7	40.7	51.8	65.1	80.0
Military income (wages)	1.0	1.2	1.4	1.7	2.1	2.5	3.1
Operations and support	7.0	10.6	14.6	19.4	25.1	32.2	40.4
Investment, military	10.5	12.4	15.7	19.6	24.6	30.4	36.5
Investment, civilian	86.4	112.6	148.1	190.0	241.8	304.0	373.2
Consumption, civilian	141.9	185.1	243.3	312.1	397.3	499.4	613.1
			1980 Dollars				
Wage rate	225.4	261.8	307.0	369.2	445.8	542.0	665.4
Real GDP per capita	250.0	313.9	412.5	529.0	673.1	845.9	1,038.2
			Growth Rates in Percent				
Growth rate, real GDP	—	5.45	5.62	5.10	4.94	4.68	4.18
Growth rate, real GDP per capita	—	4.65	5.62	5.10	4.94	4.68	4.18

Table B-3

HIGH PRODUCTIVITY GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,148.8	1,522.9	2,070.5	2,846.3	3,939.0	5,488.0
Capital stock, military	65.7	102.9	151.1	216.0	304.1	426.4	600.1
Gross national product	246.8	343.4	487.1	680.0	947.8	1,328.6	1,870.4
Real gross national product	246.8	343.2	486.5	678.9	946.0	1,325.9	1,866.4
Civilian output	245.7	342.1	485.5	677.9	945.0	1,324.8	1,865.4
Defense spending	18.5	25.8	36.5	51.0	71.1	99.6	140.3
Military income (wages)	1.0	1.3	1.6	2.2	2.8	3.8	5.0
Operations and support	7.0	10.8	15.8	22.6	31.8	44.5	62.6
Investment, military	10.5	13.6	19.1	26.2	36.4	51.3	72.7
Investment, civilian	86.4	120.2	170.5	238.0	331.7	465.0	654.6
Consumption, civilian	141.9	197.5	280.1	391.0	545.0	763.9	1,075.5
			1980 Dollars				
Wage rate	225.4	279.3	353.4	462.5	611.6	809.5	1,073.5
Real GDP per capita	250.0	326.9	436.7	574.0	753.6	995.0	1,319.6
			Growth Rates in Percent				
Growth rate, real GDP	—	6.82	7.23	6.89	6.86	6.98	7.08
Growth rate, real GDP per capita	—	5.51	5.96	5.62	5.59	5.72	5.81

Table B-4

LOW PRODUCTIVITY GROWTH

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,124.8	1,392.1	1,704.0	2,054.1	2,444.3	2,883.4
Capital stock, military	65.7	98.6	130.2	162.1	194.7	229.4	268.3
Gross national product	246.8	301.7	368.0	434.6	506.4	588.2	681.5
Real gross national product	246.8	301.6	367.8	434.3	506.0	587.6	680.7
Civilian output	245.7	300.6	366.8	433.2	504.9	586.6	679.7
Defense spending	18.5	22.6	27.6	32.6	38.0	44.1	51.1
Military income (wages)	1.0	1.1	1.2	1.4	1.5	1.7	1.8
Operations and support	7.0	10.3	13.5	16.7	20.0	23.6	27.5
Investment, military	10.5	11.2	12.9	14.5	16.4	18.9	21.8
Investment, civilian	86.4	105.6	128.8	152.1	177.2	205.9	238.5
Consumption, civilian	141.9	173.5	211.6	249.9	291.2	338.2	391.9
			1980 Dollars				
Wage rate	225.4	245.4	267.0	295.6	326.8	358.4	391.1
Real GDP per capita	250.0	287.3	330.1	367.2	403.0	441.0	481.3
			Growth Rates in Percent				
Growth rate, real GDP	—	4.10	4.05	3.38	3.10	3.04	2.99
Growth rate, real GDP per capita	—	2.82	2.82	2.15	1.88	1.82	1.76

Table B-5

HIGH SAVINGS

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,274.7	1,779.0	2,442.3	3,286.6	4,353.1	5,708.2
Capital stock, military	65.7	102.6	147.9	203.8	271.9	356.4	463.9
Gross national product	246.8	338.9	463.3	611.8	795.4	1,029.5	1,328.2
Real gross national product	246.8	338.7	462.8	610.9	794.1	1,027.7	1,325.7
Civilian output	245.7	337.6	461.8	609.9	793.0	1,026.6	1,324.7
Defense spending	18.5	25.4	34.8	45.9	59.7	77.2	99.6
Military income (wages)	1.0	1.3	1.6	1.9	2.4	2.9	3.5
Operations and support	7.0	10.8	15.5	21.2	28.3	37.0	48.1
Investment, military	10.5	13.4	17.7	22.7	29.0	37.3	48.0
Investment, civilian	111.0	152.5	208.5	275.3	357.9	463.3	597.7
Consumption, civilian	117.2	161.0	220.1	290.6	377.8	489.0	630.9
			1980 Dollars				
Wage rate	225.4	275.7	336.1	416.1	513.3	627.3	762.4
Real GDP per capita	250.0	322.6	415.4	516.6	632.6	771.2	937.3
			Growth Rates in Percent				
Growth rate, real GDP	—	6.54	6.45	5.71	5.38	5.29	5.23
Growth rate, real GDP per capita	—	5.23	5.18	4.46	4.13	4.04	3.98

Table B-6

LOW SAVINGS

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,004.3	1,157.3	1,368.5	1,642.9	1,994.0	2,445.1
Capital stock, military	65.7	98.8	132.1	168.9	211.5	263.4	329.2
Gross national product	246.8	304.4	381.8	471.4	582.2	724.5	906.9
Real gross national product	246.8	304.3	381.6	471.0	581.5	723.5	905.6
Civilian output	245.7	303.3	380.5	469.9	580.5	722.5	904.5
Defense spending	18.5	22.8	28.6	35.4	43.7	54.3	68.0
Military income (wages)	1.0	1.2	1.3	1.5	1.7	2.1	2.4
Operations and support	7.0	10.3	13.7	17.5	21.9	27.2	34.0
Investment, military	10.5	11.4	13.7	16.4	20.0	25.1	31.6
Investment, civilian	61.7	76.1	95.5	117.9	145.6	181.1	226.7
Consumption, civilian	166.6	205.5	257.7	318.2	393.0	489.1	612.2
			1980 Dollars				
Wage rate	225.4	247.6	277.0	320.6	375.7	441.5	520.5
Real GDP per capita	250.0	289.9	342.5	398.2	463.2	543.0	640.2
			Growth Rates in Percent				
Growth rate, real GDP	—	4.28	4.63	4.30	4.31	4.47	4.59
Growth rate, real GDP per capita	—	3.01	3.39	3.06	3.07	3.23	3.35

Table B-7

CAPITAL INFLOWS

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,243.2	1,684.6	2,242.3	2,927.4	3,765.2	4,798.6
Capital stock, military	65.7	102.2	146.0	198.7	261.8	338.6	435.0
Gross domestic product	246.8	335.1	452.1	588.7	755.1	964.5	1,228.4
Gross national product	246.8	332.6	447.1	581.2	745.1	952.0	1,213.4
Real gross domestic product	246.8	334.9	451.6	587.9	753.8	962.8	1,226.2
Real gross national product	246.8	332.4	446.6	580.4	743.8	950.3	1,211.2
Civilian output	245.7	333.8	450.6	586.9	752.8	961.7	1,225.2
Defense spending	18.5	25.1	33.9	44.2	56.6	72.3	92.1
Military income (wages)	1.0	1.3	1.5	1.9	2.3	2.7	3.3
Operations and support	7.0	10.7	15.2	20.7	27.2	35.1	45.0
Investment, military	10.5	13.1	17.1	21.6	27.2	34.5	43.8
Investment, civilian	96.4	131.3	176.4	228.2	290.5	367.8	464.3
Consumption, civilian	141.9	186.1	246.9	318.9	407.9	521.8	667.0
Capital inflow	10.0	10.0	10.0	10.0	10.0	10.0	10.0
International debt	0.0	50.0	100.0	150.0	200.0	250.0	300.0
Debt interest	0.0	2.5	5.0	7.5	10.0	12.5	15.0
			1980 Dollars				
Wage rate	225.4	272.6	328.0	400.4	487.3	587.7	705.1
Real GDP per capita	250.0	319.0	405.3	497.1	600.5	722.5	866.9
Real GNP per capita	250.0	316.7	400.9	490.8	592.5	713.1	856.3
			Growth Rates in Percent				
Growth rate, real GDP	—	6.30	6.16	5.42	5.10	5.01	4.96
Growth rate, real GNP	—	6.14	6.09	5.38	5.09	5.02	4.97
Growth rate, real GNP per capita	—	5.00	4.91	4.17	3.85	3.77	3.71
Growth rate, real GDP per capita		4.84	4.83	4.13	3.84	3.77	3.73

Table B-8

CAPITAL INFLOWS WITH PAYBACK

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,243.2	1,684.6	2,242.3	2,714.7	3,308.7	4,067.5
Capital stock, military	65.7	102.2	146.0	198.7	258.8	327.3	411.7
Gross domestic product	246.8	335.1	452.1	588.7	729.9	910.0	1,140.4
Gross national product	246.8	332.6	447.1	581.2	724.9	907.5	1,140.4
Real gross domestic product	246.8	334.9	451.6	587.9	728.7	908.4	1,138.4
Real gross national product	246.8	332.4	446.6	580.4	723.7	905.9	1,138.4
Civilian output	245.7	333.8	450.6	586.9	727.7	907.4	1,137.3
Defense spending	18.5	25.1	33.9	44.2	54.7	68.2	85.5
Military income (wages)	1.0	1.3	1.5	1.9	2.2	2.6	3.0
Operations and support	7.0	10.7	15.2	20.7	26.9	33.9	42.6
Investment, military	10.5	13.1	17.1	21.6	25.7	31.8	39.9
Investment, civilian	96.4	131.3	176.4	208.2	253.6	312.5	399.1
Consumption, civilian	141.9	186.1	246.9	318.9	406.6	516.7	655.7
Capital inflow	10.0	10.0	10.0	-10.0	-10.0	-10.0	0.0
International debt	0.0	50.0	100.0	150.0	100.0	50.0	0.0
Debt interest	0.0	2.5	5.0	7.5	5.0	2.5	0.0
			1980 Dollars				
Wage rate	225.4	272.6	328.0	400.4	471.0	554.5	654.5
Real GDP per capita	250.0	319.0	405.3	497.1	580.5	681.7	804.8
Real GNP per capita	250.0	316.7	400.9	490.8	576.5	679.9	804.8
			Growth Rates in Percent				
Growth rate, real GDP	—	6.30	6.16	5.42	4.39	4.51	4.62
Growth rate, real GNP	—	6.14	6.09	5.38	4.51	4.59	4.67
Growth rate, real GNP per capita	—	5.00	4.91	4.17	3.15	3.27	3.38
Growth rate, real GDP per capita		4.84	4.83	4.13	3.27	3.35	3.43

Table B-9

MORE DEFENSE, CONSTANT MANPOWER

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,123.8	1,425.0	1,821.7	2,325.9	2,962.5	3,772.3
Capital stock, military	65.7	126.3	184.8	249.2	324.0	415.2	530.5
Gross national product	246.8	320.2	419.3	536.2	680.8	865.8	1,102.4
Real gross national product	246.8	320.1	419.0	535.6	679.8	864.4	1,100.5
Civilian output	245.7	319.0	417.9	534.5	678.8	863.4	1,099.4
Defense spending	24.7	32.0	41.9	53.6	68.1	86.6	110.2
Military income (wages)	1.0	1.2	1.4	1.7	2.0	2.5	2.9
Operations and support	7.0	13.1	19.0	25.5	33.2	42.5	54.2
Investment, military	16.7	17.7	21.5	26.4	32.9	41.7	53.1
Investment, civilian	84.0	109.0	142.8	182.6	231.8	294.8	375.4
Consumption, civilian	138.1	179.2	234.6	300.0	380.9	484.4	616.7
			1980 Dollars				
Wage rate	225.4	260.5	304.2	364.7	439.3	527.5	632.7
Real GDP per capita	250.0	304.9	376.0	452.8	541.5	648.7	778.0
			Growth Rates in Percent				
Growth rate, real GDP	—	5.34	5.53	5.03	4.89	4.92	4.95
Growth rate, real GDP per capita	—	4.05	4.28	3.79	3.64	3.68	3.70

Table B-10

LESS DEFENSE, CONSTANT MANPOWER

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,149.4	1,483.9	1,923.4	2,481.5	3,185.9	4,081.4
Capital stock, military	65.7	75.0	94.8	122.9	158.5	203.3	260.9
Gross national product	246.8	323.5	427.0	549.5	701.0	894.6	1,142.1
Real gross national product	246.8	323.3	426.6	548.8	699.9	893.1	1,140.1
Civilian output	245.7	322.3	425.6	547.7	698.8	892.1	1,139.1
Defense spending	12.3	16.2	21.4	27.5	35.0	44.7	57.1
Military income (wages)	1.0	1.2	1.4	1.7	2.1	2.5	3.0
Operations and support	7.0	8.0	10.1	13.1	16.9	21.6	27.7
Investment, military	4.3	6.9	9.8	12.6	16.0	20.6	26.4
Investment, civilian	88.7	116.3	153.5	197.5	252.0	321.6	410.6
Consumption, civilian	145.7	191.0	252.2	324.5	413.9	528.3	674.5
			1980 Dollars				
Wage rate	225.4	263.1	309.8	373.7	452.3	545.1	655.5
Real GDP per capita	250.0	308.0	382.9	464.0	557.5	670.2	806.1
			Growth Rates in Percent				
Growth rate, real GDP	—	5.55	5.70	5.16	4.98	5.00	5.00
Growth rate, real GDP per capita	—	4.26	4.45	3.92	3.74	3.75	3.76

Table B-11

MORE DEFENSE, MORE MANPOWER

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.[illegible]	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	598.1	672.1	754.1	804.6	848.2	898.6	954.2
Labor force, military	6.2	6.2	6.2	6.2	6.2	6.2	6.2
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,123.8	1,425.0	1,821.7	2,325.9	2,962.5	3,772.4
Capital stock, military	65.7	123.9	180.9	244.1	317.7	407.5	521.3
Gross national product	246.8	320.2	419.3	536.2	680.8	865.8	1,102.4
Real gross national product	246.8	320.0	418.8	535.3	679.5	863.9	1,099.8
Civilian output	245.4	318.6	417.4	533.9	678.1	862.5	1,098.4
Defense spending	24.7	32.0	41.9	53.6	68.1	86.6	110.2
Military income (wages)	1.4	1.6	1.9	2.3	2.7	3.3	3.9
Operations and support	7.2	13.1	19.0	25.5	33.1	42.3	54.0
Investment, military	16.0	17.3	21.1	25.9	32.3	41.0	52.3
Investment, civilian	84.0	109.0	142.8	182.6	231.8	294.8	375.4
Consumption, civilian	138.1	179.2	234.6	300.0	380.9	484.4	616.7
			1980 Dollars				
Wage rate	225.6	260.7	304.5	365.0	439.7	528.0	633.2
Real GDP per capita	250.0	304.9	375.9	452.7	541.3	648.3	777.6
			Growth Rates in Percent				
Growth rate, real GDP	—	5.34	5.53	5.03	4.88	4.92	4.95
Growth rate, real GDP per capita	—	4.05	4.28	3.79	3.64	3.68	3.70

Table B-12

LESS DEFENSE, LESS MANPOWER

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	500.8	674.8	756.8	807.3	850.9	901.3	956.9
Labor force, military	3.5	3.5	3.5	3.5	3.5	3.5	3.5
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,149.4	1,483.9	1,923.4	2,481.5	3,185.9	4,081.4
Capital stock, military	65.7	76.8	97.8	126.7	163.2	209.1	267.9
Gross national product	246.8	323.5	427.0	549.5	701.0	894.6	1,142.1
Real gross national product	246.8	323.3	426.7	548.9	700.2	893.5	1,140.6
Civilian output	246.0	322.6	425.9	548.2	699.4	892.7	1,139.8
Defense spending	12.3	16.2	21.4	27.5	35.0	44.7	57.1
Military income (wages)	0.8	0.9	1.1	1.3	1.6	1.9	2.3
Operations and support	6.8	8.0	10.2	13.2	17.0	21.7	27.8
Investment, military	4.8	7.3	10.1	13.0	16.5	21.1	27.0
Investment, civilian	88.7	116.3	153.5	197.5	252.0	321.6	410.6
Consumption, civilian	145.7	191.0	252.2	324.5	413.9	528.3	674.5
			1980 Dollars				
Wage rate	225.2	262.9	309.6	373.5	452.1	544.8	655.2
Real GDP per capita	250.0	308.0	383.0	464.2	557.7	670.5	806.4
			Growth Rates in Percent				
Growth rate, real GDP	—	5.56	5.71	5.17	4.99	5.00	5.01
Growth rate, real GDP per capita	—	4.26	4.45	3.92	3.74	3.75	3.76

Table B-13

HIGH PRODUCTIVITY, HIGH SAVINGS

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,049.7	1,114.2	1,182.7	1,255.4	1,332.5	1,414.4
Labor force, total	604.3	678.3	760.3	810.8	854.4	904.8	960.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	900.1	955.7
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,291.2	1,875.0	2,728.7	3,942.0	5,655.5	8,088.5
Capital stock, military	65.7	104.9	159.9	237.0	343.5	492.5	704.8
Gross national product	246.8	361.9	534.9	770.0	1,097.4	1,563.4	2,227.1
Real gross national product	246.8	361.6	534.2	768.6	1,095.2	1,560.0	2,222.2
Civilian output	245.7	360.6	533.1	767.5	1,094.1	1,559.0	2,221.1
Defense spending	18.5	27.1	40.1	57.7	82.3	117.3	167.0
Military income (wages)	1.0	1.4	1.8	2.4	3.3	4.4	5.9
Operations and support	7.0	11.1	16.8	24.9	36.0	51.5	73.6
Investment, military	10.5	14.7	21.5	30.4	43.0	61.3	87.5
Investment, civilian	111.0	162.9	240.7	346.5	493.8	703.5	1,002.2
Consumption, civilian	117.2	171.9	254.1	365.7	521.3	742.6	1,057.9
			1980 Dollars				
Wage rate	225.4	294.4	388.0	525.7	708.2	952.6	1,278.3
Real GDP per capita	250.0	344.5	479.4	649.9	872.4	1,170.7	1,571.1
			Growth Rates in Percent				
Growth rate, real GDP	—	7.94	8.11	7.55	7.34	7.33	7.33
Growth rate, real GDP per capita	—	6.62	6.83	6.27	6.07	6.06	6.06

Table B-14

HIGH PRODUCTIVITY, LOW POPULATION

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0
Labor force, total	604.3	678.3	760.3	810.8	854.4	883.4	883.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	878.8	878.8
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,148.8	1,522.9	2,070.5	2,846.3	3,936.2	5,413.3
Capital stock, military	65.7	102.9	151.1	216.0	304.1	425.8	585.6
Gross national product	246.8	343.4	487.1	680.0	947.8	1,310.8	1,775.5
Real gross national product	246.8	343.2	486.5	678.9	946.0	1,308.1	1,771.4
Civilian output	245.7	342.1	485.5	677.9	945.0	1,307.0	1,770.3
Defense spending	18.5	25.8	36.5	51.0	71.1	98.3	133.2
Military income (wages)	1.0	1.3	1.6	2.2	2.8	3.8	5.2
Operations and support	7.0	10.8	15.8	22.6	31.8	44.5	61.3
Investment, military	10.5	13.6	19.1	26.2	36.4	50.0	66.8
Investment, civilian	86.4	120.2	170.5	238.0	331.7	458.8	621.4
Consumption, civilian	141.9	197.5	280.1	391.0	545.0	753.7	1,020.9
			1980 Dollars				
Wage rate	225.4	279.3	353.4	462.5	611.6	818.0	1,108.0
Real GDP per capita	250.0	334.8	474.7	662.4	923.0	1,276.2	1,728.2
			Growth Rates in Percent				
Growth rate, real GDP	—	6.82	7.23	6.89	6.86	6.70	6.25
Growth rate, real GDP per capita	—	6.02	7.23	6.89	6.86	6.70	6.25

Table B-15

HIGH SAVINGS, LOW POPULATION

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0
Labor force, total	604.3	678.3	760.3	810.8	854.4	883.4	883.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	878.8	878.8
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,274.7	1,779.0	2,442.3	3,286.6	4,350.2	5,637.6
Capital stock, military	65.7	102.6	147.9	203.8	271.9	355.9	453.3
Gross national product	246.8	338.9	463.3	611.8	795.4	1,015.8	1,261.5
Real gross national product	246.8	338.7	462.8	610.9	794.1	1,013.9	1,258.9
Civilian output	245.7	337.6	461.8	609.9	793.0	1,012.9	1,257.9
Defense spending	18.5	25.4	34.8	45.9	59.7	76.2	94.6
Military income (wages)	1.0	1.3	1.6	1.9	2.4	2.9	3.7
Operations and support	7.0	10.8	15.5	21.2	28.3	37.0	47.1
Investment, military	10.5	13.4	17.7	22.7	29.0	36.2	43.8
Investment, civilian	111.0	152.5	208.5	275.3	357.9	457.1	567.7
Consumption, civilian	117.2	161.0	220.1	290.6	377.8	482.5	599.2
			1980 Dollars				
Wage rate	225.4	275.7	336.1	416.1	513.3	633.9	787.3
Real GDP per capita	250.0	330.4	451.6	596.1	774.8	989.2	1,228.3
			Growth Rates in Percent				
Growth rate, real GDP	—	6.54	6.45	5.71	5.38	5.01	4.42
Growth rate, real GDP per capita	—	5.74	6.45	5.71	5.38	5.01	4.42

Table B-16

USING ALL FAVORABLE INDICATORS

Category	1980	1985	1990	1995	2000	2005	2010
			Millions of People				
Population	987.1	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0
Labor force, total	604.3	678.3	760.3	810.8	854.4	883.4	883.4
Labor force, civilian	599.6	673.6	755.6	806.1	849.7	878.8	878.8
Labor force, military	4.7	4.7	4.7	4.7	4.7	4.7	4.7
			Billions of 1980 Dollars				
Capital stock, civilian	905.8	1,291.2	1,875.0	2,728.7	3,942.0	5,651.2	7,974.5
Capital stock, military	65.7	104.9	159.9	237.0	343.5	491.8	687.6
Gross national product	246.8	361.9	534.9	770.0	1,097.4	1,542.5	2,113.6
Real gross national product	246.8	361.6	534.2	768.6	1,095.2	1,539.1	2,108.5
Civilian output	245.7	360.6	533.1	767.5	1,094.1	1,538.0	2,107.4
Defense spending	18.5	27.1	40.1	57.7	82.3	115.7	158.5
Military income (wages)	1.0	1.4	1.8	2.4	3.3	4.5	6.1
Operations and support	7.0	11.1	16.8	24.9	36.0	51.5	72.0
Investment, military	10.5	14.7	21.5	30.4	43.0	59.7	80.4
Investment, civilian	111.0	162.9	240.7	346.5	493.8	694.1	951.1
Consumption, civilian	117.2	171.9	254.1	365.7	521.3	732.7	1,004.0
			1980 Dollars				
Wage rate	225.4	294.4	388.0	523.7	708.2	962.6	1,319.0
Real GDP per capita	250.0	352.8	521.2	749.9	1,068.5	1,501.6	2,057.2
			Growth Rates in Percent				
Growth rate, real GDP	—	7.94	8.11	7.55	7.34	7.04	6.50
Growth rate, real GDP per capita	—	7.13	8.11	7.55	7.34	7.04	6.50

REFERENCES

Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers*, 1986.

Beijing Xinhua, "Excerpts from China's Seventh Five-Year Plan (1986-1990)," April 14, 1986, also in Foreign Broadcast Information Service (FBIS), *Daily Report-People's Republic of China*, April 18, 1986.

Burke, David P., *The Data Resources Incorporated (DRI) People's Republic of China (PRC) Econometric Model and Forecasting Service*, Data Resources Incorporated, Lexington, Mass., June 18, 1980.

Chow, Gregory, *Outline of an Econometric Model for Chinese Economic Planning*, Economic Research Program, Memorandum No. 280, Princeton University, April 1981.

Deng Xiaoping, *Building Socialism with Chinese Characteristics*, Foreign Language Press, Beijing, 1985.

Dernberger, Robert F., "The Economic Consequences of Defense Expenditure Choices in China," in U.S. Congress, Joint Economic Committee, *China: A Reassessment of the Economy*, U.S. Government Printing Office, Washington, D.C., July 1975.

Haruki Niwa, "China Model," in Shinichi Ichimura and Mitsuo Ezaki (eds.), *Econometric Models of Asian Link*, Springer-Verlag, 1985.

Henry, D. P., *SMOKE: A Small Model of the Korean Economy*, The RAND Corporation, N-2381-NA, April 1986.

Kwack, Sung Y., Gary Fromm, and Samson W. Tu, *A Model of the People's Republic of China and Its Policy and External Shock Multipliers*, Wharton Econometric Forecasting Associates and SRI International, Menlo Park, Calif., March 3, 1980.

Lau, Lawrence J., William W. F. Choa, Wu-Long Lin, and Jia-Dong Shea, *An Econometric Model of China*, Stanford, unpublished, 1976, revised 1978.

Manichi shimbun, April 15, 1981, p. 7, reprinted in FBIS, *Daily Report-People's Republic of China*, April 16, 1981, Annex, p. 2.

State Statistical Bureau, People's Republic of China, *Statistical Yearbook of China, 1984*, Economic Information Agency, Hong Kong, December 1984.

State Statistical Bureau, "Communique of the State Statistical Bureau Concerning the Fulfillment of the 1985 Economic and Social Development Plan," *Jingji ribao*, Beijing, March 1, 1986.

TKP, Hong Kong, April 20, 1986, p. 1.

Tsao, James T.H., *China's Development Strategies and Foreign Trade*, Lexington Books, 1987.

U.S. Congress, Joint Economic Committee, *China: A Reassessment of the Economy*, U.S. Government Printing Office, Washington, D.C., July 1975.

U.S. Department of Defense, *Soviet Military Power*, 1986.

Wang Huijiong, "China's Prospects for the Year 2000," *Beijing Review*, No. 44, 1985, p. 18.

Wolf, C., Jr., G. G. Hildebrandt, M. P. Kennedy, D. P. Henry, K. L. Terasawa, K. C. Yeh, B. Zycher, A. Bamezai, and T. Hayashi, *Long-Term Economic and Military Trends, 1950-2010*, The RAND Corporation, N-2757-USDP, April 1989.

World Bank, *World Development Report*, 1984.

World Bank, "Annex D; Model and Projections," *China: Long-Term Issues and Options*, Report No. 5206-CHA, Washington, D.C., May 1985a.

World Bank, *China: Long-Term Issues and Options*, Report No. 5206-CHA, Washington, D.C., May 1985b.