Chapter 2

The Chinese Context for Technology Transfer: The Economic Issues

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Shanghai-looking down **at the** Wusong River which leads into the all important Huangpu River. Shanghai, which means "up from the sea" is presently China's busiest port with about half of all Chinese exports passing through this important trading and commercial center.

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Chapter 2

The Chinese Context for Technology Transfer: The Economic Issues

China's economic performance since 1949 has been characterized by both notable achievements and serious failures. The China of 1949 was impoverished and in economic disarray after years of foreign invasion and civil war. Building an industrial economy with the full spectrum of industries and achieving an average growth rate of 6 percent for 30 years were major accomplishments. In addition, China raised the average life expectancy from 36 to 67 years and feeds 22 percent of the world's population with 7 percent of the world's arable land. However, major setbacks from economic mismanagement have also been experienced. China's future economic growth will depend at least as much on avoiding these problems as on achieving great successes.

Scientific knowledge and technical know-how are key elements in China's efforts to modernize its economy and enhance national security. Technology played a role from the 1950s through the 1970s in the development of a comprehensive (albeit, not technically progressive) industrial economy and an extensive research and development (R&D) system. By the late 1970s, however, the Chinese were prepared to acknowledge that many problems with their industrial and R&D systems were inhibiting the further development of the nation's technical capabilities.

Important changes in policies were begun in the late 1970s, including the pursuit of modern technology from abroad. Since then, many Chinese policymakers have come to realize that the development of technical capabilities faces *systemic* problems that cannot be solved simply by changing the R&D apparatus or by importing more foreign technology. Rather, changes on a number of different fronts are required.

More recent policy changes have included major reforms in the economy. China's relationships with the international environment have changed dramatically with the initiation of the open door (kai *fang)* policy and the efforts it entails to attract technology and investment from abroad. Operational objectives for technical capabilities have been redefined, and a number of other measures for altering the policy and managerial environment have been taken.

Together, these initiatives, and the problems they are intended to address, constitute the Chinese context for technology transfer. In this and the following chapter, the elements of China's quest for enhanced technical capability are examined and analyzed.

THE CULTURAL REVOLUTION'S LEGACY

All Chinese leaders since the turn of the century, Communist or non-Communist, have shared a desire to make China a strong world power. However, the means to this goal have changed radically. Since the end of the Cultural Revolution (1966-76), Chinese leaders have introduced major modifications to the political and economic institutions that evolved during the Maoist era (1949-76) of "socialist construction. After decades of relative isolation from the capitalist world, China now seeks to participate in the international economy, to invite capitalist participation in Chinese modernization programs, and to secure access to the technology of capitalist countries, all while retaining its basic socialist character. These

near-revolutionary changes in policy have been implemented despite formidable obstacles, most of which were created or exacerbated by the Cultural Revolution. In particular, the new leadership had to deal with widespread political disillusionment and remove from office thousands of cadres who had risen to positions of influence during the Cultural Revolution.

As economic growth and technological progress again became high priorities, the post-Cultural Revolution leaders have had to confront long-standing problems. In particular, economic productivity was low and the rate of growth declining. According to one report:

> . . . national income produced per 100 yuan of fixed assets averaged 34 yuan during the 1976-79 period, compared with 52 yuan during the First Five Year Plan. Over one-third of all state-owned enterprises were running at a loss in 1976. In 1978, 43 percent of the quality and 55 percent of the consumption norms in industry could not meet the best levels set in the 1960s. [1]

Rates of productivity increases declined dramatically after 1965 and began to rise again only in the 1980s.[2] The causes of this decline are complicated. They include a poor incentive system for labor and management, rigid economic planning, and serious problems in fostering technological innovation. To some extent, these factors are inherent to centrally planned economies, as discussed below. However, the Cultural Revolution not only disrupted progress that might have been made in that decade, it also induced in many educated Chinese (those best equipped to solve the problems) an enduring fear of standing out by being too successful.

Declining gains in productivity were not attributable to a lack of investment. In fact, between 1949 and 1979 the average annual rate of investment was 11.4 percent, which was largely directed into capital construction in the heavy industry sector, with the metallurgical, energy, and machine building industries receiving about 65 percent of industry's shares However, the 6 percent average annual growth of the economy was not commensurate with these investments. Clearly, the Chinese had not gained the productivity benefits from investment that other countries realized. Returns on investment were one-third of those in Japan and labor productivity was one-tenth. Energy consumption per unit of output was as much as five times greater than that in the advanced countries, and while machinery exports made up from 40 to 60 percent of the total exports of the latter, they were only about 5 percent of Chinese exports.[4]

Thus, Chinese economic growth has been due largely to very high rates of investment infixed capital over the years rather than productivity improvements. Consumption and per capita income remained low. There were, in short, imperatives for taking an approach that would result in more efficient use of inputs and progressive technological change.[5]

Another legacy of the Cultural Revolution was the stagnation of the R&D and educational systems. China's research organizations, universities, and science policy and management agencies were terribly disrupted by the Cultural Revolution. Training of new scientists essentially ceased, trained scientists were not properly employed, and the infrastructure for research was neglected. This situation exacerbated the separation of research from production, a problem that had plagued Chinese R&D since it was organized along Soviet lines in the 1950s. Although technological achievements had been made, especially in the national defense sector, the incorporation of new technology into serial production was not widespread, and the strict separation of military-related

[1] Elizabeth J. Perry and Christine Wong (eds.), *The Political Economy of Reform in Post-Mao China* (Cambridge, MA: Council on East Asian Studies, Harvard University, 1985), p. 4.

[2] Robert F. Dernberger, "China's Development Strategy: Investment Financing Needs and Sources, " paper presented to the Fifteenth Sine-American Conference on Mainland China, Taipei, June 1986.

[3] Ibid.

[4] Sun Zhenhuan, "A Study on the Question of an Integrated Military-Civilian Industrial System, *Jingji Yanjiu* 5, May 20, 1985. In JPRS-CEA-85-080 Sept. 3, 1985, pp. 2-3.

[5] For a more complete analysis of these productivity problems, See Gene Tidrick, *Productivity Growth and Technological Change in Chinese Industry,* World Bank Staff Working Papers, No. 761 (Washington, DC: The World Bank, 1986).

work from the civilian economy prevented the latter from benefiting from the most advanced technology.

Moreover, as Chinese scientists traveled abroad more widely in the early 1970s, they began to realize how much further they had fallen behind during the Cultural Revolution, a very dynamic period for world science. China's leaders found that they could not look to the archaic R&D system to be the source for new technology needed by Chinese industry or even the knowledge base for the effective assimilation of imported technology.[6]

Other factors also contributed to China's readiness to experiment. Deng Xiaoping, who emerged as China's senior leader, clearly wished to see progress toward the achievement of the goals of the four modernizations policy (with which he had been closely associated since 1975) in his lifetime. Second, China's political leaders could not ignore the successful economic performance of the Asian newly industrialized countries (NICS) in the 1970s. Third, the relative peace in Asia-combined with the evolving new relationship with the United States- offered China the opportunity to rethink its domestic economic structure. In particular, it offered the possibility to move away from the Maoist idea of organizing the economy according to regional self-sufficiency, a strategy dictated by national defense considerations and perceptions of a threatening Asian regional environment. Instead, new forms of economic integration, which presumably would be more economically rational, were possible.[7]

China in the late 1970s was thus experiencing a convergence of forces for major redirection of policy. In this context China began experimenting with extensive reforms in the economy, and the major opening to the outside world that has become known as the open door policy. This opening was based on the assumption that China's modernization could not be realized without such interactions, an assumption that differs markedly from Maoist self-reliance.

The combination of domestic reform and the open door policy has profound impacts on technology transfer to China. The open door has entailed the invitation of foreign economic participation in Chinese development, and has led both to a major expansion of the amount and variety of technology going to China and to an increase in the variety of modes of transfer. It has also allowed more than 35,000 students and scholars, mainly in technical fields, to travel abroad.[8] Because the reform program makes it more likely that in the long run the technology being imported will be effectively utilized, the open door policy and economic reform reinforce each other.

[6] See Richard P. Suttmeier, "Overview: Science and Technology Under Reform," in U.S. Congress, Joint Economic Commission, *China Economy Looks Toward the Year 2000,* vol. 2 (Washington, DC: U.S. Government Printing Office, 1986), pp. 199-215.

[7] Perry and Wong, op. cit., pp. 4-5.

[8] For an analysis of China educational relationship with the United States, see Committee for Scholarly Communications with the People's Republic of China, *A Relationship Restored: Trends in U.S.-China Educational Exchanges, 1978-1984* (Washington, DC: The National Academy Press, 1986).

THE CHINESE ECONOMY

Economic Structure

The old development strategy left the economy unbalanced. China is a low-income country with a very large agricultural sector of low productivity. Its industrial output per worker is that of a middle-income country, largely because of massive investments in heavy industry, but this sector is still small compared with agriculture. The greatest anomaly, however, is the service sector, which is relatively smaller than that of almost any other country.[9]

As Chinese leaders implemented their new policies, they found that inadequacies in economic performance were traceable to funda-

[9] The World Bank, *China: Long-Term Issues and Options (Washington,* DC: 1985).

mental problems with the economic structure as well as to the disruptions caused by the Cultural Revolution. In the 1950s, the Chinese economy was modeled on that of the Soviet Union, and many of the features of a centrally planned economy (CPE) are still prominent. Three defining characteristics of such an economy are that most of the means of production (especially in industry) are owned either by the state or by collectives, that the allocation of resources is accomplished mainly by the decisions of central planners, and that prices there fore have a secondary role in resource allocation.

These characteristics, as in other CPES, became translated into characteristic economic organizations of the state. Central planning bodies (in China, the State Planning and Economic Commissions) in principle oversee a large number of specialized government ministries such as the Ministries of Machine Building, Electronics, Astronautics, and Railways, discussed later in this report, with responsibilities for operating the economy. Under the ministries are the enterprises, factories, and transport and commercial organs that are the loci of the economic activity. To function effectively, central planners must have abundant and accurate information, the capacity to process the information, and the confidence that their decisions will be implemented without distortions. However, neither China nor any other CPE has met these conditions. In practice, China's CPE does not run as the formal design would suggest.~1

China began experimenting with the operation of a CPE in the late 1950s mainly by decentralizing decisionmaking to units of local government and taking a more collective approach to factory management.[12] These changes also led to a more active role in economic management for local Communist Party committees.

Policies followed during the Cultural Revolution cemented a significant role for local authorities in the operation of much of the economy. Thus, while many Chinese enterprises are under the supervision of the central government, many others are under units of local government. In some industries, strong compe tition has developed between local and central control. Shanghai's competition with the Ministry of Electronics over leadership in computers and microelectronics is a prime example. [14]

The legacy of experiments with decentralization and recentralization has had profound effects on the structure of and distribution of influence within the Chinese economy. A large component of the economy outside the state plan is controlled by local authorities who have access to their own investment funds.[16] This nonplan sector includes collective enterprises and village industry. In recent years it has grown more rapidly than the planned sector and has come to represent between onefourth and onethird of the value of industrial output.

Even that part of the economy more clearly under the control of the central government fails to meet the ideals of central planning. In particular, the production ministries have, over the years, accumulated powers over the control of substantial material and human resources (outside the national budget) that make direction and coordination by central planning bodies difficult. The entrenched power of the ministries and the access to substantial resources (which are outside the national budget) enjoyed by local authorities make the goal of coordinated central planning and plan implementation quite difficult.

[10] Cf. Robert F. Dernberger, "Economic Policy and Performance, *in* U.S. Congress, Joint Economic Committee, *China Economy Looks Toward the Year 2000* (Washington, DC: U.S. Government Printing Office, 1986), pp. 21 ff.

[11] Cf., Ed A. Hewett. "Reflections on a December, 1984 Trip to the PRC," *in* Janet A. Cady (cd.), *Economic Reform in China*, Report of the American Economists Study Team to the People's Republic of China (New York, NY: National Committee on U.S.-China Relations, n.d.) pp. 33-39.

[12] A perennial issue in Chinese decentralization has been whether to decentralize to the factory or enterprise level (the intent of the current reforms) or to the level of local government.

[13] Christine P.W. Wong, "Ownership and Control in Chinese Industry: The Maoist Legacy and Prospects for the 1980s," *China's Economy Looks Toward the Year 2000,* vol. 1, pp. 571-604.

[14] Denis Fred Simon, "China's Evolving Computer Industry: The Role of Foreign Technology Transfers," app. 2 in vol. 11 of this report, May 1986.

[15] Barry Naughton, "The Decline of Central Control Over Investment in Post-Mao China," *in* M.D. Lampton (cd.), *Policy Implementation in Post-Mao China* (Berkley, CA: University of California Press, forthcoming). See also, Wong, op. cit.

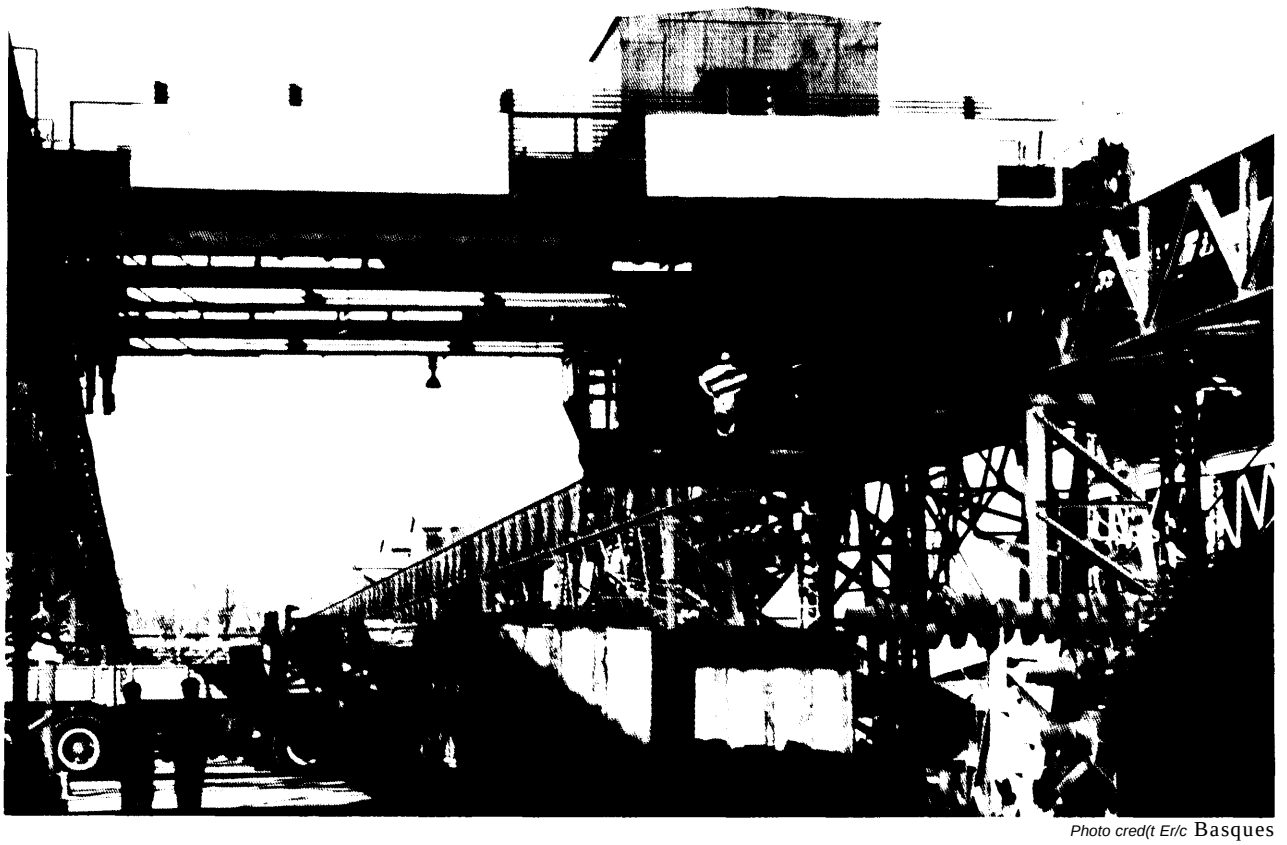

Photo cred(t Er/c Basques

One of the many storage yards at the Dalian diesel locomotive factory-note the diesel engine crankshafts at the lower right. The Dalian plant produces the Dongfeng locomotive, regarded as China's best,

It is therefore useful to think of the structure of the economy in political terms, with tensions existing between central planners and the ministries and between central and local authorities, Although it would be a mistake to underestimate the ultimate powers of the central planning authorities, there have clearly been much less effective central direction, control, and coordination in the routine operation of economic institutions than had been assumed. The Chinese bureaucratic morass and the delays in decisionmaking that inform the tales of frustration told by foreign business representatives must be seen in light of this institutional setting.

Other effects of the economy during the Maoist period are also still being felt. The tradition of collectivism in factory management, for instance, has tended to place the immediate interests of the workers ahead of economic efficiency. The Chinese enterprise has thus been not only an economic unit, but also a unit of government and a welfare institution. Not surprisingly, the emergence of modern enterprise management has been slowed, with the result that managerial deficiencies are now a major obstacle to the realization of economic objectives. [16]

The case for new directions in economic policy and changes in economic institutions, therefore, has been seen by Chinese leaders as a compelling one. These changes, called a new "development strategy, " include new sectoral

[16] William A. Fischer, "The Transfer of Western Managerial Knowledge to China, "pp. 5 in vol. I I of this report, May 1986.

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priorities, new sources of growth, and changes in economic institutions and behavioral rules that are part of the reform program. '7

Economic Reforms

The reform of China's industrial economy has its official expression in the "Decision on the Reform of the Urban Economy" announced at the Third Plenum of the Twelfth Party Congress in October 1984. However, the current reform experience in Chinese industry has its origins in reform experiments begun following the Third Plenary Session of the Eleventh Party Congress in December 1978. In addition, reforms in agriculture preceded the current industrial reforms and have enjoyed much success and popular support.

The intent of the economic reform efforts is to make workers, managers, and enterprises more accountable for their work and to increase the quality of economic decisionmaking. Accordingly, the reform measures adopted have been aimed at the incentive structures at work and at altering the loci of decisionmaking. The key elements include:

1. Increasing the autonomy of enterprises for making decisions about what to produce and how to produce it.
2. Allowing enterprises to retain more of their earnings, which can be used for investment, for bonuses, and for improving living and working conditions for workers.
3. Allowing enterprises to buy more of what they need and sell more of what they produce in marketplaces instead of through state-administered commercial channels. The role of central planning will thus be changed, with some sectors of the economy removed from the planning system and the substitution of 'guidance plans for mandatory plans.
4. Making enterprises responsible for meeting obligations to the state through the payment of taxes instead of measuring their performance and collecting their remissions to the state through shares of profits.
5. Reforming prices gradually to reflect scarcity values.
6. Reforming the banking system to make it more of an instrument for macroeconomic control; the financing of enterprise activities is to be done through banks rather than through state appropriation.
7. Reducing the role of party committees in economic management.

Although official reports from China on the reforms are quite positive, and reflect a commitment by the leadership to continue its course, the implementation of reforms in industry has clearly been more difficult than in agriculture. For instance, it is more difficult to provide incentives for greater individual effort in industry, and there are many more sources of opposition to reform.

Without a rational price system, the efforts to give enterprises more autonomy have led to macroeconomic (as well as macroeconomic) distortions that have troubled the central government, which recognizes the importance of price reform but also understands that the transition from administered prices to market prices is fraught with political dangers. Student demonstrations in late 1985, ostensibly directed at Japanese trading practices, were also a reflection of the discontent felt by many urban residents with the increases in living costs occasioned by price reform. The regime therefore approaches the pace of price reform with some caution, anticipating at least a 5-year period of price reform implementaion.

According to one recent analysis, the most dramatic changes in China have occurred outside of the formally planned economy. This sector outside the plan has always existed in China, but the reforms have encouraged its vigor and enlargement. I* Reportedly, growth in the rural industry sector in 1984 was 40 percent, climbing to more than 50 percent (if annualized) during the first half of 1985 (when overall industrial growth was more than 23 percent). Indeed, growth at this rate has become very troublesome for central policy makers because it has led to distortions in national in-

[17] Dernberger, "China's Development Strategy, " op. cit.

[18] Barry Naughton, ''Summary of Findings, *in* Cady, op. cit.

vestment and to the waste of raw materials. Central authorities have therefore attempted to limit the rate of growth.

Reforms have had much less success within the planned sector, particularly with regard to price reform. Overall, Chinese reform must be seen as involving these two sectors, with the outside-the-plan economy realizing many of the benefits of liberalization and putting pressure on the within-the-plan economy to change. A crucial issue is how China manages the transitional period. It must keep pressure on the within-plan sector to change, but until then, there will be both increasing imbalances in the supplies of energy and raw materials going to the two sectors and uneven changes in wages and the supply of consumer goods, with the danger of serious inflation. Such dangers invite the reassertion of central controls that, if done clumsily, could vitiate the reforms.

It should be reiterated that the efficacy of comprehensive central financial controls always remains in doubt. Abundant resources remain in the hands of local authorities, giving them the power to pursue investment strategies that may not be in China's best overall interests. These "extra-budgetary funds" have over the years, made possible a close, but not necessarily economically rational, relationship between local governments and the enterprises under their jurisdictions. Such relationships frustrate not only the center's desires for greater macro-economic coordination, but also the objectives of central reformers for greater enterprise autonomy. Viewed in this way, the reforms can be understood to be *both* centralizing (to achieve more effective central control) and decentralizing (to provide for greater enterprise autonomy and to free the economy of political interventions from local governments).

Thus, the experience of the Sixth Plan period indicates three things about the Chinese economy. First, there is enormous energy residing in the economy that can be released with the right incentives, but this energy is more readily apparent in the outside-the-plan part of the economy. Second, there are very large amounts of financial resources in the economy available to local governments and relatively uncontrollable by the central authorities. Local levels have a strong inclination to use these resources to grow extensively. Thus, even though the central authorities have been able to curb investment financed from the state budget, the level of total investment in the economy in 1984 was 42 percent higher than in 1979, owing largely to investments made by local authorities with extra-budgetary funds.[18]

Third, the experience of the Sixth Plan period shows the need for strong central controls of the economy. Given the institutional features of the Chinese economy, its underdeveloped market mechanisms, traditions of decentralization, and irrational price system, rational economic behavior at the micro level can be and often is irrational at the macro level. This is particularly true given the shortages of energy, raw materials, transport, and communications infrastructure.

During 1986 the leadership backed away from vigorous implementation of the reform package. The retrenchment was undertaken to consolidate the reforms to date and to adjust to the economic problems of 1985—the overheating of the economy, difficulties in foreign trade occasioned by the rapid drawing down of foreign exchange reserves, and the drop in world oil prices, which exacerbated the foreign exchange problem.

These unexpected economic difficulties made the politics of reform more complicated, strengthened the voices of the more conservative members of the leadership who call for a more cautious approach to reform, and pointed to the possibility that the more difficult challenges of reform have yet to be faced. Carrying the reforms further for instance, through loosening controls over labor and capital will be necessary to solve some of the problems the reforms have encountered. However, further reforms of this sort are also likely to engender more active political opposition, since they cut more closely to the essence of a Marxist-Lenin-

[19]Dernberger, "China's Development Strategy, " op. cit.

ist regime.[20] The conflicts in Beijing in early 1987 appear to be over precisely these issues. Further reform, therefore, becomes a challenge to Chinese politics, and makes the question of the future strength of the reform coalition a matter of importance. This question is further discussed in chapter 6.

The Seventh Five-Year Plan

Economic policies initiated in the early 1980s have clearly stimulated economic growth. Indeed, the pace of growth has been such that in 1985 central officials feared that the economy was overheating. The new 5-year plan (the seventh) thus calls for more moderate growth while pushing for the full implementation of the reform program.

As proposed by the Central Committee of the Communist Party in September 1985,[21] and approved by the National People's Congress in April 1986,[22] the plan differs from earlier plans in deemphasizing specific quantitative targets for the economy. Instead, it contains general principles for action and identifies areas for special attention. It is usefully seen as a plan for a transitional period, one that builds on the achievements of, and attempts to compensate for, the weaknesses of the Sixth Plan while looking ahead to the needs of the 1990s.

Thus, the Seventh Plan calls for the continued implementation of reforms throughout the plan period. It calls for continued improvement in living conditions and an increase of 4 to 5 percent in the average annual per capita level of consumption. It is premised on a comprehensive rate of growth in Gross Value of Industrial and Agriculture Output (GVIAO) of 6.7 percent per annum, or an average annual growth in gross national product of 7.5 percent (which includes an average increase of 11.4 percent per year in the service sector). Labor productivity is to grow at an average annual rate of 3.8 percent.[23]

The plan has a number of implications for technology transfer and foreign investment. First, it sets economic priorities that will entail the importation of technology. Major investments are called for in transportation, telecommunications, energy, and semi-finished and raw materials.

The plan also calls for the acceleration of the development of new high-technology industry, especially electronics and computers, and the modernization of large, established industries, such as the automobile industry. The severity of the need for technological transformation of established industry is reflected in one recent report:

> . . . only *20* percent of the industries in China can measure up to standards of developed countries in the past decade. Sixty percent are so obsolete that they need to be replaced or upgraded. This explains the wide gap between China and developed countries in economic efficiency and productivity.
>
> China consumes 210,000 tons of coal per $10,000 in gross national product; the Soviet Union 120,000 tons, the United States 91,000 tons and Japan 37,000 tons .. .24

The Chinese have placed great hope in the industrial use of microelectronics technology (for control systems) for the technical transformation of industry. Altogether, there will be 600 major projects for the technological transformation of existing industries. Priority in importing technology will be given to the technologies for infrastructure development, for establishing new industries, and for transformation projects that will contribute to China's ability to earn foreign exchange.

The plan reaffirms the continuation of the open door policy, assumes the continuation of

[20] The dilemmas of incomplete reform, or partial marketization, in socialist systems are explored in Jan S. Prybyla, "Mainland China and Hungary: To Market, To Market . . .," paper presented to the Fifteenth Sine-American Conference on Mainland China, Taipei, June 8-14, 1986.

[21] See "Proposal of the Central Committee of the Chinese Communist Party for the Seventh Five-Year Plan for National Economic and Social Development, *Xinhua* (Beijing: Sept. 25, 1986). In *FBIS*, Sept. 26, 1986, pp. K1-K32.

[22] "See "Excerpts From China's Seventh Five-Year Plan (1986-1990), " *Xinhua* (Beijing: Apr. 14, 1986). In *FBIS* (Apr. 18, 1986), pp. K1-K37.

[23] "Ibid.

[24] "*China Daily*, Oct. 22, 1985.

foreign investment, and predicts a 40- to 50-percent increase in foreign trade over the plan period. China expects to increase exports in areas of current strength (textiles, petroleum, coal, nonferrous metals, farm sidelines, and traditional handicrafts) and hopes to increase its activities in the area of finished manufactures (especially machine tools, electrical products, apparel, and processed foods). Exports are predicted to rise slightly more rapidly (8.1 percent) than imports (6.1 percent).

Clearly discernible in the language of the plan is a sense of the interrelatedness of importing technology and exporting products. Exports are necessary for paying for imports, and China realizes that its export performance in price, quality, and value added will depend on its ability to acquire and assimilate new technologies.

The final area where the Seventh Plan's contents pertain to technology transfer is the stress placed on the development of indigenous scientific and technological capabilities (discussed in ch. 3) and the emphasis on human resource development. The manpower development projections call for the graduation of 2.6 million young people from regular institutions of higher education (as opposed to radio, TV, correspondence, and night schools, which are also to see significant increases) and of some 180,000 from graduate programs during the plan period. These figures represent increases of approximately 70 percent and 400 percent, respectively, *over* the Sixth FiveYear Plan period. In addition, there is to be a 110-percent increase in the numbers trained in polytechnic and vocational schools over the previous plan period.[25] This ambitious human resources development plan eventually should ease China's shortage of trained personnel, a major obstacle to China's ability to absorb technology and foster domestic innovation.

Economic Challenges

In spite of the promises of the Seventh Plan, China's developmental problems remain formidable. An enduring issue is the lack of innovativeness in the Chinese industrial economy, a problem with clear implications for productivity. The shortage of available energy remains a fundamental constraint on growth. The underdevelopment of transportation and communications is severe.

In 1981 the Chinese announced their intention to quadruple the size of the economy, measured in GVIAO, over the 1980 level by 2000. In addition, they called for raising the national income per capita by approximately 5 percent per year, from $300 in 1980 to $800 by 2000. Two important issues are the sources of growth (extensive, through further heavy investment, versus intensive, through technological change) and the constraints on growth (primarily, limited investment, energy, and transport and communications resources).

In its recent analysis, the World Bank has explored the growth prospects of the Chinese economy for the remainder of the century.[26] While accepting that China may reach its quadrupling goal, the bank study also considered two other scenarios. In the first, constraints on growth from energy, raw materials, and infrastructure shortages and from managerial difficulties hold growth below the quadrupling rate. The second alternative places less emphasis on physical constraints and foresees a major expansion of the service sector. In this scenario, even though the GVIAO quadrupling goal is not quite met, the per capita income goals are reached. The appeal of this balanced scenario is that by bringing the service sector more in line with that of other countries, China can more efficiently create national wealth while requiring fewer of the scarce inputs needed for the quadrupling approach.

Chinese authorities have not publicly altered the quadrupling goal in response to the World Bank analysis. However, they have called for a more active service sector, and the drift of the reform program is supportive of service expansion. At the same time, major efforts will be made to remove the main obstacles to the

[25] Excerpts from China's Seventh Five-Year Plan.

[26] The World Bank, op. cit.

Photo credit Er/c Basques

Slogans promoting increased worker productivity are visible at many Chinese plants. This one can be found at the Beijing Jeep Corp. joint venture plant in Beijing.

quadrupling goal: inefficient management, shortages of materials and infrastructure deficiencies.

China's movement toward the quadrupling goal has so far been impressive. Quadrupling the GVIAO by 2000 will require annual rates of growth of 7 percent. During the Sixth Five-Year Plan period (1980-85), the economy grew at a substantially faster pace (averaging 11 percent per annum between 1981 and 1984). Substantial growth has resulted from reforms in the agricultural sector, not only leading to increases in the value of agricultural output, but also stimulating new activities in sideline and small rural industrial production. The more general relaxation of economic controls has also led to a boom in construction, to growth in other forms of local industry, and to the appearance of new forms of private and collective enterprise.

China also faces the problem of finding the financial resources, particularly foreign exchange, required to accomplish its development goals. Having decided to seek financial assistance from foreign sources, China has in recent years benefitted from loans from the World Bank and foreign governments. In addition, from the late 1970s to 1984, China accumulated a large foreign exchange reserve. As a result of a decentralization of control over foreign exchange, however, reserves were drawn at an alarming rate in 1985, leading to a recentralization of controls and some rethinking of technology transfer strategy (discussed below) in late 1985. Since exports of petroleum have been China's leading foreign exchange earner in recent years, the decline in world oil prices in the first half of 1986 exacerbated the foreign exchange problem and made it one of the more formidable constraints on growth in the short run.

China will address these problems with a continuation of the trend toward new techniques of finance—such as an increasingly intimate relationship with foreign commercial banks and the further encouragement of foreign investment—and a technology acquisition strategy. By the end of 1985, the foreign exchange problem, the search for foreign invest-

ment, and the strategy for technology acquisition had become increasingly intertwined.

In the face of the drawdowns on foreign exchange, the allocation of foreign exchange to Chinese organizations and enterprises increasingly became a function of their ability to earn it. This meant that some sectors, such as the petroleum industry, had a greater claim on scarce foreign exchange than did, for instance the electric power industry. This new foreign exchange norm also created problems for Sino-foreign joint ventures, which the **Chinese** hoped would bean important vehicle for technology transfer. Joint ventures typically must import equipment and components for a period of time after they start up, and may not be in a position to earn foreign exchange through exports for quite some time. The operations of these enterprises can easily be seriously disrupted if they are denied access to the foreign exchange they expect. The increasing number of such occurrences in early 1986 led foreign firms to question the attractiveness of investments in China.

China's formidable economic problems would be extraordinarily difficult to resolve without technology and investment from abroad. The importance of the open door policy, therefore, is not likely to diminish in the short run, and the Chinese seem willing to continue to modif y the policy to improve the business climate in China. Whether they are prepared to take these modifications as far as the foreign businesses would like remains to be seen. It is important to consider some of the features of the open door policy, and some of its problems, in greater detail.

THE OPEN DOOR POLICY

China's open door policy and its reform program are mutually reinforcing. The political, economic, and science and technology reforms noted above will help China select and assimilate foreign technology. Yet, the implementation of the reforms is clearly incomplete, and many problems remain with technology transfer.

Since the beginning of the open door policy in 1978, China has initiated a multifaceted strategy to open itself to the outside world. The measures adopted include:

- the establishment of four "special economic zones' in which foreign investment is encouraged;
- plans to make the the Fujian, Yangtze, and Pearl River deltas "economically open' regions;
- the acceptance of foreign investment and loans from international organizations (especially the World Bank), foreign governments, and commercial sources;
- the approval of a variety of forms of foreign participation in the Chinese economy, including joint ventures, cooperative management schemes, wholly owned foreign enterprises, and compensation trade arrangements;
- cooperative schemes with foreign interests in natural resource surveys and exploitation; and
- the gradual modernization of an infrastructure for interacting with the outside world, including changes in the banking system and the creation of new institutions such as the China International Trust & Investment Corp. (C ITIC) and the China Coordinating Center for Business Cooperation, under the State Economic Commission.

To create an environment conducive to foreign investment and technology transfer, the Chinese authorities have also attempted to establish an entirely new legal framework for foreign participation in the economy. Laws have been passed pertaining to joint ventures, foreign contracts, company registration, labor management, special economic zones, foreign enterprise taxation, exchange control, offshore petroleum exploration, marine environment protection, trademarks, patents, and, most re-

cently, the activities of wholly owned foreign firms operating in China. Greater autonomy for approving foreign investments has been given to local governments, and restrictions on foreign banking operations have been loosened.[27]

Thus, much has changed in China's interactions with the world economy since 1978. Whereas China's exports represented only 0.75 percent of the world's exports in that year, they had grown to 1.25 percent in 1984, moving China from 32nd position to 16th in value of exports. From the end of 1978 to the end of 1984, China received more than $17 billion in foreign capital (of which $4 billion were direct investments), which represented about 10.5 percent of the total investment in capital construction during the same period. The use of foreign capital is expected to increase during the Seventh Five-Year Plan period, during which China expects to absorb US$30 billion, $5 to $7 billion of which is to be foreign investment .[28]

The open door has also led to a substantial increase in China's acquisition of foreign technology. Although significant questions remain about absorption and about how to measure flows of technology into China, there is little doubt that technology transfer to China has been substantial. Between 1981 and 1985, for instance, China spent approximately $9.6 billion to import full sets of equipment and other advanced technology. This represented a 69-percent increase over the previous 5-year plan period.[29] Between January and June of 1985, 318 technology import contracts were approved by the Ministry of Foreign Economic Relations and Trade, more than double the number from the same period in the previous year. In dollar terms, the first 6 months of 1985 saw contracts worth $2.05 billion, compared to $339 million from the previous year.[30]

Despite these notable changes, reservations by foreign interests about the Chinese business environment have become more numerous and more serious. Frequently mentioned disincentives operating on foreign firms, according to the U.S. Commerce Department, include:

> . . . foreign currency restrictions making the repatriation of profits uncertain, the overvaluation of the Chinese contribution to Sino-foreign enterprises, inflated labor costs, poor labor discipline, high manufacturing costs, unpredictable customs treatment, undependable supplies of local materials, inadequate energy, transportation, and communications, a cumbersome bureaucracy, still unfavorable tax and accounting policies, an irrational pricing structure, uncertain access to a poorly defined domestic market, a marginal return on investment, and difficult expatriate living conditions .31

The ongoing economic reforms themselves introduce uncertainties that make planning more difficult for foreign investors now than in 1979, when joint ventures were first authorized. Furthermore, the new laws are often very general and ambiguous, largely untested, and inconsistently administered by bureaucrats who have not prized legality highly in the past. A framework maybe in the making, but as yet it is both fragile and incomplete.[32] Foreign investments and technology transfers are less than the Chinese expected. From 1979 to 1985, the Chinese realized only 36.4 percent of the foreign investment pledged, in contrast to 70.8 percent of the foreign loans pledged during the same period.[33]

To improve the investment climate, the Chinese promulgated new investment regulations in October 1986.[34] The regulations grant a priv-

[27]Teh-pei Yu, "Foreign Capital in Mainland China," paper presented to The Fifteenth Sine-American Conference on Mainland China, Taipei, June 8-14, 1986.

[28]Teh-pei Yu, "Foreign Capital," op. cit., p. 9.

[29]"Foreign Trade Minister Views Trade Situation," *FBIS*, June 10, 1986, p. K8.

[30]*Xinhua*, Aug. 18, 1985. In JPRS-CEA-85-088, Oct. 2, 1985, p. 81.

[31]U.S. Department of Commerce, "People's Republic of China," *Foreign Economic Trends and Their Implications for the United States*, FET 86-85 (Washington, DC: U.S. Government Printing Office, September 1985).

[32]See, for instance, Ellen R. Eliasoph and Jerome Alan Cohen, "China's New Technology Import Regulations," *The China Business Review*, vol. 12, No. 6, November-December 1985, pp. 36-40.

[33]Teh-pei Yu, "Foreign Capital," op. cit., p. 17.

[34]"Provisions of the State Council of the People's Republic of China for the Encouragement of Foreign Investment' (promulgated on Oct. 11, 1986), *China Daily*, Oct. 14, 1986, p. 2.

ileged position to export oriented and technologically advanced enterprises established with foreign investment, and attempt to eliminate the arbitrariness that has surrounded the supplies of inputs to foreign-invested firms and the labor and rental rates that have been levied. Although the views of the foreign business community were actively solicited in preparing the regulations, some of the important concerns of the foreign investor—especially the questions of access to the Chinese domestic market and the repatriation of profits—have apparently not been alleviated by the issuance of the regulations.

Thus, from the foreign perspective, there remain reasons to doubt just how open the open door actually is. Import restrictions, bureaucratic red tape, domestic subsidies, and unfavorable tariffs combine to make a formidable protectionist regime. In part, the existence of this regime reflects the legacy of China's past, the consequences of the interactions of a closed economy modeled on the Soviet Union, Maoist principles of self-reliance, and the turbulence of the Cultural Revolution. However, it also reflects underlying contradictions in China's conception of the open door and ambiguous attitudes toward the international economy in general and foreign technology in particular (a subject pursued in greater depth in ch. 3).

These underlying problems have several components and are inseparable from the often irrational operation of domestic institutions .35 First, there is a basic ambiguity about China's overall development strategy. Is it to be an export promotion or import substitution strategy?sG O, is it to involve both, as the new investment regulations seem to imply? Chinese development since the founding of the People's Republic of China has clearly not followed the export promotion strategy. The relatively small export sector of the past, the use of foreign technology (and the relatively little import of it after 1960) to support domestic industrial development, and the strong emphasis on self-reliance are all more consistent with an import substitution approach than one that is export driven.

However much China might want to emulate the export promotion approach of the Asian NICS, there are reasons to doubt it will happen soon. China is a large country with a historic internal focus and enormous domestic needs and problems. China's past strategy of self-reliance and regional self-sufficiency led to a dispersion of industrial projects. Poor transportation and communications hinder the access of the products of this inland economy to the international trading centers on the coast. China's politically powerful basic industries, including machinery suppliers, regard the Chinese domestic market as their preserve. While they are not necessarily opposed to some form of new economic internationalism, they have insisted that the definition of the open door be on their terms. Furthermore, most Chinese products lack the quality and design to be competitive on world markets.

Finally, the most favorable era for pursuing an export-oriented development strategy may have passed, at least for the immediate future. China's desire to expand its exports has already caused trade friction, and the projections of future Chinese exports would suggest that these may intensify. Unlike the Asian NICS, which were able to take advantage of especially open markets in an industrialized world enjoying exceptional prosperity, the Chinese interest in an export-led development approach comes when the Western economies are shaky and their domestic markets are increasingly subject to protectionist pressures.

A range of policies pertaining to exchange rates, tariffs, prices for export items, subsidies and export credits, import licenses, and tax advantages are involved in the shift from import substitution to export promotion. The Chinese have begun to implement policies pertaining to most of these areas to accelerate export expansion. However, many of these are likely to cause negative reactions from China's trading partners and will complicate the question of

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"Cf., Huang Fangyi, " Analysis and Suggestions on China's Introduction of Foreign Technology and External Trade, " op. cit.

[36]See, John B. Sheahan, "Alternative International Economic Strategies and Their Relevance for China, " World Flank Staff Working Papers, No. 759, 1986.

Photo credit Er/c Basques

A Jeep Cherokee being assembled at the Beijing Jeep Corp. plant, a joint venture between the American Motors Corp. and the Beijing Automotive works. This modern assembly line serves as a model for efficient production techniques and improved quality control.

China's re-admission to the General Agreement on Tariffs and Trade.

A second major component of the open door dilemma is the uncertain mixture of decentralization and centralization of foreign economic decisionmaking. This is related to, but not synonymous with, the uncertainties about the mixture of market and planning elements, which is one of the uncertainties of the economic reform program. Chinese experience with the open door policy and with decentralizing marketing reforms since the late 1970s has pointed to the danger of a loss of control over macroeconomic policy as a concomitant of reform. On the other hand, the Chinese are also aware of the stifling of economic activity resulting from certain forms of centralization. The saying 'giving rise to rigidity as soon as we exercise centralization, and giving rise to disorder as soon as we relax control' captures the sense of this dilemma. Thus, relaxation of central controls over foreign economic activity in the recent past has led to the rapid dissipation of foreign exchange holdings. At times, as discussed in the following chapter, it has also led to irrational, duplicative technology imports.

The problem of policymaking for importing foreign technology has both institutional and conceptual dimensions. Chinese institutions for the conduct of foreign economic relations reflect both the legacy of socialist foreign trade and the results of the decentralizations introduced since the late 1970s. This institutional legacy has locked China into an alternating pattern of either too much centralization or too little central control exercised in the national interest. China has yet to find a formula for institutions that are able to set and enforce a foreign economic policy that both serves basic national interests (e.g., maintaining

responsibility for the nation's foreign exchange holdings) and allows for decentralized decisionmaking in the service of economic dynamism.

The institutional problem has a conceptual or intellectual analog. China is, in effect, searching for the intellectual foundations of an industrial policy. Such an intellectual formulation would spell out which sectors of the economy deserve priority for export promotion or for the import of technology. Should priority go to industries with high immediate export potential (e.g., textiles or consumer electronics), to basic industries such as steel or transportation, or to industries (e.g., advanced electronics, robotics, communications) that would allow China to leapfrog over phases of the product cycle (ignoring perhaps comparative advantage) and compete in high value--added goods and services? The problem of an intellectual formulation is also evident in the lack of a decisionmaking strategy for intrasectoral or intraindustry technology transfer. "

Such an intellectual formulation would then serve as a conceptual framework for the myriad analyses, feasibility studies, and decisions China must make about how to use its limited resources to extract the maximum benefit *from* its interactions with the world economy. At present, although the Chinese recognize the need, such a formulation or strategy does not exist.

The following chapter discusses how some of these issues surrounding the open door policy pertain more specifically to the technology transfer phenomenon.

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[7]See Geoffrey Oldham and Alyson Warhurst, *Technology Transfer to the Chinese offshore Oil Industry*, unpublished report, University of Sussex, Science Policy Research Unit. no date.