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International technology transfer : America via China

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INTERNATIONAL TECHNOLOGY TRANSFER: AMERICA VIA CHINA

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ABSTRACT

Momentous changes continue to occur in China. The high priorities now accorded economic modernization and improved global relations present a sharp contrast to the years of the Cultural Revolution and earlier. But what happened last year, the June 4 Tiananmen Square massacre, brought about great confusion and uncertainty over China's future course. China may be a constructive trading and strategic partner, or it may choose a more divergent path. U.S. decisions on technology transfer will be an important determinant of which path is followed and the implications for the world.

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FOREWORD STORY

There is a Chinese tradition of telling stories to make serious points about issues:*

* Note: Personal experience, July 1984 - July 1988, as foreign marketing engineer and interpreter in Machine Tool Research Institute, Tianjin, P. R. China.

THE VANISHING CONTRACT

They sat on the couch at the head of the room, Director Wang and David, and the smiles on their faces were identical—in width and warmth, in reserved cordiality and dignity, in courteousness and interested attention. The tea lady brought in a big aluminum thermos while we talked, and poured hot water into the cups, set out with tea leaves in them and matching covers to keep the heat in while the leaves steep.

The Chinese go to a lot of trouble to make foreigner feel welcome. The young interpreter had come to get David and his staff (two assistants) in

a company car (there were very few private ones in China), and three men had stood waiting for David in the bitter cold at the gate of the Institute's compound, as if David's visit were the main event in their lives. They had ushered David up the steps of the administration building, through the coldest, grayest, dampest concrete corridors the foreigners had ever seen, and into the meeting room.

The room was paneled and carpeted, heated and well lighted in deference to the delicate foreign constitutions. Director Wang met the visitors there with some more of his staff. He introduced David to everyone—all the names ran together, Wangs and Wongs and Yangs and Houngs—and ushered him to the seat beside himself on the couch. The others distributed themselves in the upholstered chairs down Wang's side of the room. David's two assistants sat on the other side. David's Chinese-American assistant Bob carefully did not take the chair next to David, which, like the chair next to Director Wang, was at a forty-five-degree angle to David, but took the next one down, at right angles. The chair next to David was the interpreter's and Bob wanted to be known as an assistant, not an interpreter.

Director Wang started off with a few inquiries about the trip, about how many times they had been to China, and asked if they wanted to do some sightseeing. After each question he had to wait for his young interpreter, and then the youngster had to translate David's banalities back to Wang, and they both looked at each other and listened carefully, as though this were the most important conversation in the world. Then Wang gave a "brief

introduction"— the procedure never varies— stopping after each sentence. He told David a little bit about the Institute, how old it was, how many students it had, how many departments it was organized into, and the titles of each of the Houngs and Wongs present. Wang was a sophisticated old pro and reeled it off with the kind of dignity and charm that would be called "Old World" in China.

Then it was the visitors' turn. David told him how much they appreciated being there and having the director take the time out of his busy schedule, etc. David told Wang about their organization and what he did, and what Bob and Jane, his other assistant, did: all data Wang already knew. It was an intensely exciting meeting for David, the first chance he had to make a real "deal" in China, if only he didn't blow it.

Talking through an interpreter is a wonderful exercise in learning to think clearly, for those who use it as such. Many don't, and just blab away as they always do, losing he interpreter by the third "and." It is hard work to put one thought—no less and no more—into one sentence, but one has all that time when the interpreter is saying it over again to sip tea and think of one's next sentence. It ought to be a required course in every college.

Then they got down to business, or rather they headed in that direction. Engineer Yang, who was sitting along the side, had asked if David could get in touch with a certain company in the United States—Sun Microsystems. Sun makes a super-microcomputer that was especially attractive to

the Chinese in the Institute because it could be used for many scientific and engineering purposes: for example, it could be hooked up to a variety of production processed and then used to control the process, and at the same time to record technical measurement data and do scientific calculations on the data. They knew just what they wanted, the make and model number as well as the manufacturer. David had contacted Sun, and this was the meeting to start the process of planning a meeting to start negotiating.

As usual, Wang and David were the only ones to speak during the early part; the others spoke only when one of them asked them to. Wang told David about their great interest in cooperating with American company, and David told Wang about his discussion with the international vice president of Sun. The tea lady came back and gave us refills. David told Wang about the questions the VP had: how would the Chinese service the system, where did they want the training to take place, how many could they buy in the first order, in the first year.

The discussion became more general then, with the Chinese going back and forth among themselves about the questions, and occasionally, upon a little gesture from Wang, stopping to interpret part of it for David. One of Bob's important functions was to listen in on all the discussion that wasn't relayed to David. Time was wearing on. Chinese meetings, whatever time they start, always seem to go on until the next mealtime. That meant they had until eleven-thirty, when they would break for lunch.

Wang was wearing a Western business suit and tie but the others had on their winter Mao jackets, a size or two bigger in order to make room for the sweaters and long johns that one could see peaking out at their wrists and ankles. They need all that bulk in the unheated homes and offices, but here in the hot Westerners' meeting room they were obviously uncomfortable and some were yawning and dozing.

At about eleven-twenty, Wang began to summarize. He promised to get answers to the questions. They set a date for the next meeting and Wang said they would like to have a small dinner that night to welcome David. Would he like one of them to take him sightseeing that afternoon? Tomorrow?

So David and his staff drove back to the hotel for lunch and a free day and a half. The small dinner was a fifteen-course banquet, as they knew it would be, with incredibly delicious dishes, beer and wine and 120-proof "mao tai"—the Chinese version of schnapps and "white lightning" —and many, many toasts, and an official even more important than Wang presiding. They only business talk was a remark by Wang that they were very pleased with the morning's meeting, would have the answers to the questions, and looked forward to a "successful cooperation." The rest of the talk was generalities about friendship and "old friends" and mutual benefit and the like. As general as it was, it was delivered with evident warmth and sincerity, and the food was exquisite—subtly and delicately seasoned, delicious beyond description, The Chinese surely know how to make one feel welcome

and important..

The day after next, David and his staff were back in the meeting room. Wang had sent his regrets. The next man down the line was on the couch with David. Engineer Yang was still a couple of seats down in the pecking order. Vice Director Lu, now presiding, told David that they had discussed the Sun system and decided that they wanted not only to buy several but to sell the systems to others in China and be a service center for them—in other words, to be a distributor. ' The Institute was ready to buy one as soon as a U.S. export license could be arranged, and had foreign exchange available and earmarked for buying nine more, if the system measured up to its promotional literature. They asked if the company would send the first system over as soon as possible so they could hold a demonstration and invite potential buyers from all over China. And when would the Sun executives pay a visit? The Chinese wanted to welcome them and talk about signing a letter of intent.

David was elated. None of that deplored Chinese procrastination here! This was decision-making that world be admirable even in America. David thought, just shows that one has to get to the right people. He hustled back to California to report to the VP.

A month later, David was back with the VP and there were factory and laboratory tours as well as the banquet and meeting room routine. The VP had been in China in 1945 with the Flying Tigers and was full of enthusiasm

for his visit.

After the first day in the meeting room, with its art-deco wall fixtures for lights—a strong hand sticking out of the wall, grasping a metal torch supporting an artichoke- shaped, cream-colored glass globe—they met in a more workmanlike setting. The walls were plain, not imitation paneled, there was a fluorescent light overhead, and they sat on plain folding chairs around a rectangular table that had a glass top over a white, perfunctorily embroidered cloth. The teacups were there, each with its cover, and the tea lady came in as soon as they were all seated.

They had three highly satisfying working sessions in that room, relieved by the plant and lab tours. The VP and some of the Chinese quickly established a bond of shared technical expertise, understanding one another on a professional level while the interpreter was wrestling with unfamiliar technical terms—their understanding expressed with gleeful nods and laughs and exclamations of "Yeah! Yeah!" and "Hao! Hao!" and sometimes triumphant handshakes.

By the end of those working sessions the Americans had reaffirmed the plan set out by Lu: they would start buying on a sort of "annual quantity purchase contract" or "blanket purchase order" while the Sun people trained Institute people in the United States and otherwise both parties geared up for a full- fledged distributorship in China. The VP laid out in considerable detail how many people they would need for sales, customer service, cus-

tomer training, and record keeping for U.S. export-control purposes as well as Sun's. He gave the Chinese several copies of both a distributorship contract and the interim quantity purchase contract, and the Chinese took them off to translate and study. In the meantime, the Americans signed a letter of intent that broadly stated our intentions, without the specific commitments of a contract.

Plans were made for getting a system into China for demonstration purposes, and the Americans spent a lot of time hammering out what would be a safely realistic timetable that would still be as fast as possible. The Chinese really got into it with great enthusiasm and determination, as did the VP and David, and after work they fueled their expectations with quart after quart of Tsingtao beer.

The Americans went back to America and set about the arduous business of getting an export license. A demo license wouldn't have been much trouble, but they agreed that the demo application should be consistent with the much more detailed and precise data required for an export license for a series of sales. The U.S. government requirements for pages and pages of technical data are framed in terms and measurements that no one uses anymore, and so not only are they very hard to understand, but the data are not available and have to be measured and computed especially for the purpose. It costs a lot of money and time to get together a proper license application.

Meanwhile, the Americans made arrangements for four Institute people

to come to Sun's headquarters factory for training. Sun had agreed to provide the training and travel and living expenses and build the cost into the price of the first systems to be sold. That is because in China they can get approval for paying foreign exchange for hardware with about one-fiftieth the hassle it takes for "software"—like training.

It took three months and a good many thousands of dollars to get the license application prepared and filed and the demo license issued; to get the trainees passported and visaed and transported and housed and acclimatized and trained; and to get the right configuration of the Sun system and all its peripheral necessities produced and tested and ready to ship. Meanwhile, David was in touch with Yang and the other Institute people about shipping dates and arrangements, visas for the VP and a technician, getting a formal purchase order for the first system, and all the other little details.

At last the demonstration was almost ready to go. David went back to Shanghai to make sure all was there. This time it was stifling hot instead of bitter cold outside, and by this time the Chinese were considered good enough friends that they didn't need the prized and much-in-demand foreigners' meeting room, with its heaters and air-conditioners. Sometime they were in the glass-topped-table room and sometimes in a bare, drab little room with four red imitation-leather upholstered chairs and two side tables for the tea.

They made detailed plans for the demonstration, down to times and places

and the subjects to be covered in lectures by the VP and the technician. David wanted to get the commercial and administrative plans straight, so he had a list of about fifty points, covering everything from the correct shipping address, through payment terms, to how they would handle orders and the resulting paperwork. It took an entire half-day to go over all the points and discuss them, and he had to adjourn for dinner before he knew the answers to any of them.

When the Plans for the demo were all pinned down, David went back to the rest of the plans, specifically how the Chinese wanted to pay for that first system. There was a pause while each of the Chinese seemed to wait for another to speak, and then both sides had the following exchange:

"Well, we should be able to find a buyer within six months."

"But I thought you were buying it," David said innocently.

"No, we don't have any foreign exchange allocation."

"But you said you had foreign exchange earmarked for buying ten systems."

"Well, we did, but we spent that for Japanese cars."

"But you gave us a purchase order."

"Well, we thought we had a buyer then."

"What happened to the buyer?"

"They bought another system."

"But Sun has been relying on that purchase order."

"We are sure we can find a buyer."

"But the first system was to be for your own use. How can you be a sales and service center without a system of your own for demonstrating and for

training service people?"
"Other companies have come here and brought their own people to demonstrate and service their systems. We think Sun should do that if they want to compete."
The tone was getting aggressive-defensive, and the facial expressions aggrieved.
"But you asked us to invited Sun to come."
"They should be glad we are giving them an opportunity to come to China. China is a very big market; they should be willing to make an investment to get started."
"But until now that isn't what you told us to tell them."
"Sun should honor the spirit of the letter of intent they signed, they owe it to us, and for them not to go ahead will look very bad for them."

The conversation was a lot longer than that, as David went back over it again and again, hoping he had misunderstood. But finally he had to understand: plans for the demonstration were in great shape and they were ready to go; there were no other plans beyond that.

As the meeting drew to an end, Yang asked, "Does this mean there might not be any demonstration?" David said, "Indeed it does, but the decision will be up to Sun."

Almost everyone has seen the Chinese yin-yang symbol: the circle that is half white and half black, divided by a spiral whorl in the center. It sym-

bolizes the principle of duality and complementarity, that everything in the would is composed of equal portions of opposites. In this case, the exhilaration of David's trip to Sun in the winter was balanced by the depression of his return trip in the summer. Why did this happened? David had no answer but he had a lot of anxious and angry conjectures.

Lets look at the human story behind this horror story:

Before

(The Chinese system call for many meetings, often small ones, each to decide a small point and then check it out with everyone else involved. The following scenario condenses all those meetings into one for the sake of brevity.)

Wang would be senior person, and the order of rank observed, but not as strictly and formally as when meeting with strangers—and no more so than in any Western meeting of people holding different ranks in the company. Wang would act as chairman, for the most part, not taking sides or positions until his decision was needed on a difficult point.

"The Americans are coming back in two weeks. Are we ready for them?"
"We are all ready for the demonstration. We have sent out announcements and invitations, and we have Professors Ren and Gu ready to supervise it."
"We have the demonstration hall reserved, and we have spoken to customs about clearing the system in through the airport."

"Good. Any news on the application for approval to sell systems?"

"Still no word from the Ministry, Lau Wang." (Only Vice Director Lu would use the familiar-respectful term Lau, which is the equivalent of "Old Man" or "Old Buddy".)

"But my second uncle's wife's sister's husband's cousin works at the ministry and he found out for me that the responsible person at the Ministry doesn't think anyone should be permitted to buy the system."

"Can we influence the responsible person?"

"Maybe, but not right away. My relative can't approach directly."

"That's too bad. Our own bureau is still studying the question of approving foreign exchange for purchasing the first system. So they won't help."

"But we told them we wanted to buy it, not that we would."

"I think they think we said we would."

"Well, that's too bad. We only said that we were planning to."

"Our telex said we would."

"Well, it shouldn't have said that."

"Xiao Yang," (Xiao is the opposite of Lau: an affectionate respectful diminutive akin to "Young Man"), "What did you find out about the foreign exchange allocation?"

"The official at the Bank of China responsible for out foreign exchange is a school friend of my wife's younger brother, so he kept the allocation open as long as he could. But the authorities were afraid that the allocation would lapse, so finally they insisted on using it to buy Japanese cars in the last month of the fiscal year."

"So that's gone for good."

"Lucky for us we didn't go to the expense of setting up that big distribution organization they wanted."

"Yes, it is. But what shall we do about the Americans?"

"Maybe we don't need to do anything. They seem to have been happy so far."

"They are happy, all right. But they keep talking as though they are happy with our agreement to buy a system and sell others."

"They must know things aren't that simple. They have to get approvals from their authorities, they must know we do too."

"They should be happy with all we've done for them, bringing them right into the heart of our affairs. Without us they could have spent years talking to the Ministry and the Foreign Trade Corporation."

"If need be, I can talk to a cousin at the University of Hunan—he says they have an unused foreign exchange allocation."

"Well, yes, but we can wait on that. They have gone this far on only a letter of intent, so surely they'll go through with the demonstration and we can work on the next step after that."

"And after all, we have done them a big favor by inviting them in."

After

"What? You mean they have reneged on the demonstration?"

"After we laid ourselves on the line with the ministry, the bureau, the Bank of China, the announcement, and invitations?"

"How irresponsible! Who would have thought it of them?'

"This is going to make us look terrible. I don't know what we'll say at the ministry, at the academy meeting, to the mayor's office, anywhere. We'll never be able to hold our heads up again!"

"Just goes to show you. You can never trust them. One day they are all over us like flies, the next day they've disappeared, leaving us to pick up the pieces of their broken promises."

Chapter 1

INTRODUCTION

A billion people! If they each buy just one...

If the U.S. give them technology, they'll be just like Japan...

In a country that can launch satellites, why is the plumbing so bad...

All they want is technology, and they expect miracles
from it...

China evokes countless, often contradictory, expectations and impressions. What is clear is that China will become increasingly important to the United States over the next several decades. Its impressive economic growth in recent years, if continued, will propel it into the ranks of the newly industrialized economies of Asia-Taiwan, South Korea, Hong Kong, and Singapore-but eventually on a much larger scale. China will acquire increasing political influence in would affairs as its economic, technological, and

military strengths grow. U.S. interests in Asia will be profoundly affected by China's international role.

As important as these development are, the U.S. ability to influence them is limited. China's economic growth id much more dependent on internal Chinese factors than on any U.S.actions, and China will play its international role on the basis of its own perceived best interests. What the United States can do is reinforce China's constructive choices and trends, and protect itself against the risk that Sino-American interests will again diverge.

One of the most important influences that the United States has is technology transfer. China recognizes the need to acquire new technology and new capabilities in its efforts to modernize and expand its economy. This need was one of the main reasons for ending its self-imposed isolation and for opening itself to the West in the 1970s. The United States benefits insofar as China is strategic asset, if not and ally, in the global competition with the Soviet Union. Technology transfer helps build these ties and increases China's strength vis-a-vis the Soviet Union. It also can lead to important commercial ties and to the export of American products. In addition, China is still a very poor country,and technology transfer can be an important element in humanitarian efforts to help a billion people move out of poverty. Technology transfer can also provide some of the keys China needs to meet its modernization goals. Modernization, in turn, will enhance China's position in the world.

This thesis is going to discuss the U.S.-China technology transfer on three aspects—China's need for technology; The U.S. Role in technology transfer; Economic and political implications.

1-1 CHINA'S NEED FOR TECHNOLOGY

China has considerable technological capability already, especially compared with that of other developing countries, but progress has been very uneven. Military industries in particular have been developed " pockets of excellence" that can compete in world markets. For example, China has built and launched its own experimental communication satellites and has offered to launch foreign satellites. On the other hand, much of China's civilian technology is out-of-date, if not obsolete. The Seventh Five-Year Plan (1986- 90) has set the acquisition of technology as a high priority, especially in the fields of transportation, electronics and computers, telecommunications, and energy. The plan calls for importing much of this technology. One of the Four Modernizations was to raise the level of science and technology. The others–agriculture, industry, and defense–also to a large degree depend on improvements in technology. Some of these improvements could be accomplished by the purchase of modern equipment without technology transfer, but China has limited funds for imports. China could develop some technologies independently, but in general this would be much slower and less efficient than acquiring them from abroad.

China has ambitious goals, including a quadrupling of the 1980 industrial and agricultural output by year 2000. Progress so far has been above that rate, primarily because a loosening of controls has freed a latent strength in the economy. New technology has made only a minor contribution but will be of increasing importance on the future. Goals for economic growth will not be met without improved technology to modernize industry and to alleviate constraints in energy, transportation, and communications.

Technology transfer can foster not only an increase in production, but also an increase in the quality of products. Modern industrial equipment can easily surpass the quality levels of the antiquated equipment typical of Chinese factories. Exposure to modern management practices, which technology transfer often entails, broadens the Chinese manager's concepts of what can be accomplished and how. Coupled with these new tools has been the realization of the need for quality in products if China is to compete well enough in world markets to earn the foreign exchange to continue buying technology. However, China's modernization does not yet appear to have reached the point where improvements in one sector lead to improvements in others. For instance, computers and other modern equipment sometimes remain unused because of a lack of expertise or an adequate supply of a necessary input, such as electricity.

The question is not whether China is capable of modernization, but whether it is willing to make enough of the changes required for continued, rapid modernization. Like other centrally planned economies, China

developed a pattern of decision-making that discourages efficiency and innovation, and gives the management of a productive enterprise few incentives to improve, the economic reforms have been directed at providing workers and management with incentives to increase output and quality and to improve economic decision- making. Measures taken include increasing the autonomy of enterprises, allowing them to retain and reinvest earnings, freeing up some markets, loosening price controls, and reducing the role of the Chinese Communist Party. Reforms have been successful in agriculture but less so in industry. Delays in price reform and opposition by those fearing loss of their power have slowed improvements in efficiency.

China's Open Door policy is closely related to economic reforms and is intended to facilitate technology transfer and trade. Under this policy, economic zones and coastal cities have been opened to foreign investment, and joint ventures and cooperative manufacturing have been encouraged.

To date, however, the results have been somewhat disappointing. Investments have been lower than expected, and many problems have been encountered, including high costs, shortages of skilled workers and supplies, and unfamiliarity with quality and scheduling requirements. Moreover, most enterprises are risk-averse, and the incentives for new capabilities may be weak if other constraints (e.g., energy or materials) limit production in any case. Delays and uncertainties caused by the intricacies of Chinese bureaucracy have been particularly frustrating for outsiders trying to do business. Although the Ministry of Economic Relations and Trade was established to

facilitate trade, the process is still cumbersome and full of pitfalls. If new technology is sought, approval may be needed from both the local authorities and several agencies of the central government, depending on the enterprise, the priority of the technology, and the cost.

The shortage of foreign exchange has become critical over the past year. Unlike many developing countries, China has refused to go heavily into debt, and it has had many competing requirements for its declining foreign exchange reserves. Decisions on which technologies to import are now frequently biased by considerations of how much foreign exchange can be earned rather than by how much the Chinese economy would benefit. petroleum technologies have been particularly favored because petroleum is one of the most important exports, even though infrastructure (e.g., electric power, transportation, communications) inadequacies have been much more of a constraint on the economy.

China initiated an economic retrenchment policy in 1988 to address pervasive economic problems by recentralizing authority over investment approval, foreign trade, materials distribution, and credit allocation. Implementation of this policy continued following the political turmoil in June 1989 and the replacement of Zhao Ziyang by Jiang Zemin as Communist Party General Secretary. The retrenchment policy and uncertainty over China's future political and economic climates have cooled foreign investor and banking interest in China. Chinese leaders have, however, stated that the Open Door policy will be no change toward trade and investment.

1-2 THE U.S. ROLE IN TECHNOLOGY TRANSFER

The technology transfer from the United States is from private companies. Although most U.S. firms approach the China market with the intent to sell products, many find they must include technology transfer if they wish to gain access to the China market. The variety of experiences are illustrated by the following examples:

* General Electric won two large orders for locomotives in part by a willingness to transfer the technology of materials and manufacture. G.E. is not setting up any manufacturing facilities in China, though an important apart of the contract stipulated that China would produce several of the parts for the locomotives. The first contract took several years to negotiate. The second needed only a few months, largely because trust had developed among the participants. G.E. was also flexible in tailoring the locomotive design to Chinese requirements.

* American Motors established a joint venture with the Beijing Automotive Works to produce AMC's Cherokee model. Initial production has used parts sent from the United States. The intent was to increase the local content as rapidly as possible, but China has been unable to produce parts and supplies in the quantity and quality required. As a result, costs are high and export of the Cherokees has been impractical. China's foreign exchange

crisis interfered with the purchase of U.S. parts, leading to a shutdown of the plant for 2 months, though a compromise has allowed restart.

* McDonnell Douglas has started co-production of 25 MD-82 twinjet transports with the Shanghai Aviation Industrial Corp., following a sale of 5 to China. The planes are being produced partially under the direction of Americans, with the first plane expected to fly in 1987. Training will also be provided for the Chinese in the United States. The planes are to be certified for airworthiness by the U.S. Federal Aviation Administration, which provides an explicit standard for quality control.

One hallmark of these cases is the lengthy negotiations.The McDonnell Douglas agreement took 10 years, for example. China's shortage of foreign exchange has become a critical problem in cases such as AMC's joint venture. The import of supplies and the repatriation of profits are difficult. Recent Chinese regulations require foreign ventures to export or supply advanced technology in return for access to China's market. In many cases, however, the quality of the goods produced is not up to international standards, which greatly limits exports.

In addition, taxes and unexpected expenses have made China one of the most expensive places in the world in which to do business. A company usually cannot hire its own employees; they are supplied by the state at a cost far higher than their actual salaries, and they cannot easily be replaced if they are incompetent or are transferred by the state. One of the main ad-

vantages of manufacturing in China—low-cost labor—is thus lost. Chinese managers also tend to be very cautious and frequently seen to lack a spirit of innovation.

High costs and bureaucratic rigidities are particularly difficult for small companies to manage. Few can afford to have a representative in China or continue negotiations for extended periods. Small companies are also particularly disadvantaged by complex export controls. However, some small companies have established profitable niches, particularly in the sale of specialized equipment.

Overall, businesses report mixed results in China. Some have lost money on early ventures, in the hope of building a profitable, long-term relationship, only to find China turning to competitors or dropping those imports altogether. The investment climate is particularly poor in addition to Chinese student movement. Foreign investment dropped by over 30 percent in 1989. China's leaders have recognized that foreign companies are being deterred by many regulations and costs over which the Chinese Government has control, as well as by more intractable deficiencies in skilled man-power, infrastructure, and resources. Significant steps have been taken to improve the atmosphere for foreign business (e.g., preferential tax treatment), but it remains to be seen whether these will be adequate.

It should be noted that some U.S. companies are doing quite well in China, particularly those that are not involved in joint ventures or other

manufacturing investments. Two-way trade is over $8 billion and is still rising. Some companies recognize that it takes a long time to get established but are convinced that eventually the Chinese market will justify their patience. Others are waiting for other markets to improve, and anything sold to China will help bridge a gap, even if at little or no profit. U.S.

The presence of 40,000 Chinese students and scholars in American universities has been one of the most effective forms of technology transfer. Most students are in science or engineering courses. It appears that most students leave with friendly personal ties as well as an education. There is a evident that this will lead to political benefits for the United States in the student democracy movement (e.g., appeal to democracy and political reform with the economic reform together which U.S. strongly support). Consequently, this will lead to commercial benefit as well, sooner or later.

1-3 ECONOMIC AND POLITICAL IMPLICATIONS

Technology transfer will have profound long-term impacts on China's economic and political future. Some sectors such as consumer electronics will benefit considerably because the industry has a head start or because the technology is more easily assimilated. Past experiences suggest that others will find foreign technology to have little effect because the industry is unprepared. Dissemination of the management concepts of quality, efficiency, and

timeliness may be the most important result of technology transfer. Improvement in the quality of Chinese products (necessary for them to compete in international markets) may be the first general impact of technology transfer to be visible.

It appears quite probable that China's economic growth will remain high (above 5 percent and possibly over 7 percent). The goal of quadrupling the 1980 output by year 2000 should be attainable, though several factors could interfere. Foreign exchange limitations, energy constraints, and political instability could all hold the growth rate down.

China's exports should also rise rapidly over the next 15 years, but the competition with American products will not be great. The newly industrializing economies, including Korea, Taiwan, Mexico, and Brazil are more likely to feel the competition. Direct competition with either industrialized countries or less developed countries is less likely because the product mix will be different. One exception may be American agricultural exports to Asia, which could be hurt by rising Chinese surpluses. On the whole, however, China's increased role in the international economy should be beneficial for the United States.

Several factors may slow China's export growth: rising protectionism in the developed countries may preclude growth in sectors, such as textiles, where China is strong. Diminishing foreign exchange reserves could limit China's ability to invest in new productive capacity.

There is a strong relationship among modernization, economic reforms, political changes, and technology transfer. As long as modernization is a prime goal (as it has been for the last 13 years), most economic reforms made to date will be retained. Modernization depends on technology transfer to achieve more efficient production, and further economic reforms will be needed to assimilate technology. However, the economic reforms are straining the political system, as evidenced by reactions to last year's public demonstrations. If political reforms do not reinforce economic reforms, modernization is likely to be slow.

Some of the more difficult economic reforms have yet to be implemented. Price decontrol is essential for rational economic decision-making, but it strikes at the heart of the concept of the planned economy. Mobility of labor would increase productivity but would bring unaccustomed social dislocations. Recent developments suggest that there is a strong resistance to reforms such as eliminating the control of Communist Party cadres over factory operations. If China insists on making ideology preeminent, it is unlikely to greatly improve its economic efficiency.

If China's modernization program turns out to be even a partial failure, there are likely to be negative implications for the United States. A society disappointed and frustrated from unmet expectations of economic improvement would be more susceptible to political extremism, which could easily have ramifications for Taiwan and Korea. However, successful reforms will

create their own problems. Rising expectations of the population and critical environmental problems will make enormous demands on the leadership. Economic and political changes are creating an environment that will encourage a pluralism of ideas and a liberalization that is incompatible with traditional Communist Party control. It remains to be seen whether the party can accommodate itself to these changes and define a new social role, or whether it will attempt to slow modernization to preserve its control. The present problems of the reform movement indicate that the party conservatives still have considerable power, but China's political evolution is likely to exhibit many unpredictable shifts. As a matter of fact, there is a political reform movement all over the world nowadays.

Chapter 2

CHINA'S NEED FOR TECHNOLOGY: 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 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.

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.

2-1 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 consumption norms in industry could not meet the best levels set in the 1960s." *1

Rate 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 share.*3 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 counties, 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 in fixed 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 work from the civilian economy prevented the latter from benefitting 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 mew 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 redirections of policy. In this context China began experimenting with extensive reforms in the economy, and the major 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 40,000 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.

2-2 THE CHNIESE 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 fundamental 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 therefore have a secondary role in resource allocation.*10

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, 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 had met these conditions. In practice, China's CPE does not run as the formal design would suggest. *11

China began experimenting with the operation of a CPE in the late 1950s mainly by decentralizing decision-making 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.*13 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 competition 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.*15 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 one-fourth and one-third 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 particu-

lar, 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.

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 decision-making 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 priorities, new sources of growth, and changes in economic institutions and behavioral rules that are part of the reform program.*17

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 decision-making. Accordingly, the reform measures adopted have been aimed at the incentive structures at work and at altering the loci of decision-making. 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 if 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 form 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 macro-economic 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 macro-economic (as well as micro-economic) 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 the 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 implementation.

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. Reportedly, growth in the rural industry sector continued to be around 40 percent fome 1985 to 1989,*18 Indeed, growth at this rate has become very troublesome for central policy-makers because it has led to distortions in national investment and to the waste of raw materials. Central authorities have therefore attempted to limit the rate of growth by

the policy of economic retrenchment.

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 are 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.*19

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.

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-Leninist regime. *20 The conflicts in Beijing in early 1987 and the political turmoil in June 1989 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.

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 call 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 capital 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 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 of 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, formation 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 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.

Clearly discernable in the language of the plan is a sense of the inter-

relatedness 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 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 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 Five-Year 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.

Current Economic Situation And Challenges

In spite of the promises of the Seventh Plan, China's developmental problems remain formidable. The shortage of available energy remains a fundamental constraint on growth. The underdevelopment of transportation and

communications is severe.*26

As early as 1985, the Word Bank explored the growth prospects of the Chinese economy for the remainder of the century. While accepting that China may reach its quadrupling goal, the bank study also considered constraints on growth from energy, raw materials and infrastructure shortages and from managerial difficulties hold growth below the quadrupling rate.*27 However, Chinese authorities did not publicly altered the quadrupling goal in response to the World Bank analysis. China's economy has grown rapidly in recent years. GNP grew more than 11 percent in real terms in 1988, driven by a 20-percent increase in real industrial output. The overheated growth of manufacturing and capital investment worsened already acute energy and raw materials shortages.*28 (See table 1 as a reference).

China's trade deficit widened as imports rose sharply to meet rising industrial demand for raw materials and to offset production shortfalls of grain and other agriculture goods. Strong capital inflows, however, enabled China to increase foreign exchange reserves to US$17.6 billion at year- end.*29
To cool down the economy and to strengthen the central government's macroeconomic control, the government adopted a program of economic retrenchment and restructuring in September 1988. Credit limits were imposed (particularly for fixed asset investment), key prices frozen, construction projects cancelled, and interest rates on savings raised. By October 1989, GNP growth had slowed to 5 percent. Inflation had dropped from 27 percent in the first quarter to 11 percent. Growth in money supply had been

brought in line with economic growth. The burgeoning trade deficit was being brought under control. The government devalued the renminbi (RMB) in December from RMB 3.7 to US$1 to RMB 4.7 to US$1.*30

Implementation of this policy continued following the political turmoil in June 1989 and the replacement of Zhao Ziyang by Jiang Zemin as Communist Party General Secretary. In November 1989, the Fifth Plenum of the Thirteenth Party Congress of the Chinese Communist Party decided to continue the policy of economic retrenchment and restructuring for the next few years. This policy has been successful at the macroeconomic level in a decision-making through administrative fiat and greater centralization of foreign trade, the production and allocation of key commodities, fiscal authority, and credit issuance risks bringing the economy to the brink of recession has raised serious questions about China's commitment to fundamental, market-oriented reform.*31

In October 1989 industrial production dropped 2.1 percent compared with the previous October. Cash-starved enterprises—particularly the large- and medium-size backbone enterprises—are enmeshed in a web of interlocking debt. Meanwhile, state-owned enterprises in key industries receive preferential access to credit and raw materials, at times jeopardizing economic efficiency. Retail sales declined 8.2 percent in real terms during the first three quarters, causing inventories of unsold goods to pile up on store shelves and in warehouses. As industry tries to make ends meet, wage growth has slowed, and unemployment and underemployment are on the rise. The government

officially estimates that unemployment will double from 2 to 4 percent by year-end; unofficial estimates are much higher.*32

Attempts to regain control over macroeconomic decision-making through greater centralization of foreign trade, the production and allocation of key commodities, fiscal authority, and credit issuance have also slowed the momentum of economic reform and liberalization.*33

For 1989, the Embassy estimates real GNP growth in the range of 5 to 6 percent, fueled by industrial growth of below 7 percent. The 1989 year-end retail price inflation rate could decline to 6 percent. Due to the high inflation experienced during the first half of the year, though, the official figures for average annual inflation will still be close to 20 percent.*34

Agricultural output will likely achieve the 4-percent growth targeted for 1989, thanks to a fairly good harvest of the major grain crops. Better advanced planning and timely credit support from the central bank indicate that there will be no extensive repeat of the situation in 1988 when there was widespread use of IOU's to pay for grain required to be sold to the state.*35

China's new political leadership has reaffirmed the central importance of agriculture in the Chinese economy. Modest price increases for cotton and grain have been announced.*36 To increase agricultural output, though, the government will continue to rely primarily on non-price incentives: increased

applications of science and technology, improvements in the irrigation system, greater use of hybrid rice and crossbred corn seed, and development of agricultural infrastructure. Monopoly government control of fertilizer and other inputs, instituted to check profiteering, will be retained. The role of large-scale farming, particularly near major urban areas, will be expanded on a voluntary basis as the government seeks to improve agricultural efficiency perceived lost through excessive decentralization. Low yields and the decrease in arable land will nevertheless continue to frustrate ambitious agricultural growth plans.*37

Following the June political turmoil in Beijing, international financial institutions suspended consideration of new loans to China. Most new bilateral aid programs were also held in abeyance. In the wake of these decisions, commercial banks drastically curtailed long- and medium-term lending to China.*38

Chinese leaders have, however, stated repeatedly that there has been no change in the decade-old open policy toward trade and investment. Many U.S. businesspeople are, nevertheless, finding their decisions influenced by China's austerity program, changes in industrial policy, attempts to recentralize control over the economy, and continuing lack of transparency in China's trade and investment regime. Potential U.S. investors report that it is more difficult to locate Chinese partners financially able to conclude joint venture contracts. U.S. exporters face tighter Chinese import restrictions, and some have experienced difficulty in obtaining timely payment.*39

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 modify the policy to improve the business climate in China. It is important to consider some of the features of the open door policy, and some of its problems, in greater detail.

2-3 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 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. (CITIC) 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 recently, 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.*40

Thus, much has changed in China's interactions with the world economy since 1978. 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. For instance, the Commerce Department estimates that the value of US high-technology exports to China increased from $600 million in 1982 to $1.7 billion in 1988. The total comes to more than $8 billion.

US High-Technology Exports to China *41

Year	Total Dollar Value (billion)
1982	0.63
1983	0.65
1984	0.82
1985	1.71
1986	1.28
1987	1.43
1988	1.72

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 over-valuation 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.*42

In response to criticism of its investment climate, the Chinese Government is devising ways to overcome some difficulties; for example, facilitating exchange of surplus foreign currency for renminbi yuan between foreign- invested enterprises and statutorily limiting the approval process to 3 months. Economic laws are being promulgated to regulate the business environment and protect legitimate business activities. After the June political turmoil in 1989. China's leaders have repeatedly stated that there has been no change in the decade-old open policy toward trade and investment. Moreover, in the long run, if the government's current retrenchment policies are successful in curbing inflation and restoring the conditions necessary for a resumption of economic reform, U.S. business will benefit from a more stable economic environment in which to trade and invest.*43

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 June 4 Tiananmen Square massacre. 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.

These underlying problems have several components and are inseparable from the often irrational operation of domestic institutions. First, there is a basic ambiguity about China's overall development strategy. Is it to be an export promotion or import substitution strategy? Or 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 domes-

tic needs and problems. China's past strategy of self-reliance and regional self-sufficiency led to a dispersion of industrial products. 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.

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 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 decision-making. 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 macro-economic 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 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, It has also led to irrational, duplicative technology imports.

The problem of policy-making 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 holding) and allows for decentralized decision-making 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 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 decision-making strategy for intrasectoral or intraindustry technology transfer.*44

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 need, such a formulation or strategy does not exist.

TABLE 1

PEOPLE'S REPUBLIC OF CHINA: KEY ECONOMIC INDICATORS

	1988	1989 Projected (Revised)	1990 Projected
Domestic Economy 1/			
Population (millions)	1,096	1,111	1,127
Natural Rate of Population Growth (%)	1.4	1.4	1.4
Official Unemployment (avg. % for year)	2.0	4.0	5.0
GNP (billion yuan)	1,385	1,558	1,720
Real GNP Growth (%)	11.2	6.0	5.0
GNP Per Capita (yuan)	1,264	1,402	1,526
Real Per Capita GNP Growth (%)	9.4	4.6	3.5
Gross Value Indus. Output (billion yuan) 2/	1,810	2,045	2,352
Real Growth GVIO (%)	20.7	7.0	5.0
Industrial Productivity Growth (%)	8.8	7.0	3.0
Gross Value Agric. Output (billion yuan) 2/	562	618	705
Real Growth GVAO (%)	3.2	4.0	4.0
Retail Sales (billion yuan)	744	737	848
Real Growth Retail Sales (%)	12.2	-7.0	5.0
Total Fixed Asset Investment (billion yuan)	431	387	430
Real Growth Fixed Asset Investment (%)	6.8	-16.0	1.0
Domestic Finance			
General Retail Price Index (CPI) (% change)	27.7	6.0	10.0
Domestic M-2 Money Supply (billion yuan)	1,077	1,184	1,302
M-2 Growth Over Prior Year-End (%)	20.3	10.0	10.0
Govt. Budget Surplus/Deficit as % of GNP	-1.9	-2.3	-2.4
Balance of Payments (US$ billions)			
PRC Exports (FOB)	47.5	53.2	59.6
PRC Imports (CIF)	55.2	64.0	69.1
Trade Balance (BOP basis)	-3.3	-7.8	-6.6
Current Account Balance	-1.3	-7.0	-5.2
Foreign Direct Investment (paid in)	2.6	2.6	1.8
Foreign debt, year end (estimated)	40.0	44.0	48.0
Debt Service Paid (estimated)	4.0	5.0	5.5
Debt Service Ratio (% of exports)	8.4	9.4	9.2
Foreign Exchange Reserves (year-end)	17.6	17.0	16.0
Average Exchange Rate for Year (yuan/$) 3/	3.7	3.7	4.7
U.S.-China Trade and Investment (US$ billions) 4/			
U.S. Exports to China (FAS)	5.0	6.0	6.2
U.S. Imports from China (FAS)	8.5	12.1	15.1
U.S.-China Trade Balance	-3.5	-6.1	-8.9
U.S. Share of Chinese Exports (%)	18.7	22.7	25.3
U.S. Share of Chinese Imports (%)	9.1	9.4	9.0
U.S. Investment (Cumulative, Approved)	3.3	3.7	4.0
U.S. Share of Total Foreign Investment (%)	13	12	10

Source: U.S. department of commerce, FET May 1990.

PEOPLE'S REPUBLIC OF CHINA: KEY ECONOMIC INDICATORS

	1987	1988	1989 Projection/
Domestic Economy 1/			
Population (millions)	1,080	1,096	1,111
Natural Rate of Population Growth (%)	1.4	1.4	1.4
Official Unemployment (avg. % for year)	2.0	2.0	3.5
GNP (billion yuan)	1,092	1,385	1,787
Real GNP Growth (%)	9.4	11.2	9.0
GNP Per Capita (yuan)	1,011	1,264	1,608
Real Per Capita GNP Growth (%)	7.9	9.4	7.2
National Income (billion yuan)	915	1,153	1,487
Real National Income Growth (%)	9.3	11.4	9.0
Gross Value Indus. Output (billion yuan) 2/	1,378	1,810	2,444
Real Growth GVIO (%)	16.5	20.7	15.0
Industrial Productivity Growth (%)	6.4	8.8	8.0
Gross Value Agric. Output (billion yuan) 2/	445	562	697
Real Growth GVAO (%)	4.7	3.2	4.0
Retail Sales (billion yuan)	582	744	967
Real Growth Retail Sales (%)	9.6	12.2	10.0
Total Fixed Asset Investment (billion yuan)	352	431	420
Real Growth Fixed Asset Investment (%)	9.2	6.8	-15.0
Domestic Finance			
General Retail Price Index (CPI) (% change)	7.3	18.5	20.0
Market Price Index (% change)	22.0	31.9	30.0
Domestic M-2 Money Supply (billion yuan)	895	1,077	1,292
M-2 Growth Over Prior Year-End (%)	23.4	20.3	20.0
Govt. Budget Surplus/Deficit as % of GNP	-1.6	-1.9	-1.7
Balance of Payments (US$ billions)			
PRC Exports (FOB)	34.7	47.5	52.8
PRC Imports (FOB)	36.4	50.8	60.1
Trade Balance (BOP basis)	-1.7	-3.3	-7.3
Current Account Balance	0.3	-1.3	-5.3
Foreign Direct Investment (paid in)	1.9	2.6	2.7
Foreign debt, year end (estimated)	30.2	38.0	46.0
Debt Service Paid (estimated)	2.5	4.0	4.5
Debt Service Ratio (% of forex revenues)	6.3	8.0	8.2
Foreign Exchange Reserves (year-end)	15.2	17.6	16.0
Average Exchange Rate for Year (yuan/$) 3/	3.7	3.7	3.7
U.S.-China Trade and Investment (US$ billions) 4/			
U.S. Exports to China (FAS)	3.5	5.0	6.0
U.S. Imports from China (FAS)	6.3	8.5	10.2
U.S.-China Trade Balance	-2.8	-3.5	-4.2
U.S. Share of Chinese Exports (%)	18.2	18.0	19.3
U.S. Share of Chinese Imports (%)	9.6	9.8	10.0
U.S. Investment (Cumulative, Approved)	2.9	3.4	3.7
U.S. Share of Total Foreign Investment (%)	13.6	12.5	11.9

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Chapter 3

THE CHINA'S NEED FOR TECHNOLOGY: STRATEGIES AND ISSUES FOR TECHNOLOGY IMPORTS

Chinese leadership has consistently stressed the central role of science and technology for China's modernization. It would be impossible to reach China's overall economic goals by year 2000 without major contributions from modern science and technology. The challenge for Chinese planners has thus been to develop a workable strategy and consistent plan for scientific and technological development. After some false starts in the late 1970s, a coherent set of objectives began to take shape in the 1980s.

3-1 GOALS FOR TECHNOLOGICAL MODERNIZATION

China has four categories of goals for technology. The first is for Chinese industry to reach at least the present Western level of technology by year 2000. This will require a major effort at revitalizing established industries,

including a special, well-funded program of "technological transformation", which is being administered by the State Economic Commission (SEC).

The second objective is to ensure that modern technologies are diffused to China's rural areas. The interest here is not only to continue with the technological transformation of agriculture, but also to provide a modern technological foundation for burgeoning rural industry. China expects that the coming decades will see major movements of the labor force out of agriculture and into rural industry and services. A special project, the Spark program, administered by the State Science and Technology Commission, is designed to provide technological inputs into this major shift in the occupational structure.

A third objective is to give priority to the technologies needed to develop the country's infrastructure and natural resource industries. Thus, a wide variety of technologies pertaining to energy, telecommunications, transportation, and resource exploitation are targeted for acquisition and development. This part of the strategy, by necessity, involves the activities of many Chinese agencies.

Finally, the Chinese have identified a number of technologies that they believe will be the basis for new high-technology industries—electronics and computers (including advanced software applications such as CAD/CAM), biotechnology, materials, robotics, lasers, and space and ocean technologies. The Chinese expect these technologies will lead to major industrial advances

and have targeted them for special attention in the hope of becoming competitive.

The achievement of these goals will require the modernization of the domestic research and development (R&D) system. But the Chinese also realize this cannot be achieved without the transfer of foreign technology to China. It is important to note , however, that the various goals entail different approaches for acquiring the appropriate technology. Whereas much of the technology desired is in the hands of foreign companies, some of it (e.g., transportation and telecommunication technologies) is in the hands of foreign governments or public corporations. In addition, the Western university is the locus of the knowledge needed to launch high-technology or science-based industries. The sending of students and older scientists abroad to a Western university for advanced training, therefore, can be seen as an important channel for technology transfer.*1

To gain access to these sources of technologies and use them effectively, the Chinese have initiated programs of domestic reform and have made extraordinary changes in their approaches to foreign relations.

3-2 THE DECISION-MAKING SYSTEM

Without a clear national consensus on the proper course for technology transfer, different perspectives and interests have led to a fractured decision-making system in China. Indeed, organizational complexity is often a dominant factor in China's relations with Western enterprises and is a major

obstacle to China's modernization.

China's record of choosing, importing, and assimilating technology has been much influenced by the operation of its decision-making institutions, and particularly by the overlapping central and regional jurisdictions that characterize the decision-making system. For instance, coordination between the central ministries and between decision-makers in Beijing and those at the province and enterprise levels has not always been good. Decision-makers in Beijing who make purchasing decisions about foreign technology have not always had a good understanding of the technical problems in the field. There is a lack of coordination between the economic commissions at various levels of government and the science and technology commissions.*2

The Chinese in recent years have sought to rationalize their decision-making for technology import policy, with mixed success. China's problems are in part a function of reconciling the many domestic bureaucratic interests in foreign technology into a coherent position.

A related problem is that of reorganizing a foreign trade bureaucracy that was set up originally to conduct trade with other socialist countries. In the original scheme, a centralized Ministry of Foreign Trade (MFT), was chiefly responsible for the conduct of trade and for the centralized allocation of scarce foreign exchange.*3 China's former MFT oversaw eight national foreign trade corporations specializing in different commodities. As trade expanded rapidly, old system was not able to handle this increase and became

an obstacle to further growth in trade. Gradually, foreign trade corporations were set up under other ministries, not directly under the MFT. Further complicating the situation was the granting of greater trade autonomy to local governments as part of the decentralization experiments. To bring some coherence to this system, the old MFT was combined with three other central trade agencies in 1982 to form the Ministry of Foreign Economic Relations and Trade (MOFERT).

Yet uncertainties remain about how the system works largely as a result of a series of centralizations and decentralizations of foreign trade decision-making authority. For both economic reforms generally and for technology imports, the Chinese are still searching for the right balance between centralization and decentralization and between the achievement economy and the encouragement of local initiative.

The foreign trade apparatus also shows a tension between the influence of the planning system and the play of the market. China clearly plans some of its technology procurements. For instance, the SEC had an import plan for the 1986-1988 period that contained some 3,000 items of technology for its national effort to renovate small and medium-sized enterprises.*4 Planning targets for other types of projects were also established.

In recent years, however, as enterprises have been allowed to retain foreign exchange, there has been a drift toward a more decentralized, market-driven approach to technology acquisitions, This trend and the attendant

fear that the center will lose all control over technology imports have led to recentralizing technology transfer policy and foreign exchange controls.

The Chinese system for decision-making on technology imports is very complex and, at least for outsiders, uncertain. In the cases considered for this report, OTA saw considerable confusion about how decisions are made. There was also evidence of decisions being changed, sometimes because of changed circumstances, but also because of the underlying fluidity of the decision-making system itself.

Decision-making procedures vary according to the size of the project and the type of control over the project (central or local). Often, but not necessarily, these variations can be explained by the type of industry involved. The electronics industry, for instance, has experienced considerable decentralization, while the energy industry has retained greater centralization.*5 Decision-making also varies according to the mode of transfer being used; decisions concerning joint ventures, for instance, will involve different procedures and regulations from those involving licensing.

A further complication is the relationships that exist between the end user of the technology and the organizations that have jurisdiction over the end user. In addition,, the making of a decision can be thought of as having stages—consultation, negotiation, ratification, implementation, evaluation—that often involve different participants.*6 Finally, the system is complicated precisely because in basic ways it is changing. For instance, until recently,

the role of the banking system was not central. However, with economic reform, which has increased the role of the banks in the running of the economy generally, banks—especially the Bank of China—have also become important in foreign trade and technology imports.*7

Perspective of the Enterprise

An enterprise may not always wish to incorporate new technology into its operations. In an economy of shortages, as has been the case for some time in China, producers can sell whatever they produce, giving them little incentive to assume the risks and costs of technological change.

If a decision is made to acquire new technology, several practical decisions must follow. How quickly can the technology be procured? How easily will it be absorbed or assimilated? What level of technology should be chosen? How will it be paid for? Should it be procured domestically or internationally? The economic and technical reasons for importing technology include domestic market competition and, increasingly (as a result of government pressures to export), international market competition. Foreign technology generally results in better products. In addition, it clearly carries a great deal of prestige. An increasing number of Chinese firms are establishing "technology introduction offices" to aid in acquisition decisions.

Apart from the central question of what market exists for the enterprise's products, the Chinese environment has to considered. Is the technology available in China? Has it been targeted as a high priority by the Chinese

Government? Will it be addressed by the nation's R&D system? How much pressure does the enterprise feel to increase its exports? What kind of access does it have to foreign exchange? Can the enterprise get special benefits from the state by procuring the technology? The enterprise must also anticipate that these issues will be assessed by the layers of bureaucracy (local or national, and sometimes both) that must approve the enterprise's project.*8

Furthermore, the international environment must be considered. Is the technology available internationally, and are the agents (companies, governments) willing and able to transfer it? What mode of transfer is most appropriate for the technology, and is the adoption of that mode feasible? In this international context the importance of export controls comes in.

Hidden factors exacerbate delays from the enterprise perspective. Once a decision is made to import technology, which can be a lengthy process, the decision has to be approved by higher authorities to assure consistency with national policies, particularly those pertaining to types and levels of technology and to the expenditure of foreign exchange.*9 Thus, well before a contract would actually be signed, and indeed in some cases well before negotiations with foreign firms begin, the enterprise would have gone through considerable negotiations within its own system; anywhere from 6 to 18 months would already have passed. If the enterprise must then wait for a protracted export license decision, it could face delays of 2 years or more before the technology arrives. Given the complexities at the enterprise level, it is unlikely that there would be a simple, consistent set of benefits for choosing

one technology over another.

The willingness of decisionmakers to take risks is also an important factor. China's economic system over the years has structured incentives in such a way that decisionmakers are often risk averse. Risk aversion has been further encouraged by the history of unpredictability in Chinese politics, which has made managers unwilling to take individual actions that could expose them as targets of a future radical political campaign. Foreign partners in joint ventures have reported risk aversion and lack of initiative among middle managers as factors slowing the absorption of technology at the enterprise level. The present uncertainties are likely to aggravate this timidity.

Perhaps the most crucial factor in decisionmaking during the last few years is the availability of foreign exchange. Despite severe foreign exchange regulations, there are an increasing variety of viable strategies for obtaining foreign exchange. Some enterprises, for a variety of reasons, will be more privileged in their access to foreign exchange than others, and the technologies they demand will therefore tend to have a high priority. Central authorities are there fore challenged to ensure that the country's foreign technology needs are not determined by the pattern of availability of foreign exchange; What is best for China may not be what is best for the enterprise with foreign exchange.

The foreign exchange constraint also has a more indirect and often detrimental effect on technology transfer behavior. Because of its shortage, foreign

exchange is rationed. When projects are approved, but not necessarily before a foreign vendor is chosen and contracts are signed, enterprises are given quotas for use in going ahead with the project. There are some indications that the technology transfer strategies of Chinese enterprises are determined more by considerations of how to use the quota than by how to save foreign exchange and make the introduction of the technology part of an economically progressive decision. (Remember in the forward story, the Chinese use the quotas of foreign exchange to buy a Japanese car in stead of the computer system because of fearing the quotas would be lapse.)

In one case, an American firm that took pains to package a sale with a selling price factored in both hard and Chinese currency (in order to help the Chinese save on foreign exchange) lost the sale to a Japanese firm that offered a somewhat lower total price but insisted on hard currency for all of the settlement. The foreign exchange cost to China was thus higher, although the sale price to the enterprise was lower. Since the enterprise had a quota that had to be used (or lost), it had no incentive to save on foreign exchange. In other cases, the Chinese foreign exchange allocation system seems to have led to the overvaluing of hardware transfers relative to software, despite policy to the contrary. In accounting for the use of foreign exchange to procure technology, it is easier to point to a piece of equipment than to something as amorphous as know-how. Foreign exchange limitations at the enterprise level also keep enterprises from buying all the support items necessary for making the projects work.

The Government Perspective

Chinese authorities in recent years have tried to bring central policy guidance and coherence to the business of importing technology, issuing a variety of mew policy statements and regulations. From the perspective of the central government, the main principles for choosing foreign technology include the following. Technology to be imported should:

1. be above the level of that which is available in China;
2. be of practical use;
3. contribute to China's eventual self-sufficiency;
4. foster economic and social development;
5. be useful for generating foreign exchange.

Judgments about how to apply criteria such as these become part of the technology import decisionmaking process, and periodically various agencies, particularly the State Science and Technology Commission (SSTC), are called upon to interpret these guidelines in specific cases.

As part of an effort to protect both China's interests (particularly restrictive business practices by foreign firms) and the proprietary interests of foreign suppliers of technology, the Chinese State Council promulgated new "Regulations of the People's Republic of China on Administration of Technology Acquisition Contracts." These regulations call for their administration by MOFERT, which subsequently drew up its "Measures for the Examination and Approval of Contracts for the Import of Technology".

The regulations set criteria for the kinds of technology to be imported, limit the normal life of the technology transfer contract to 10 years, offer protection to foreign technology that falls outside the patent system, and charge MOFERT with establishing a system for reviewing and approving technology transfer contracts. As of this writing, it is still too early to judge the longer term effectiveness and the consequences of these new procedures. Some of their ambiguities have been noted,*10 and complaints have been heard that demands by MOFERT for guarantees that the technology transfer will be successful place a heavy burden on the foreign supplier and lead to higher costs.*11

The regulations do seem to strengthen the hands of the central government over enterprises and localities. It also seems that the regulations were inspired by China's examination of the experiences of other developing countries that tried to centralize authority over technology transfers to protect national interests from the economic power of multinational enterprises.

The most important organization for technology transfer decisionmaking in the central government are the State Planning Commission (SPC), SEC, MOFERT, and SSTC. In addition, the ministries having cognizance over the technology in question also play an important role. For very large projects or projects of special national importance, decisions would be elevated above the SPC level to an appropriate level, such as the Leading Group for the Invigoration of the Electronics Industry, or the Science and Technology Leading

Group, or perhaps to the State Council itself.*12

The role of the SPC in the Chinese economy is to prepare 1- and 5-year economic plans and to assure that financial, material, and human resources are made available for the execution of projects included in the plans. This includes annual authorizations to expend foreign exchange. Since the SPC can give only limited attention to specific project proposals for importing technology, it focuses on strategic commodities*13 and technology transfer projects with a value of US$5 million or more. There are exceptions to this $5 million figure, however. The central government has delegated to the Shanghai municipal government, for instance, the power to approve projects up to the limit of US$10 million and the power to approve joint venture projects up to $30 million.*14

The SEC has traditionally implemented the plans. In recent years, the SEC has also assumed both the leading role in implementing the economic reform program and the responsibility for introducing modern management to Chinese enterprises. Its most direct role in technology transfer decision-making, however, is related to its responsibility to see to the technological transformation (jishu gaizao) of established Chinese enterprises.

The mission of MOFERT is to plan and administer foreign trade. Through the activities of its Technology Import and Export Department, it provides policy advance on China's needs for a given technology, its ability to absorb the technology, and the likely overseas sources.*15 MOFERT also approves

the language of technology transfer contracts to ensure that it conforms with the country's regulations, and it takes the lead in proposing new regulations or revisions and clarifications of existing regulations. It also serves as the cooperating partner with the U.S. Trade and Development Program. In addition, it certifies transfers in keeping with understandings reached with the Coordinating Committee for Multilateral Export Controls (COCOM) as part of the latter's liberalization of export controls.

The SSTC does not have a direct ongoing role in decisionmaking for the import of commercial technology, but is an important participant nonetheless. It is centrally involved in importing technology for the national research and technological development projects. It controls and can also play a decisive role in providing technical assessments of important pieces of technology to be imported. Further, the SSTC plays a key role in setting national technology policy. This includes statements of priority about which technologies China should expect to have by the end of the century and whether these will be acquired by importing technology or by developing it indigenously. These statements of policy serve as points of reference for the SSTC's own assessments of proposed projects and also guide the decisions of other participants in the system.

Many enterprises in China are local rather than under central control. The local government level has counterparts to the central government decisionmakers discussed above. These include planning, economic, and science and technology commissions; a bureau of foreign trade; and enterprise bu-

reaus for different industries. In some cases, as with the central government, a corporate organization may exist between the enterprise and the industrial bureau. The level of decision will depend on the value of the transaction. In all cases, however, the contract must be approved by the foreign trade bureau.*16

Foreign Firms

Foreign firms differ in their motives and strategies for transferring technology. Some firms approach technology transfer as the sale of a commodity without presuming any equity participation in the Chinese economy. The appeal of the transaction may be tied to other corporate objectives, but basically it is a sales relationship.

For other firms, China is seen as an export platform and source of supply for components and finished goods. Such firms can be expected to transfer technology needed to accomplish those business objectives. In these cases the firms can be expected to be earners of foreign exchange for China, although, as the Beijing-Jeep case demonstrates, they may also require substantial amounts of foreign exchange during the startup period.

Other firms may be more interested in China as a source of raw materials. They too can be expected to be earners of foreign exchange, and may, if required by the Chinese, be willing to transfer technology. The foreign oil companies that have participated in Chinese offshore oil development fall into this category. In this case, a great deal of the technology is in the form

of the experience of the personnel of the companies, something that cannot be transferred readily except imperfectly via training. A small portion of the technology of the oil companies, such as exploration technology, is highly valued and highly perishable proprietary information that companies normally refuse to transfer. The Chinese have been considerably disappointed over the implementation of the technology transfer provisions in the offshore oil development case because of Chinese misunderstanding about the nature or the technology and a failure of the oil companies to understand Chinese expectations.

Other industries have different dynamics. In some areas of high technology where the Chinese have a keen interest, the very identity of the foreign firm is tied to its technology. In these industries–electronics, materials, telecommunications, biotechnology–there is great expense involved in product development and a rapid rate of product obsolescence. Markets must be expanded to distribute costs. In such highly competitive cases, technology is not viewed as a commodity to be sold, and there is great reluctance to transfer technology unless it will lead to a long-term presence in China with opportunities to design products for the Chinese market and to repatriate profits. It also requires Chinese partners who have the organizational flexibility to respond to rapidly changing technologies and business opportunities.

There are some signs that China is coming to appreciate this diversity of motives and strategies among foreign firms. The investment regulations, for instance, recognize the difference between export-oriented and technologi-

cally advanced firms that need access to the domestic market. However, there is still much in the nature of Chinese policies and in the Chinese economic and political systems that makes it difficult to accommodate the diversity of technology transfer issues.

The Foreign Exchange Constraint

Since the end of 1985, concern over the availability of foreign exchange has become an even more important element in decisionmaking about technology imports. The officially preferred way of making a decision to import technology has been to fold it into the normal planning process. If a positive decision is made on a product, then in principle the necessary foreign exchange to implement it will be provided. However, it is precisely because foreign exchange costs are a factor in judging the desirability and feasibility of the project that decisionmaking through the planning system has in recent years been biased toward projects that promise to earn foreign exchange quickly. Thus, until recently, petroleum and coal projects promising to produce exportable commodities have enjoyed a privilege denied to electric power.

As noted above, the SPC has the major role in allocating the right to expend foreign exchange to ministries, enterprises, and local governments. For the enterprise that wishes to import technology, therefore, one source of foreign exchange is that which is provided in the plan. For projects that have been included in the plan, provision is make, in principle, for the foreign exchange necessary to carry it out. This solution may not be optimal for more

complex joint venture projects, where foreign exchange needs may be very fluid.

Enterprises can also earn foreign exchange themselves. The tight restrictions on foreign exchange imposed by the state in the recent years can be thought of as an incentive for enterprises to become more active foreign exchange earners, though they are allowed to keep only a fraction of their earnings and may need permission to spend even that. The enterprise can also approach the local government or the supervising ministries for out-of-plan foreign exchange, although the accounts held by these entities may not be large.

In addition, the enterprise can attempt to buy foreign exchange from other units using local currency (renmibi) at a rate set by the Chinese Government. Or foreign exchange can be borrowed from the Bank of China if the bank approves of the project. In such cases, repayment is usually made in foreign currency. Other agencies, such as the China International Trust and Investment Corp. (CITIC), which have floated loans from foreign banks, are also prepared to lend foreign exchange.

It is clear that changes are occurring in the allocation of foreign exchange, just as in the economy as a whole. This does not necessarily mean that there is less overall central control over the total amount of foreign exchange expended. The Chinese government adopted a program of economic retrenchment and restructuring in 1988, and strengthen the central government's

macroeconomic control after the June political turmoil in Beijing in 1989.

The System in Practice

The decisionmaking system is supposed to operate as follows: Proposals for the import of technology originate in an enterprise under one of the central ministries or units of local government. The enterprise, however, is working under control figures that have already been supplied by the SPC or local authorities as a guide to enterprise planning. In developing the proposal, the enterprise typically must demonstrate the feasibility of the project through a feasibility study. The project must then be submitted to the ministry or local enterprise bureau for approval. The approving authority at this level may also conduct its own independent feasibility study. For local enterprises, the project must then be approved by the local planning committee. If the project exceeds $5 million, it must be submitted to the SPC for approval, and the SPC may also do its own studies as to the desirability and feasibility of the project.

For projects pertaining to the technological transformation of industry, the proposal would go to the SPC. For projects below the $5 million level that do not pertain directly to technological transformation, the approval decision would be made at the level of the ministry, a national corporation, or a local government.

After substantive approval by one of the bodies mentioned above, a contract defining an agreement with a foreign partner must be submitted for

MOFERT review, which involves a comparison of the terms of the contract with criteria expressed in policy regulations.

It is difficult to say with confidence that the decisionmaking actually works the way it is designed to. In addition, the decisionmaking system is embedded in an environment of bureaucratic struggles and shifting alliances, making the decision process, as well as the outcome of a decision, difficult to predict.

The problem of duplicative technology imports has been particularly evident in consumer-oriented light industry. Reportedly, over 100 color television assembly lines were imported since the late 1970s. If all were put into operation, they would more than saturate the market. To make matters worse, many of the components could not be made in china and had to be imported, resulting in a waste of foreign exchange. Similar problems were encountered with other consumer appliances, such as refrigerators and washing machines. Strong local interest in the production of floppy disks for computers has led to the proliferation of small plants to produce them, thus losing economies of scale.

A related example is the field of optical telecommunication technologies. In this case, three different Chinese organizations have been negotiating with three different foreign companies, from the United State, Japan, and Europe. Instead of coordinating their efforts, they are all going separate ways, with the possible result of duplication and excess capacity. Since this area of tech-

nology has been identified as a national priority, two units of the central government have been charged with overseeing the importing of this technology. However, because these central authorities are linked to the organizations involved with the negotiations, they are unlikely to be disinterested arbiters and coordinators.17*

Information is not available on the technical differences on whether the plant, the branch bank, or the provincial economic committee were unaware of the State Council directive or simply chose to ignore and circumvent it. Nor is it known whether the plant and provincial authorities genuinely believed that the foreign technology was most appropriate, whether they were attracted to the foreign technology simply because they assumed it was best because it was foreign, whether there was some form of corruption involved, or whether the authorities were simply incompetent to evaluate the proposed transfer in light of China's own capabilities. Any or all of these explanations are possible, given a variety of reports from China in recent years. What is clearer, however, is that from the central government perspective, this is the kind of experience that leads to duplicative imports that unnecessarily drain foreign exchange reserves.

Would the decision have been more in keeping with the national interest if there had been greater centralization? The answer to this question is not certain. The answer would almost certainly be positive if the center had a limited number of such cases to decide and could denote the necessary resources to information gathering and analyses. However, the number and

variety of technology import cases clearly are far greater than the central authorities can handle. Central planner incompetence and ignorance of local particularities is precisely the weakness of centrally planned economies, and the main justification for decentralization. While the central authorities can and do rectify grievous mistakes, as they have now done in the TV, refrigerator, and washing machine cases, routine and efficient central direction of technology imports is seemingly beyond the capacity of the system.

China has had difficulty finding an institutional formula that would allows effective central policymaking, the observance of these policies in their implementation, and the flexibility of decentralized decisionmaking. The Chinese sometimes refer to the structure of economic authority in China as a checkerboard, meaning that vertical authority emanating from the central government through ministries and commissions is crosscut by the horizontal interests of local or regional authorities. This system is sometimes also referred to as "tiao tiao kuang kuang", literally "branches and lumps," are formed when these are crosscut by regional authorities.

This system of institutions has the effect of constraining the decisionmaking effectiveness of all parties and explains why even in periods of greater centralization, central authority is not necessarily determinative even on high-priority matters.

The now-standard insistence on feasibility studies for technology import decisions is intended to inject additional technical judgments into decisions

and to force the attention of more interested parties on assimilation problems. The mechanisms for horizontal technical communication also aid in Chinese decisionmaking. Although this was not true in the late 1970s, decisions about importing technology are often informed by some of the best technical judgments in China. This is largely a result of the growth of consulting and advisory services.

However, the best technical judgments do not necessarily result in the the most appropriate technology decisions, and it seems that the full integration of technical, economic, and political criteria remains something of an ideal. For instance, the feasibility studies are not always taken seriously and are used for manipulative purposes. The prevalence of this practice, not unheard of in other countries, is not known.

A summary assessment of China's decisionmaking system for technology imports is difficult. The system is composed of elements of centralization and decentralization, of market principles and planner influences. An optimistic interpretation is that it can be thought of as a transition to a more market- driven, decentralized system. The pessimistic interpretation is that the system is stymied, stuck between the imperatives of centralization and decentralization, of market and plan.

3-3 ISSUES OF ASSIMILATION AND DIFFUSION

Acquiring technology is only half of China's problem. Once transferred, the technology must be assimilated and diffused effectively if China's mod-

ernization goals are to be achieved.

The question of assimilation is linked to the underlying issue of technological dependency on the foreign suppliers of technology. Since the end of the 1950s, China has been particularly sensitive to this issue of dependency and has striven to avoid it. Ironically, however, the policies and institutions established in the past to foster self-reliance are now obstacles to the full assimilations of technology under the new assumptions of the open- door policy. The risk of dependency thus increases as the problems of assimilation remain unsolved.

In discussing the assimilation of technology, it is useful to distinguish between production (using the imported technology), manufacturing (replicating the import), and design (the capability to redesign the technology). Overall, China's ability to assimilate production technology has been greater than its ability to absorb manufacturing or design technologies. However, it is also useful to recall the various periods of Chinese technology imports, since assimilation experience has varied somewhat from period to period.

The Chinese seemingly did better at assimilating all three types of technology during the 1950s than in the subsequent two periods. Soviet provision of blueprints, technical advisors, and training programs undoubtedly contributed to this success. On the other hand, the technology transfer experiences of the 1960s and 1970s were not notably successful in terms of thorough assimilation.*18

China's past history of importing technology suggests that many factors influence effective assimilation.*19 Choosing the right technology at the outset is clearly important. Many of the cases of unsuccessful assimilation were due to procurement decisions made by technically unqualified people, which resulted in the import of technology having the wrong properties for the intended task. Also, the Chinese underestimated the value of expertise relative to hardware, and neglected the support items necessary to make assimilation successful.

A second concern has been that managers have not been willing to make the effort to fully absorb the technology. That is, have been more interested in expanding output by exploiting the production technology without attending to the acquisition of the underlying manufacturing and design know-how. Imported technology has been seen as a shortcut to technical progress. Yet, effective assimilation requires focused attention to the problems of absorption. In addition, it requires communication and cooperation among a variety of organizations, such as enterprises, research units, government agencies, and universities. China's segmented society has often frustrated the meeting of this requirement.

Another problem has been the lack of adequate managerial know-how to employ the technology fully. This was less of a problem in the 1950s since the Chinese imported Soviet management along with the technology and had the services of Soviet advisors. In subsequent periods, however, Chinese man-

agerial backwardness became a hindrance.

China's past experience also points to the importance of having domestic R&D resources committed to the tasks of assimilation. As the Chinese currently see it (which is in keeping with international analyses as well), much of the Japanese success in assimilation was due to the attention given to adaptive engineering and R&D in support of absorption, with expenditures on the latter running five to seven times those of the purchase of the technology.*20

Although China's R&D resources are not insubstantial, they have often been poorly deployed and misused; China's best talent, for instance, is typically employed in centralized research units not physically proximate to the enterprise importing the technology. Furthermore, Chinese R&D personnel have been compartmentalized, keeping researchers and engineers from the academies, the universities, and the production ministries from working together on assimilation tasks.

China has many of the same problems of assimilation that other developing countries receiving transferred technology experience. Yet, China also has both distinctive advantages and disadvantages in dealing with technology from the international economy. During the last 2 years, the Chinese have come to realize the importance of paying special attention to the problems of assimilation. Current discussions of assimilation, however, indicate that the problems that troubled the assimilation process in the past have by no means been overcome. An examination of current assimilation problems points to

the following problems.

Technical Manpower

A first constraint facing many developing countries is a shortage of qualified technical and managerial manpower and a lack of scientific tradition. In absolute terms, China has a large pool of scientists and engineers. Even though the quality of training received by those in pool varies a great deal, and the distribution of talent by region and economic sector is unbalanced, China does have a cadre of technical specialists to facilitate technology transfers.

China is also rapidly expanding its technical manpower ranks through its own new educational policies and by taking full advantage of educational and training opportunities offered abroad by institutions of higher education, companies, and training opportunities suffered abroad by institutions of higher education, companies, and foreign governments. Thus, while manpower inadequacies do appear in the contest of technology transfers, foreign forms seem to agree that the Chinese are moving up the learning curve effectively.

Manpower limitations affecting the assimilation of foreign technology are exacerbated by two characteristics of the Chinese technical community. The first is the misuse and maldistribution noted above. Too much of China's technical manpower is concentrated in centralized research institutes, which have historically not been well connected to production enterprises. Mean-

while, at the level of the enterprise, there is often a severe shortage of engineers.

Limitations on the mobility of technical personnel also hinder both the assimilation and diffusion of technology. The tendency of enterprises and research institutes to regard technical personnel as the property of the unit has been a major obstacle to labor mobility. A variety of new approaches to stimulate the movement of technical personnel have been introduced. Although these have had some positive results, the problem remains serious.

Second, problems with the educational system affect the seriousness of the manpower constraint. Two deficiencies in particular stand out. First, the typical Chinese graduate is usually stronger in theory than in hands-on experience relevant to the tasks of technology absorption. Second, the educational system, attention on training narrow specialists who are often ill-equipped to deal with problems requiring interdisciplinary approaches. In addition, the failure of the educational system to produce economists who are familiar with the economics of the industries in which the transfers are occurring is a hindrance to effective decisionmaking.

Management

China's lack of personnel with modern management capabilities may be of greater immediate importance for assimilation than the shortage of scientists and engineers. Although often capable and experienced in working under conditions of static technology and the dictates of a planned economy,

China's managers now face a very different environment.

Effective technology assimilation requires a systemic understanding of how the technology will fit into the social system to which it is being transferred and a willingness to take risks and to adopt a timeframe that sees the value of the technology over the longer run. It also requires an understanding of the forward and backward linkages needed for the effective deployment of the technology. As noted above, these are not traits that were instilled in Chinese managers by the old system, which put immediate production targets foremost in the manager's mind and made risk avoidance a rational individual strategy.

The Chinese government is well aware of the limitations of the present enterprise managers. Modernization in management has been encouraged by policy changes such as decentralization of authority, institution of managerial accountability, provision of incentives and flexibility in organizational design. The most effective improvements have resulted from direct contact with modern managerial techniques–through joint ventures and other forms of technology transfer and in training centers. The number of managers that can benefit directly from such contact is minute compared to the total need in China, but the effect appears to be multiplied by the dissemination of information from the centers and by learning from the example of the now more effective managers. Since managerial inadequacy is one of the most severe constraints, special attention is warrantee if technology transfer and China's modernization are to be supported.*21

Research and Development

In contrast to many developing countries, China has a comprehensive industrial structure and an extensive R&D network. Yet Chinese R&D has had many problems and, like the economy as a whole, is now the target for extensive reforms.*22

Most sectors of the industrial economy have research, design, and educational institutes. Many of these had experience with technology transfers from the Soviet Union in the 1950s, and all of them have had experience with technological self-reliance since 1960. This R&D system was terribly disrupted during the Cultural Revolution, and its capabilities were reduced. Nevertheless, it is important to recall the evolution of this system since 1949, its many achievements, and the renewed support in enjoys in the post-Mao period. It is a significant resource that could aid China in assimilating foreign technology and avoiding technological ependency. China's technical community needs to be brought up to would levels, but it does not have to be created anew.

Ironically, the existence of an established industrial structure and R&D system at times works against technology transfer. Because domestic industry and the R&D establishment have interests in domestic supply, China is faced with make-or-buy questions that would not trouble other developing countries. In addition, China's domestic industry has had trouble converting the results of its research into serially produced new products. These

problems, and the more general relative technological backwardness of the domestic industry, provide opportunities for the foreign suppliers of technology. It is likely, however, that effective international technology transfers will also stimulate the domestic industry to improve its capacity for indigenous innovation.

Like the manpower problem, the R&D system has historically been compartmentalized, and R&D has been concentrated in centralized institutes rather than at the level of the enterprise that needs the technology. The current reforms in China's science and technology management system are intended to change this situation, but it is likely that the strengthening of R&D at the enterprise level will take time.

A second problem is that R&D supportive of technological assimilation has not received priority attention and adequate funding. The linking of R&D plans to technology import plans is a recent development. The new policy emphasis being given to assimilation is intended to bring attention to the need to forge this link, but a lasting solution to the problem is not likely to be found in central policy directives. More likely, the solution will depend on the course of the reforms of the economic and the science and technology systems, with their emphasis on enterprise autonomy and the strengthening of enterprise R&D.

The Supply System

China's ability to absorb and assimilate technology is influenced by prob-

lems in the domestic economy. Many characteristics of the economy that inhibit domestic innovation in China also affect the assimilation of foreign technology. The inability of the economy to supply high-quality inputs reliably—up to the technical standards required by the foreign technology—to enterprises engaged in the importation and assimilation of technology is one of the more serious of these problems.

The uncertain availability of these inputs slows the full assimilation of the technology, prolongs reliance on foreign suppliers, and thus increases the demands for foreign exchange. Scarce supplies have been a particular irritant to joint ventures. In some cases, the best hope is to go to enterprises from the military industries that are now instructed to serve the civilian economy. These enterprises are often able to meet the quality standards required, but they may not have the incentive to link up with the joint ventures. Under current economic conditions and policies, they often find it more profitable and less demanding to produce for the Chinese domestic market.

The response of Chinese enterprises to the uncertainties of the supply system has been to pursue vertical integration, creating a technological system different from those in capitalist countries, in which components for technologies are often sourced from many different supplier companies. This systemic difference influences Chinese choices of technology and assimilation. The Chinese often expect more technology transfer than the Western firm can supply, since some of the component technologies are the property of other firms. The full assimilation of the technology supplied to China may there-

fore be blocked because the supporting, component technologies are neither available to nor being supplied to China.

The Prospects For Assimilation

The financial, manpower, decisionmaking, and economic problems noted above make it likely that assimilation will not go as smoothly as the Chinese and their foreign commercial partners might like. It is important to remember, however, that China also has capacities that make it likely that some of these limitations could be overcome in the relatively near future. These include an expanding pool of trained personnel; an established, extensive R&D system; and new policies to encourage foreign investment and technology transfer, as well as those for economic, administrative, and educational reform. China's leaders, furthermore, have incentives to maintain an environment favorable to technology transfer and absorption.

As these policies have been refined, the importance of the assimilation issue has come into focus. China clearly seeks technology transfer agreements that will facilitate assimilation and include as much of the manufacturing and design know-how, as well as the production technology. Western firms however, have diverse motivations in their dealings with China and in their uses of technology transfer in corporate strategies. The behavior of the supplier of the technology can also influence China's assimilation ability, thus adding another variable to any analysis of likely assimilation experiences.

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Chapter 4

THE ROLE OF THE UNITED STATES IN TECHNOLOGY TRANSFER TO CHINA

Although the U.S. Government sets regulations and establishes programs that directly affect technology transfer to China, the actual transfer of technological information and capabilities is generally performed by U.S. companies through direct investment, joint ventures, coproduction agreements, or license agreements, Corporate reasoning by U.S. firms for transferring technology to China includes "getting a foot in the door" of the potentially immense China market, having access to inexpensive labor, and having a presence in the Asian Pacific region for manufacturing, marketing, and distribution.

China's interests in U.S. investment are primarily to improve its technology base and to earn foreign exchange. Foreign exchange derives from various charges to the U.S. firms (taxes, payments for services, labor rates)

or through exports of goods created through improved technology. These often divergent interests of the U.S. firms and the Chinese can be the basis for mutually beneficial relationships–or a great deal of friction.

4-1 FACTORS AFFECTING U.S. COMPANIES IN THE CHINA MARKET

When the Chinese market opened to Western business in the late 1970s, foreign companies were elated. China was a country needing almost everything. It had a huge supply of potential customers and inexpensive workers, and was ruled by an apparently honest and dedicated new (albeit Communist) leadership. The economies of the United States and China were also often viewed as complementary. It was hoped that American high-technology products, capital goods, and industrial materials would help China's development, while the United States would be a growing market for Chinese goods.

In fact, in 1988, U.S. -China bilateral trade grew 38 percent , to US $13.5 billion. The U.S. trade deficit with China rose to US$3.5 billion. The United States was China's third largest trade partner in 1988 after Hong Kong and Japan, taking 18 percent of China's exports and supplying 9 percent of its imports. U.S. exports benefitted from China's increased demand foe agricultural commodities and chemical products. Sales of agricultural products more than doubled 1987 levels, accounting for nearly 25 percent of total U.S. exports to China. Chemical and fertilizer sales rose about 50 percent, while

exports of plastics, resins and synthetic rubber increased more than 150 percent. Exports of machinery and transport equipment were flat in 1988, and their share of total U.S. exports declined from 43 percent in 1987 to 29 percent in 1988. U.S. import growth was spread over a variety of products, including toys and games, travel goods and handbags, footwear, accounted for 32 percent of total U.S. imports, but grew only marginally over 1987. Growth of petroleum imports was also flat and accounted for less than 5 percent of U.S. imports from China.*1

China's Seventh Five-Year Plan (1986-90) envisions a 40-percent increase in the total volume of China's imports and exports by 1990, with the Chinese projecting imports growing at an average annual rate of 6.1 percent and exports at 8.1 percent annually. Recent figures indicate that U.S.-China trade reached 17.8 billion in 1989, a 30-percent increase over 1988 levels.*2 The growth in this bilateral trade was import driven, however, with U.S. imports from China setting a record at $12 billion, a 40.9 percent increase over 1985. U.S. exports to China totaled $5.8 billion for 1989, a 15.7 percent higher from 1988 levels. The U.S. trade deficit with China reached an historic high of $6.2 billion in 1989, primarily due to China's hard currency shortage and the strengthened macroeconomic control.*3

Future trade between the United States and China should come into closer balance. The potential is there since the United States holds a strong competitive position in the energy, telecommunications, electronics, and transportation sectors–all priority areas in the Chinese Seventh Five-Year Plan. For

example, despite the drop in total exports from the United States to China in 1986 compared with the previous year, some big gainer for the United States were exports of high technology, such as computers and telecommunications equipment, as well as metalworking equipment, heating and cooling equipment, and railway vehicles and equipment.*4

The U.S. sales to China described above have been significant. China is more interested in investments than direct sales because they promote technology transfer. However, after rushing in with many business proposals when China initiated its open door policy, few U.S. businesses have seen their overtures come to profitable fruition. Many U.S. firms feel that the bloom is off the rose. Indeed China's investment climate, many foreign businessmen say, has steadily deteriorated at least until recently. They complain of soaring costs, arbitrary tax and tariff levies, inadequate labor, and numerous other annoyances, and the most serious, the unsteady political situation. Many business people are frustrated by high costs, price gouging, tight foreign exchange controls, limited access to the Chinese market, bureaucratic foot-dragging, lack of qualified local personnel, and unpredictability. Some U.S. companies are making money in China, but they are reluctant to talk about it for competitive reasons. This is partly due of a good opportunity, and partly because they fear the Chinese would feel justified in raising their taxes and local costs.*5

The Investment Environment

Chinese Government policy since 1979 has actively encouraged foreign investment. CITIC and international trust and investment corporations in several provinces and major cities were established to facilitate investment and assist potential investors, and may themselves invest in joint ventures. To concentrate initial development on the eastern seaboard, 5 special economic zones in the southeast and 14 coastal cities were authorized to offer special incentives to foreign investors. To encourage foreign investment in high- technology and export-oriented industries, the government offered incentives such as tax holidays, tax reduction, and exemption from customs duties to foreign investors in these sectors.

Although official government policy encourages foreign investment, actual conditions faced by investors are difficult. foreign investors cite prolonged, often difficult, and costly contract negotiations, followed by a lengthy process of bureaucratic approval, as a significant disincentive. Because the Chinese currency is inconvertible, foreign-invested enterprises generally must export to cover their foreign exchange expenses–including the foreign partner's share of profits remitted out of China. In some cases where the product is an import substitute, domestic sales may be made for foreign exchange, but in this case must compete in price, quality, and delivery with imported goods. China's legal system is still evolving, and large areas of business activity are not yet covered by law. Lack of experience has led to misunderstanding and unrealistic expectations on both the foreign and Chinese sides, and resolution

of operational problems has tended to be as hoc.

In response to criticism of its investment climate, the Chinese Government is devising ways to overcome some difficulties; for example, facilitating exchange of surplus foreign currency for renminbi yuan between foreign- invested enterprises and statutorily limiting the approval process to 3 months. Economic laws are being promulgated to regulate the business environment and protect legitimate business activities. In 1986, the central government's State Council established a Leading Group for Foreign Investment to review criticism and revise foreign investment policy.

U.S. investment had continued to grow for years under this encouraging investment climate. Cumulative U.S. investment reached US$3.3 billion by the end of 1988–making the United States the largest foreign investor in China after Hong Kong/Macao. U.S. investment continued to grow during the first half of 1989, despite the difficulties imposed by China's economic retrenchment policies.*6

In the wake of 1989 mid-year political turmoil, however, it is not clear that this trend continue. Statistics currently available suggest that overall foreign investment in China during the third quarter declined sharply as compared with the same period in 1988, both in terms of number of projects approved and value of committed funds. A senior Chinese trade official has recently suggested that overall new investment in China in 1989 will be roughly the same as or slightly lower than in 1988.*7

China's leaders have repeatedly stated that there has been no change in the decade-old open policy toward trade and investment. Moreover, in the long run, if the government's current retrenchment policies are successful in curbing inflation and restoring the conditions necessary for a resumption of economic reform, U.S. business will benefit from a more stable economic environment in which to trade and invest.

During the next three years, however, many trade and investment decisions will be influenced by the austerity program. Resource allocation will be subject to planning targets rather than market signals. In addition to tight credit and more controlled access to raw materials, U.S. businesspeople may run up against greater bureaucratic inertia on the part of ministries under pressure to hold the line on expenditures. Greater recentralization of economic authority and increased reliance on administrative control of the economy have been accompanied by a growing lack of transparency in economic decision-making. Since mid-1989, the government has sought to increase the role of the Communist Party in factory management, reversing its policy of the past decade.

Schedule Delays, Taxes, Other Costs

Foreign firms in China have complained that the Chinese do not seem to understand that time is money. An example is the McDonnell Douglas venture (covered later), which took 10 years to finalize. Eventually McDonnell

Douglas won a contract for 30 MD-82s, with a price averaging out to about $35 million per plane.

By its nature, international business is risky, and overall, China is probably no riskier than other countries. However, businessmen expect a profit commensurate with the risk, and many companies have found little or no profit in their China business. Especially in very competitive areas, such as nuclear power, China has been able to play companies and countries off against one another to get very low-cost contracts. China maintains that companies should accept a low profit margin in recognition of the potential size of the Chinese market. Some companies such as General Electric accept this approach, hoping to gain a foothold and do well over the long haul. It is not yet clear how many companies will benefit from this strategy, but many U.S. companies are likely to lack the patience even to try. As has often been noted, American companies tend to focus on opportunities offering quick profits, in contrast to Japanese companies, which are prepared to wait.

Since adopting the open door policy, China has drawn up a multitude of preferential tax laws to woo foreign investors. All of these them provide tax reduction or exemption for Projects that requires a large amount of capital, involve sophisticated technology, or are located in remote areas. Moreover, companies that invest in opened, coastal cities or opened points in several deltas are offered preferential treatment to various degrees. Furthermore, to speed up port development, China has announced that projects in port development will be exempt from taxes for 1 to 5 years, and will enjoy a 50-

percent reduction in taxes from the 6th through the 10th year. Imported construction materials and equipment are exempt from customs and the industrial and commercial unified tax. All of these special economic zones and the economic development areas have an array of special incentives for foreign investment and for the importation of technology for the establishment of new enterprises and the rehabilitation of existing plants.

Despite these tax breaks and tax exemptions, however, foreign businessmen feel that they are being taken advantage of. For many foreign businessmen who have been involved in trade with China in the past, doing business in China has not gone as well or been as profitable as they had hoped. One reason for this , they say, is that the tax burden of am investor is not limited to the income taxes listed above. The total burden also includes corporate income tax, local income tax, commerce and industry tax, residence tax, personal income tax, and tax on bonuses paid to Chinese workers.

Apart from taxes, people who do business in China must also pay several types of charges and fines, including local or unit levies, which businessmen say are often capricious.

A joint venture or a foreign enterprise is responsible for all its workers' wages, allowances, and the social security the state provides the workers when they become sick, grow old, or die. One joint venture for a major hotel in Guangzhou paid wages, bonuses, diligence awards, allowances for dependents, social security, state subsidies, medical expenses, retirement, accident

compensation, and food.*8 Besides these wages and allowances, regulations also provide for legal holidays, official holidays, annual leave, sick leave, leave for visiting relatives, maternity leave, and wedding leave. Thus, to run an enterprise in China, the foreign investor has to pay several times the nominal wage rate in addition to numerous taxes and fees. The high rates and many charges for joint ventures are meant to maximize short-run foreign exchange earnings.

Intellectual Property

Almost as soon as China opened its doors to Western technology, U.S. companies become concerned about the lack of legal protection for much of their proprietary technology. In certain cases it was reported that advanced technology would not be transferred to China until there was some form of patent and licensing protection.*9

In recent years China has made significant progress toward improving protection of intellectual property. China has revised its trademark law, promulgated a patent law, and joined the Paris Convention for the Protection of Industrial Property. However, China still does not provide adequate protection or enforcement in several areas.*10

In 1989 China was placed on the "priority watch list" under the "special 301" provision of the 1988 Trade Act due to deficiencies in its intellectual property rights protection. In May 1989 the U.S. negotiated a memorandum

of understanding with the Chinese government which commits the Chinese to take steps to improve intellectual property rights protection. *11

The United States has also established an embassy-based intellectual property rights working group under Joint Commission on Commerce and Trade (JCCT) auspices to resolve individual company problems.*12

Local Sourcing, Employment, Export Marketing

Manufacturing facilities must generally obtain many parts, supplies, and services locally to operate efficiently, but in China the quantity and quality of local content is a major problem. This is especially evident in the Beijing jeep joint venture of American Motors Corp. (AMC), discussed below. The Chinese have ambitious goals for developing a supplier base for the jeep. Domestic content in the jeeps is currently in the range of 10 to 15 percent, but about 75 percent is needed for profitable exports.*13 The Chinese went into this venture wanting technology as well as the potential for exports, and thus would like to achieve domestic content of 80 to 90 percent in 5 to 7 years. AMC, however, says this goal cannot be achieved without strong backing from the Chinese Government.

One aspect of dealing in China that is difficult for foreign investors to fathom is that labor shortages can exist in a country with over one billion people. Yet, Chinese bureaucracy has created labor shortages. Foreign companies cannot simply advertise for a needed worker, such as a secretary or

an engineer. Instead, they must go through the Foreign Enterprises Service Corp. (FESCO), which monopolizes Chinese workers and assigns them to foreign companies.*14 Since FESCO cannot meet the demand for workers, the waiting lists are long, and the foreign firms must make do with whoever is finally assigned to them. FESCO can also pull away workers at any time.

In keeping with China's desire to make as much foreign exchange as it can from labor charges, wages set by FESCO are higher than those in most Asian economies. The worker does not draw this wage—as much as 85 percent of it, as well as most of any incentive bonuses, goes back to FESCO. The U.S. Embassy cites an extreme case in which a French oil company reportedly paid $9,000 a month for a highly trained technician. The technician's monthly take-home pay, however, was $54.*15

Foreign firms may be allowed to bring in expatriate staff, but that is also expensive. Beijing is already among the costliest places in the world in which to maintain expatriate staff: $150,000 to $200,000 per year.*16 This does not include office rent, which ranges from $50,000 a year at the not very luxurious Beijing Hotel to $125,000 at the Great Wall Hotel.*17

Lack of labor mobility can also cause difficulties. Getting specialized staff can be a problem because other companies are reluctant to lose their best workers and often prevent their leaving. Official reports show that 4,000 of Shanghai's skilled workers recently asked for transfers to more suitable jobs, but fewer than 350 of them were actually transferred.*18

Foreign Exchange Concerns

Foreign exchange concerns permeate every deal in China. I have discussed in Chapter 3, under the topic of Decisionmaking System.

Management Styles, Training, Language, and Cultural Considerations

It has been suggested that a useful characterization of the typical Chinese manager is that of a technically trained, operationally experienced individual whose career and professional skill development have evolved during a period of limited or no market interaction, strict prohibitions against organizational diversification, and limited economic rationality regarding performance evaluation and reward. One of the significant consequences of this situation is a widespread lack of many of the specific functional management skills commonly associated with the concept of modern management. In a more general management context, the average Chinese manager perceives his role as being more of an information conduit from the top of the economic hierarchy to the workers below than a decisionmaker/risktaker.

Another management concern has been training, which has turned out to be very difficult. Chinese engineers have educational backgrounds and work habits very different from those of their U.S. counterparts. The Chinese tend to be specialists, whereas the Americans are more generalists.

Other, less tangible, management problems must also be faced. Philosophically, the Chinese place much emphasis on human values, whereas the Americans are concerned about productivity and "the bottom line." Managers must learn to emphasize both. Neither American nor Chinese managers have been prepared for the differences in the concepts of trust and respect.

4-2 CASE STUDIES*19

The U.S. companies involved in China have ranged from very large diversified companies, such GE and IBM, to small firms selling in specific market niches. The technologies involved range from manufacturing simple circuit boards to establishing satellite telecommunications networks. The case studies that follow cover sales (with a technology transfer component), joint ventures, and coproduction, and give an indication of how things work in practice.

Locomotive Sales by GE

The first contact between GE and the Chinese occurred in 1976, when GE conducted a seminar on diesel locomotive technology in China. Right from the start, technology transfer was a prerequisite of Chinese negotiations for any purchase of locomotives. GE's purchase of locomotive components from

China was also very important in negotiating the two contracts. This type of countertrade will probably become more and more important as Chinese foreign exchange reserves decrease.

Throughout the entire negotiation process, GE worked with the same Chinese officials who represented the Railways General Industry Bureau, and the China National Machinery Import/Export Corporation. Over the years, a good relationship developed, so the second contract took much less time to negotiate.

The first contract stipulates that the technology transfer portion is for a period of 4 years and includes manufacturing and materials technology for certain components of the locomotive, but not design methods. So far the Chinese have not asked for a particular technology that was not appropriate to their needs.

The second China contract stipulates that GE will train Chinese personnel to overhaul locomotives and will provide a factory management training course. Training will be done both in China and in the United States using computers such as IBM personal computers. language problems had some impact on the technology transfer process, but the problems were surmountable.

GE apparently had no need for U.S. Government assistance. They felt that they had prepared themselves well and knew whom to contact and how

to keep negotiations running smoothly. The Protocol between the Ministry of Railways and the U.S. Government was not particularly useful, either hurt. Thus far, export controls have not affected the export of locomotives and locomotive technology to China.

GE was particularly interested in the Chinese locomotive market because it had spent $500 million modernizing its locomotive plant in Erie, Pennsylvania. At present, the market for locomotives in the United States is poor. The two China contracts, even if they produce little or no profit, allow GE to refine technological and design advances while the plant operates. When demand returns, GE will be well placed competitively.

Beijing Jeep Joint Venture with AMC

The rising Chinese demand for automobiles had previously been met largely by imports. However, the large-scale importation of vehicles ended in 1986 with a clamp-down on foreign exchange expenditures. it should be noted that direct sales of cars and trucks do little for technology transfer—the backward state of China's own industry necessitated imports, and the Chinese are making efforts to remedy the situation as described below.

AMC and the Beijing Automotive Works formally inaugurated their joint venture (BJC) to produce four-wheel-drive Jeep Cherokees in Beijing in October 1985. AMC owns 31.1 percent of the joint venture. So far, AMC has invested more than $16 million in capitalization, production equipment, and

living expenses for the expatriate staff.

The first phase is the assembly of CKD Cherokee kits shipped from the United States. This will be done at a plant that for many years has manufactured a modified Soviet-designed jeep, vehicles that are fuel inefficient and, on average, have major drive train failures within their first 12,500 miles. The Chinese are hoping that their experience in assembling Cherokees will teach them how to improve this vehicle. In particular, the improved quality control of assembly and locally sourced parts will be important

AMC has shipped almost 2,000 Cherokee kits to China. The largest single buyer of Cherokees is the State materials Bureau, Which purchased 200 of the first 500 vehicles sold, mostly for distribution to other state agencies and enterprises. Other buyers include the Mongolian police department and several foreign companies stationed in China.

Some problems with the joint venture developed early. The original 1983 contract called for a $10,000 portion of each $19,000 Cherokee sole in China to be paid in dollars. When the Chinese Government clamped down on foreign exchange outlays, however, BJC was left with a $2 million foreign exchange debt from the State Materials Bureau and an insistence by Beijing that remaining vehicles be bought only with Chinese currency. Production of Cherokees dropped to seven vehicles a Day, about one-half the output rate hoped for. The original 1986 production target of 4,000 was thus lowered to less than 2,000.

This joint venture came very close to failing, primarily because of these foreign exchange problems, with AMC threatening to walk away from the deal. However, the joint venture is too large and symbolically important for either side to let it fail. The importance was underscored by the extensive discussions of AMC with the China National Automotive Industrial Corp., The State Economic commission, and the State Planning Commission on the joint venture's problems. Some feel that the much-publicized difficulties of this joint venture in the international press helped AMC obtain this much-needed assistance from the highest levels. Recent reports indicate that many of the problem have been solved.

McDonnell Douglas MD-82 Commercial Aircraft Coproduction

In April 1985, McDonnell Douglas and Shanghai Aviation Industrial Corp. (SAIC) signed an agreement providing for the coproduction of 25 MD-82 twinjet transports, with an option for 15 more. The agreement took 10 years to finalize. The Chinese had earlier produced landing-gear door sub-assemblies for McDonnell Douglas commercial airliners. McDonnell Douglas was satisfied with the quality of the work on the over 200 doors assembled and decided to go forward with a proposal to coproduce 25 MD-82 commercial airliners in Shanghai with the Chinese. The Civil Aviation Administration of China (CAAC), the umbrella Chinese organization that oversees all as-

pects of aviation, has agreed to acquire the 25 MD-82s. The five others have already been put into service by regional carriers in Shanghai and Shenyang.

Thirty-eight engineers and specialists from the United States are staying at the McDonnell Douglas coproduction facility in Shanghai, run by the SAIC. They stay from 2 months to up to 2 years. The contract also specifies that approximately 220 Chinese will travel to the United States for training, most of them in planning, engineering, and assembly. Of these 220, about 90 percent will be engineers and 10 percent technicians, In 1987 they intend to coproduce two planes, and four planes in 1988, seven in 1989, eight in 1990, and four in 1991.

The MD-82 production line started as planned on April 1, 1986, with the first plane completed in June 1987, 1 month ahead of schedule. This plane will be test-flown to see that it is air-worthy and operates to FAA specifications, with delivery in July. subsequent planes will then be essentially replicas of this first one.

China's aircraft industry is developing new types of 100-seat jet planes in cooperation with Messerschmitt-Bolkow-Blohm (MBB) of West Germany and McDonnell Douglas. This cooperative arrangement was signed in April 1985. China has sent over 200 senior specialists from its aircraft industry to West Germany and the United States to help design and produce the new aircraft.

One reason for so much interest by foreign firms is that the potential market for aircraft in China is enormous. Unlike other countries in the region, China contains a home market for aircraft that, by itself, is large enough to justify at least the development of aircraft sized for regional markets. In this respect, China can be compared only with the United States and the Soviet Union.

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Chapter 5

CHINA'S ECONOMIC AND POLITICAL TRENDS

The recent dramatic changes in China's economy, polity, and foreign policy, have been discussed before. Despite frequent assertions by China's leaders that current policies will continue, many observers have raised the question of the stability of China's new course and China's prospects for achieving its modernization goals. Will the trends of the last 10 years continue, or is China likely to go on a markedly different course? These questions cannot be answered without considering the prospects for economic performance.

5-1 POTENTIAL LONG-TERM ECONOMIC GROWTH

Most analysts of the Chinese economy agree that the prospects for economic growth are promising, particularly in view of the changes that have been introduced since 1978. At the same time, there is also a clear recognition the China's growth trajectory could be seriously altered by a number of factors, some of which have to do with environmental factors while other

are related to the pace and extent of political and economic reform. Of course, a modest degree of economic growth is possible without degree of economic reform. Yet, the majority of problems that confront China's economic policy-makers are systemic in nature. To achieve a sustained pattern of growth, a number of modernizing reforms are definitely required. It will become progressively more difficult for the Chinese economy to grow solely on the basis of "extensive" means—i.e., increased capital investment. Thus, in assessing the prospects for economic growth, the potential success of the current reforms in economic and technology affairs must also be addressed.

In effect, there are two schools of thought regarding China's economic potential and the role of reform. One school focuses on the progress resulting from the changes to date in the organization and ideology that underlie the economy. Indeed, there is no doubt that reforms have gone quite far, especially in agriculture, toward reducing the inefficiencies associated with the former Soviet-style economic approach. Many of these reforms are mow irreversible and have become fully incorporated into the prevailing economic structure. Based on the apparent success of these reforms and on the improvements in economic performance apparently derived from these reforms, it can be argued that similar growth rates will be sustainable for the rest of the century.

The other school takes a much less sanguine view of the long-term efficacy of recent economic changes, arguing that despite the immediate changes that have been introduced, "the Chinese economy still retains the basic in-

stitutional organization, functional operations, and problems, or results, of a Soviet-type economy."*1 While acknowledging the improved performance of the economy, proponents of this perspective suggest that most of the economic gains since 1978 have been achieved through nonreplicable or one-time changes in agriculture. In this view, the foot-dragging, obstructionism, and resistance apparently hindering the implementation of the industrial reforms, suggests that further reforms are not inevitable and the prospects for rapid, sustained economic growth remain uncertain.

The difficulties with industrial reforms come when the reform coalition in the Chinese leadership has become more vulnerable to criticism from the more conservative members of the elite, owing to perceptions that the central government was steadily losing control over the economy. While there remains almost unanimous agreement on the need for reform among all of China's leaders, continued differences over such issues as the pace, the targets, and the scope remain important. Events during 1989, including the rapid depletion of foreign exchange, continued high rates of investment, excessively rapid growth, and reduced grain production, have led to greater caution in the implementation of the reform program. This caution is likely to remain characteristic of Chinese economic policy during the Seventh Five-Year Plan and could be exacerbated as result of the post-Deng succession process. Thus, even though they are essential, the more difficult reforms in the area of prices, labor and capital markets will proceed at a more gradual pace than perhaps initially intended.

5-2 FUTURE POLITICAL EVOLUTION

Despite uncertainties about the depth of conservative opposition to the pace of reforms, it appears that the general direction of China's current course in economic policy is unlikely to change drastically. Although the current leaders have major internal differences, they share a common commitment to reform and modernization. The range of foreign opinion is considerably broader on China's ability to manage what all observers would agree are enduring political problems. Until recently, the reform coalition was effective in managing divisive issues. At present, however, there are obviously serious divisions within the leadership over policy, especially the pace and extent of reform. Underlying these divisions are questions about the limits of reform in a system dominated by a Leninist party, and the future role of ideology in a society that has been so driven by ideology in the past. The lower ranks of officials and managers, some of whom have actively resisted reform, will also play a crucial role.

Clearly, China's current course and its accomplishments owe much to the presence and leadership of Deng Xiaoping. Many questions have been asked, therefore, about the prospects for politics under his successors. Deng's reputation dropped a lot due to the recent event of student demonstration. But it is still believable that the reform will carry on under his leadership (although he is not on the position, he still has the super power and influence).

Even if the reformers prevail over the more doctrinal elements of the

leadership, there will be competition for power and influence. Cleavages are certain to develop based on personal aspirations, factional relations, and policy positions, Regional divisions based on uneven growth are also likely to be a factor in intra-elite politics. How these conflicts will be managed is an important question for the future. Nevertheless, in light of past experience, there are good reasons to question the extent to which the new political rules of the game have been institutionalized. The effectiveness of political reform, still nascent compared with economic reform, will bear close watching.

The future of Chinese politics bears a close though complex relationship to the course of the economic reform program. On one hand, the future of reforms will require continued political commitment and political stability. Failure of reform will reflect badly on the Dengist leadership and could be a source of political instability.

However if the reforms succeed, China will also face new political challenges. A successful reform program will reinforce the continuation of the open door policy and be a stimulus to modernization; however, modernization will bring with it many new problems. These include the management of demographic and environmental changes brought by modernization, the need to accommodate politically the social and economic pluralism entailed by a successful reform program, the need to respond to rising expectations from the population, and the challenges of managing the commercial and security problems resulting from interactions with the external environment via the open door.

One of the more intriguing questions about China's political future is the likelihood of democratizing and liberalizing trends. The post-Mao period has clearly seen some evidence of change in the political climate, and the leadership itself refers to the need for democratization, although it is by no means clear what that term means to those who use it.

The liberalization that has occurred has been within the established Marxist-Leninist frame-work. From the viewpoint of the Western liberal tradition, this liberalization would appear to be minimal. Yet relative to the period preceding it, the tone of political life has clearly changed for the average Chinese. There is more freedom of speech, and the Party shows new tolerance for appeals from the population for the rectification of official abuses (though this tolerance has limits, as shown by the crackdown on the student demonstration in June 1989). The election of leaders in work units is encouraged, and competitive election for local people's congresses have been tried. The National People's Congress has emerged as a more active representative body within which Government policies are debated and legislative proposals from the executive are modified. Finally, the press has become a more lively forum for the airing of different opinions, although it has by no means become free of political supervision.

At the center of the uncertainties about Chinese political change is the question of the future role of the Chinese Communist Party. In the past, the Party has run the affairs of the state—both macro- and micro-management

of the economy, culture, and ideology—and was the sole route to material gain and upward social mobility. The environment created by the reforms is inconsistent with these roles. An objective of economic reforms is the reduction of political influence in economic management. Administrative reforms have attempted to establish a clearer separation between Party and state. The ideological bases for policy are shrinking, and ideology has become a less salient factor in Chinese society and public life. Material benefits are increasingly available to those with money, and the ability to earn money has increased. The prestige and privilege once attached to Party membership no longer seems attractive to large segments of the population.

It is difficult to conceive of the Party allowing itself to whither away. Major questions face the Party: Will it be able to do what no other Communist party has done, and define for itself a new social role that will be compatible with modernization? Or, will it become an ever more conservative force, a drag on modernization, in the interests of maintaining its organizational integrity and control over the society in the face of changes that render it obsolete?

5-3 THE IMPACT OF TECHNOLOGY TRANSFER

Impact on the Economy

Without technology from abroad, China will have a slow and costly road to modernization. However, technology is only one function involved in reaching a more efficient economy. Shifting from an extensive to an intensive growth pattern will also require managerial changes and an improved environment for managerial decision-making.

The economic reforms are clearly intended to alter the economic environment; if successful, they would be an important step in moving toward an effective, intensive growth strategy.

The experiences of Japan and the Asian NICs readily demonstrate the importance of foreign technology transfer to economic growth, especially in certain sectors of the economy; for example, consumer electronics and textile industries. Technology transfer from abroad can also be a force supporting the kind of institutional change sought by the reform program. Since the Chinese have a stake in importing technology, technology transfer can be (but not necessarily) a force for overcoming resistance to reform. Successes in reform, in turn, can have positive growth effects, and there is some, albeit still limited, evidence that China is beginning to realize increments of growth

through "disembodied technical change" (increased output not linked to increased equipment) resulting from reform and new technology.*2

Over the longer term, as the experiences of other East Asian countries illustrate, technology transfer can have a profound effect on the growth and modernization of an economy, including qualitative changes. One of the more important consequences of technology transfer indeed is likely to be in the improvement of product quality, a change that is closely linked to the question of Chinese export expansion. The benefits from technology transfer are more likely to become evident in the 1990s, assuming that some of the basic institutional problems of the economy are solved. Growth over the short term is likely to depend on factors other than technology transfer; for example, through high levels of investment*3 and, as reforms succeed, by greater rationality in economic decision-making.

Not all effects of technology transfer are positive. Adding an active technology transfer program to an economy that is institutionally ill-prepared to receive and use the technology can lead to reduced growth and economic confusion. The importance of having a receptive institutional environment and the ability to assimilate technology and incorporate it into production is illustrated by the Asian NICs. China has clearly had technology transfer experiences recently that have not gone smoothly.

Impact on the Political System

The impact of technology transfer on China's political future is an intriguing question. China's quest for technology has made the foreigner a participant in Chinese policy-making and thus a factor in Chinese politics. The opinions and analyses of the foreigner often carry weight in Chinese policy deliberations, and access to the foreigner can be a useful political resource for the Chinese decision-mader.*6 More generally, the West and Western technology have great prestige in China, and are seen as a source of guidance for the modernization program.

But there is ambivalence about the West, about the foreigner, and about foreign technology, as well. The West is seen as the source of corrupting ideas and values, and close relations with foreigners can be a liability as well as an asset.

The impact of technology transfer is also not uniform; the distribution of the benefits from it are uneven. The most notable differential is based on geography, with the coastal regions being more clearly the beneficiaries of the open door policy and the access it has brought to the foods of the foreigner. This privileged position of the coastal region is a consciously chosen part of the Chinese development strategy, which sees these regions serving as a bridge between the advanced technology in the international environment and the more technologically backward interior sections of the country. While there now seems to be a general acceptance of this policy, it has not come without objections from the interior.

As with the impact on the economy discused above, the impact on the political system could be positive or negative. China's long history of xenophobia, the force of nationalism, the potential for corruption resulting from interactions with the foreigner, and the differential distribution of benefits of technology transfer all make for potent threats to domestic political stability and to continuity in foreign policy.

Impact on Social Change

In contemplating the future impact of technology transfer on Chinese politics, a central issue is the extent to which technology transfer will contribute to social change, which will in turn effect the Chinese political system. One approach to this question is to see the Dengist leadership generally in control of issues of liberalization and the impact of technology transfer.

A second approach is to see technology transfer as a force for social change that is somewhat beyond the control of the elite. As Chinese society becomes more complex because of technological changes, it has greater difficulty achieving centralized, comprehensive political controls.

Furthermore, certain requisites of successful technology transfer are more compatible with a pluralistic, decentralized social order than with a centralized, monolithic system. If China wishes to have the benefits of the technology, it will have to accommodate these requisites.

These two perspectives—one stressing managed political change from the top and the other seeing political change resulting from social and economic change from below—need not be regarded as mutually exclusive. There is evidence for both interpretations. Perhaps the more significant observation, therefore, is that technology transfer is part of a complex process— involving active elite participation control—which is forcing political change in directions that could be interpreted as liberalizing.

It is impossible to say whether these trends will continue or whether on balance they are a force for future political stability. There clearly are other forces in Chinese political life the work against liberalization, but more importantly, there is the question of whether liberalization serves Chinese modernization interests or not. While the Western observer might consider the answer of this question to be obvious—modernization cannot proceed without liberalization—a careful reading of Chinese politics would indicate that under certain conditions, some forms of liberalization might have negative consequences.

Modernization-induced change, including the impacts of technology transfer, in principle could create problems for the political system in two ways. First, as a force eroding concentrations of power, technology transfer could to the further fragmentation of authority. There is already evidence, for instance, that the combination of the open door environment and domestic reforms have produced delays in decision making on certain large projects where foreign technology would be central.

At the same time, technology transfer, and economic modernization more generally, will create a host of new social problems—new environmental insults, occupational dislocations and employment problems, new infrastructure and social services requirements—that will require effective political responses. A case could be made that more, rather than less, concentration of power and authority might be required, and that without it, technology transfer could increase China's problems of governability and political stability.

There clearly are dynamics of Chinese politics that are beyond the ken of the foreign observer, and that makes predictions and forecasts subject to considerable doubt. The political changes in China since the late 1980s have been important , have pointed toward the likelihood of continued stability, and have been liberalizing to a degree. The increased interactions with the outside would, including increased technology transfer, have been atible with those changes—the open door has both helped and been helped by the domestic political changes. The trend line therefore is encouraging. By implication, to support technology transfer is to support the trend.

However, Chinese politics have shown unexpected changes of direction in the past, and may again. In addition, the political role of technology transfer is complex. Modernization can be a disruptive as well as a positive experience. Ultimately, the question becomes whether or not China will be blessed by skillful and dedicated political leaders who can guide the country

around the pitfalls of technological change while reaping the benefits of that change.

5-4 IMPLICATIONS FOR THE UNITED STATES AND THE WORLD ECONOMY

It has been U.S. policy since the 1970s that a friendly modernizing China is in the U.S. interest. Quite apart, from any foreign involvement, China is undergoing major changes designed to realize finally a century-long quest for ealth and power. The United States and other countries are now involved in these changes in China, and technology transfer is one of the prominent modes of involvement. The implication of this involvement must be understood in order to judge whether it serves U.S. interests.

One area where the implications of China's future course require rethinking is China's international economic role. China's foreign trade has expanded dramatically in recent years, albeit from a small base, and China clearly has premised its current modernization drive on active participation in the world economy. Chins's interest in membership in the General Agreement on Tariffs and Trade is indicative of its growing interest in and commitment to international economic institutions

China's export economy suffers from both technical and systemic inefficiencies. The economic system reforms, currency revaluation, and other

incentives for Chinese producers to export rather than sell to the domestic market will help alleviate systemic inefficiencies. Technology transfer will help with the technical inefficiencies. Indeed, the main short-term consequence for economic performance of technology transfer will be to improve the performance of the export sector, mainly through qualitative improvements.

China's foreign trade potential is much greater than its actual trade today. The rate of growth of China's foreign trade has been greater than the overall rate of economic growth and this is likely to continue for the next 10 years. China's exports have been rising at an average annual rate of 14 percent since 1978, and the value of exports now represents 7 percent of the gross national product. It is quite possible that by 2000, this later figure could be doubled.

As China's exports have increasingly diversified, questions have arisen about whose products China's will replace in which markets. During the next 10 years. Chinese products are most likely to be competing with those of the NIC's in third country markets. Direct competition with either the LDCs or developed countries such as the U.S. is likely. One exception to this is that U.S. agricultural exports to Asian markets may suffer from Chinese export expansion.

China's imports are heavily weighted toward industrial supplies and producer goods rather than consumer goods and should offer attractive trade

prospects for the United States. In light of the above, and although Chinese exports will compete with some U.S. products of older industries in U.S. market (such as textiles), it should be in the U.S. interest to see the expansion of Chinese exports. However, the U.S. share of the Chinese market has fallen, due in part to more aggressive marketing and more efficient export control practices in other countries.

Other problems also make the actual prospects for Chinese exports less rosy than the potential suggests. China's interest in a more active participation in world trade does not come at the best of times. Many of the markets in the advanced industrialized countries are already vulnerable to pressures from imports, and protectionist sentiments in places run high. In addition, the cost advantages Chinese products enjoy because of cheap labor may not enduring. New technological advances in the advanced countries in industries that were vulnerable to inexpensive imports based on low wage rates could upset established patterns of comparative advantage in the near future.

China's rapid decline of foreign exchange holdings has led to increasing interest in commercial credits. The Seventh Five-Year Plan expects $40 billion to $50 billion in financing of all kinds from abroad. As with foreign exchange, there has been some loss of central control over international indebtedness because of the increasing financial role of organizations such as the China International Trust & Investment Corp. According to estimates made by the Band of Japan, China's foreign debt by the end of the Seventh Five-Year Plan in 1990 could reach $49 billion.*4

There is no consensus about the longevity and severity of these problems. They have made the Chinese more insistent that in its trading relations, ways must be found to increase China's exports. They are also likely to lead China to seek more barter opportunities, which could lead to more trade with the Soviet bloc. Such trade would reduce the pressure on the use of hark currency reserves, would be more insulated from the perturbations of the international capitalist economy, and would be more congenial to the operation of the centrally controlled. planned sector of the economy.

China's problems of adjusting to the international economy are also likely to limit the growth of U.S.-China trade and economic cooperation in the short run, particularly when the problems of foreign investment are also considered. Efforts to improve the investment climate are not likely to have rapid results. The appeal of joint ventures has faded for the moment, which is likely to slow technology transfer and change the node of technology transfer preferred by U.S. companies to licensing agreements.

China continues to give evidence of wanting to participate in the world economy and to reap the benefits of foreign investment and technology transfer. To do so. China must export. It is likely that a number of bilateral and multilateral trade issues will result from Chinese export expansion. These include the persistence in Chinese efforts to realize bilateral trade balances, a likely increase in Chinese use of export subsidies and other forms of protectionism in China, the lack of transparency in Chinese trade decisions, and

the changeableness and unpredictability of those decisions. The rise of protectionism on the U.S. side, already evident in the growth of antidumping cases brought against Chinese imports, further complicates the prospects for U.S.-China trade and for U.S. participation through technology transfer in Chinese modernization programs.

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