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Congress of the United States  
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JOHN H. GIBBS  
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[Redacted]

Room 7D43  
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Dear [Redacted]

Enclosed are the trip reports you requested on issues relating to Japanese perspectives on technology transfer to China, and the Chinese decisionmaking process on technology importation. As you know, these reports cover research carried out in Japan and China late last year.

I look forward to discussing these issues further with your analysts working on these subjects.

Sincerely,

*Martha Caldwell Harris*

Dr. Martha Caldwell Harris  
 Senior Analyst

Enclosures

TRIP REPORT:

JAPANESE PERSPECTIVES ON TECHNOLOGY TRANSFER TO CHINA

by Martha Caldwell Harris  
US Congress, Office of Technology Assessment

As China's largest trading partner, a nearby Asian neighbor and a world economic and technology power, Japan is in a position to importantly influence Chinese modernization. From a US perspective, it is important to identify complementarity with US approaches and to analyze the reasons for differences in Japanese approaches to transferring technology to China.

This report summarizes research on Japanese policies affecting technology transfer to China carried out in Japan in November, 1985. The goal is not to review every interview, but rather to suggest interim conclusions, as a basis for further research on supplier country policies. Interview data, as well as relevant information from Japanese-language materials collected during the course of the research, provide the basis for the analysis.

The report is organized as follows. First, tentative general conclusions are presented. More detailed discussion of various perspectives on these issues follows. (The purpose of this section is provide a flavor of the comments I heard during the interviews.) Finally, a list of interviewees/organizations visited is appended.

A. Tentative Conclusions

1. Assisting China in its modernization is a primary goal of Japan's official foreign policy, but economic interaction is constrained by a number of factors (some of them unique to this particular bilateral relationship). According to officials in the MOFA (Ministry of Foreign Affairs), Japanese policy is based on the recognition that China is a socialist country, but one very different from the Soviet Union. Assisting China in its modernization efforts serves Japan's interests because this will help to ensure that China will not "become like the USSR."

There are a number of factors that underlie the recent expansion of Sino-Japanese economic relations in recent years, in addition to US-China rapprochement. These include Japan's geographical proximity to China, a long history of cultural and technological exchange, as well as the desire to repay the debt incurred during Japanese aggression earlier in the 20th century. Japanese government officials say that cooperating with China serves to counter Soviet expansionism in Asia. These factors mesh well with a growing sense of pride in Japan's economic and technological accomplishments which may allow Japan to take on a larger role as "teacher" and technology transferor in Asia. In this sense, Japan's extensive programs of economic assistance to China suggest a new style of leadership in Pacific.

A number of factors, however, present problems for Japan as economic interactions with China grow. The dark side of Japan's miracle is that it is viewed with apprehension by many in Asia who remember Japan's earlier attempt to establish a "coprosperity sphere" in Asia. In China, memories of Japanese aggression were activated during 1985, and there is evidence that Japan may remain the target of Chinese frustrations over foreign involvement. More specifically, China may be in a better position than South Korea and some of the other Asian countries to press Japan for more technology transfer and more "balanced" trade. It is far from clear, however, that the Japanese government will be able to resolve these issues in a timely fashion. As Japanese firms are increasingly involved on the ground in China, moreover, they may be more directly affected by domestic Chinese politics. For a variety of reasons, then, it may not be an exaggeration to say that forging a viable partnership with China may be one of the greatest foreign policy challenges Japan faces during the next 15 years.

Therefore, China offers Japan clear and compelling opportunities: as a potential market for both products and technology, a strategic counterpoint to Soviet influence in the region, and as a modernizing economy where Japan can potentially contribute aid and technical assistance in a unique fashion. But the expanding Sino-Japanese relationship also holds potential pitfalls for Japan. Growing Japanese involvement in China's modernization will be closely watched both by Chinese leaders who have special expectations and by other Asian countries so that Japan stands to gain a great deal if the economic interactions are seen as "successful," but also to lose prestige if frictions over trade and technology transfer grow.

2. In Japan, those who are closely following economic and political change in China (particularly in the private sector) are conservative in their evaluations of China's ability to meet its modernization goals in the next 15 years. Observers mention a number of obstacles to Chinese modernization and importation of advanced technologies: lack of infrastructure to support large projects; bureaucratic turf battles and delays in decisionmaking; employment regulations and other official requirements that make it difficult for factory managers to improve the efficiency of productive facilities. From a technology transfer perspective, the tendency of China to "undervalue" the software portion of plant exports is seen as a critical problem. A number of individuals described the Chinese approach as one of "take and take." In addition, a number of people I talked to were sceptical about the ability of China's leadership to make a smooth transition to more market-oriented approaches in the years ahead.

3. There is an element of truth as well as some misperception associated with the widely held view (in Japan and in China) that Japan has not transferred very much technology, but has concentrated on sales of goods. It is correct that Japanese exports of manufactured products dwarf exports of technology through licenses and direct investments. During the past 5 years, the general pattern has been for Japanese firms to focus on infrastructure building and plant exports, generally involving "standardized" technologies needed for manufacturing consumer products such as washing machines and TVs rather than exports of "cutting edge" technologies.

On the other hand, it would be a mistake to conclude that there has been no significant transfer of technology from Japan to China. In Japan, where technical and management training are considered elements of technology transfer, transfer of technology to China has occurred through such mechanisms although these exports have apparently often been undervalued in official contracts. In addition, Japanese firms have established a strong presence on the ground in China. Expanding exchanges of technical personnel also contribute to technology transfer, but to a degree difficult to measure precisely. During the last year, Japanese firms have also begun to establish joint ventures in more advanced technology sectors.

4. The Japanese government supports product exports (in particular) and technology transfer to China through a number of programs that involve financing and aid. Such government programs include a large JETRO effort to gather and disseminate market intelligence, extensive official financing provided through the Export-Import Bank, and a rapidly growing aid program. In the past, Japan's programs have placed more emphasis on trade than technology transfer, but this is changing. A close examination of certain programs (those of JICA aimed at renovating Chinese industry) indicates that Japanese officials clearly prefer those that involve transfers of standardized rather than new technologies.

Japan has no unilateral export controls for China, but it does participate in Cocom. While some in the United States may believe that Japan has not adequately stressed the national security aspects of technology transfer, there are recent indications that the government of Japan is more willing to prosecute firms that illegally export to the Soviet bloc.

5. Japan's private sector holds the key in technology transfer, and it has shown reluctance to invest and to transfer advanced technology to China. Trading companies whose special expertise has been in trade of raw materials and large-scale equipment and machinery, have been more concerned in the past to export goods than to transfer technology. Another problem has been that Japanese firms complain that China has not been willing to pay for software. By transferring standardized technology, Japanese firms may try to avoid a boomerang in sectors where Japanese firms are increasing their competitiveness. (Generally speaking, interviewees discounted the boomerang as a vital immediate concern, but it seemed to me that Japan's technology transfers are nevertheless structured to limit the boomerang.) The desire to avoid a conflict of interest with their operations elsewhere in Asia is another restraint on technology transfers to China.

While it seems unlikely that the Japanese corporate sector will quickly revise its stratagem and business sectors have established a number of mechanisms useful in coordinating economic interactions with China. At a high policy level, the 21st Century Committee allows Japanese and Chinese leaders to freely exchange views (sometimes on sensitive issues) and to take new initiatives (as in the area of youth exchange). At a working level, groups like the Japan-China Association for Economics and Trade (with support from both the government and industry) act as middlemen in technology transfer.

Such mechanisms both reflect historic patterns of business-government cooperation in Japan and make it possible to avoid direct public conflicts between business and government (as have occurred in the United States).

6. From a US perspective, Japanese approaches to transferring technology to China provide both complementarities and contrasts. Generally speaking, differences in approaches are natural; they underlie and help to stimulate healthy competition among major suppliers of technology. The past tendency of Japanese firms to concentrate on exports of standardized technologies and equipment may complement US exports in more advanced technology sectors. The United States has encouraged Japan to take on a larger political role, and participation in Chinese modernization may be a case where Japanese efforts can importantly serve collective Western security interests in Asia.

As Japanese firms transfer more advanced technologies, however, harmonizing export control policies will be more important. Financing is another area where contrasting approaches may require additional US-Japan policy coordination. To the extent that supplier countries are turning more and more to mixed credits and other types of aggressive financing, they up the ante for all the players and create a climate where buyers can play them off against each other. As Chinese modernization proceeds and China's exports grow, there will be increasing pressure on Japan to import more. Unless this occurs, the burdens of trade adjustment will fall more heavily on the United States.

The United States and Japan have interlocking but not identical interests in assisting Chinese modernization. While competition will remain the name of the game in transfers of noncontrolled items, consultation and cooperation may be required in other areas for the definition and achievement of Western security aims.

#### B. Japanese Perspectives on Technology Transfer to China

The summary that follows highlights differing Japanese views concerning the appropriate speed and nature of technology transfer to China. While there seemed to be universal agreement that cooperating in China's modernization serves Japan's interests, I heard differing views about how best to accomplish this. Underlying these differences in viewpoint are evaluations of China's ability to meet its modernization goals and on differing assessments of issues in Sino-Japanese relations.

1. Japanese Government Officials I spoke with MOFA officials in the China Division, Economic Cooperation Division and the Economic Affairs Bureau. They all stressed that the 3 principles of Japan's economic cooperation with China are: cooperating with Western countries; balancing aid to China with aid to ASEAN; and providing no military aid. These principles were established at the time of the "first round" of Japanese aid to China, in 1979.

MOFA stressed that technology transfer is something that Japan's private sector does, and the government can not make it happen. But Japan has

established a large aid program for China, and MOFA believes that this is a critical element of Japan's foreign policy. Under the Nakasone government there has been a willingness not only to expand aid, but also to utilize it more for political purposes to support countries whose foreign policies complement those of Japan. In the case of China, this means support of the moderate Deng regime as an alternative to the USSR.

MOFA officials expressed concern over China's complaints that Japan is not transferring enough technology. China does have a "strategy" and it is to link technology transfer and trade. Actually, no one knows for certain exactly how much technology transfer has occurred-- but according to some of China's statistics as much as 40% of the technology that has been imported to date comes from Japan. In reality, China complains to all suppliers that they are not doing enough, but the fact that Japan has been singled out is a concern. While China seeks more technology (and wants a better "balance" in trade), the real problem is that they must be willing to pay for the technology. Furthermore, in recent months the number of Japanese joint ventures has grown.

MOFA's unofficial view on Chinese modernization is that we have to "wait and see." China will pursue a zigzag course, but there will be no pendulum swing in politics comparable to the days of the cultural revolution. It will take 10 years before we can say with more certainty how China is faring. In the meantime, the proper course is a cautious one. Cocom is on the right track. Over the long run, Japan and China will become more interdependent economically, but this does not mean that the result will be something approximating the US/Japan relationship. The security alliance is a firm foundation for the US/Japan relationship and no such strong security alliance is likely with China. The technological gap between the US and Japan, moreover, was never as large as that between Japan and China. One more related point: I heard that Americans tend to "overestimate" China today, as they have over more than one hundred years.

Discussions focused on the 21st Century Committee, a group of established at the highest government levels to "look ahead" to the future of the Sino-Japan relationship. There are 11 members from each side, and in the case of Japan they come mostly from the private sector although they clearly advise and are advised by the Japanese government. Interestingly, a major focus of the meetings of the group has been youth exchange, and the clout of the committee is illustrated by the fact a Japan-China Youth Exchange Center is a project now underway that the committee spearheaded. The members of the committee speak frankly and off the record on issues as sensitive as the recent anti-Japanese demonstrations in China. MOFA staff back up the committee. It is clearly viewed as a key mechanism for exchanging views at a very high level without the constraints of "official" discussions.

I spoke with Dr. Takashi Mukaibo, a member of the 21st Century Committee. Dr. Mukaibo expressed his fears that China may be moving too fast. He stressed the problems of young people in China, and noted that "Mao still lives in the countryside." Mukaibo, who is Deputy Chairman of Japan's AEC, believes that the Chinese need nuclear power, and stresses the "separation"

between civilian and military nuclear research in China. The main reasons for Japanese reluctance to transfer technology, he believes are fear of political upheaval and limited Chinese ability to pay. In the case of nuclear power, he added that it will be difficult for the Chinese to integrate technologies from many different suppliers and that Japanese firms will be cautious because of this.

I learned quite a bit at MOFA about the technical cooperation programs sponsored by the Japanese government in China. Technical cooperation is the smallest component of ODA (only about 3% in 1984), which also includes loan and grant aid. In the case of China loan aid totaled 71.5 million yen in 1984 (about \$250 million), according to MOFA data.

Japan's technical assistance programs are generally carried out by JICA (the Japan International Cooperation Agency), and include a number of training efforts. More than 200 Chinese have been trained in Japan for periods up to 1 year, and Japanese experts have been sent to China to provide technical assistance. Materials and equipment are also provided in some cases. In late 1985, an agreement was reached to send volunteers aged 20-30 to China for a period of 2 years. In addition, a new "silver volunteers" association has been established with government support to dispatch retired engineers. Japan's "project-type" technical cooperation is seen as the best method for fostering technology transfer, and these programs are charted for expansion in China. Current such programs include the following: a hospital, family planning education, an enterprise management center, a wood utilization project and a food research center. New starts include a telecommunications training program in Beijing, a fish research center in Shanghai and an agricultural research center in Mongolia. It is important to note that Japan's aid is based on the principle that the request or initiative should come from the recipient country.

I spoke with the director of JICA's industrial development department, who is responsible for programs involving plant renovation in China. JICA provides only "surveys" of plants, and they confine their activities to projects selected by the Chinese State Economic Commission that require standardized (old) technologies. JICA consciously leaves "new" technology transfer to Japan's private sector. During 1985, JICA carried out surveys for 3 steel plants, 1 piston factory, 1 electric cable factory, and others (for a total of 8). Between 1978 and 1984 a total of 934 people have been involved development survey programs of JICA. JICA believes that the major obstacles to technology transfer to China have been inadequate patent protection and payments, and (secondarily) underskilled technicians and quality control. When queried about whether or not the SEC would like new technology, JICA responded that "China can be persuaded" to import standardized technology more appropriate at this stage.

The overall level of Japan's ODA has become an issue of national concern, since commitments have been made to quickly expand aid. The MOFA, the EPA and the MOF are the major agencies involved in annual debates on overall levels of funding. (MITI must also approve all yen loans.) In the fall of 1985 during my visit MOFA and MOF were engaged in a debate over ODA, with MOF arguing that

ODA should be reduced by the same margin as the yen's appreciation against the dollar. In September the government had committed itself to doubling ODA to \$8 billion by 1992. Japan's leadership, particularly in MOFA has committed itself to a stronger aid program, but actual levels of aid are determined in the complex bureaucratic politics associated with the budget process.

The OECF (Overseas Economic Cooperation Fund), responsible to the EPA, acutally provides the loans and grants provided as segments of ODA. Officials in the Economic Cooperation Division of EPA explained that between 1980 and 1984, 200.1 billion yen (about \$800 million) was provided for projects in China. In addition, commercial loans valued at more than \$400 million were extended to support 7 large key projects. During the second stage (1985-91), the plan is to provide 400.7 billion yen (about \$2 billion). The second stage projects include some carry- overs, and a new telecommunications project to extend telephone networks.

In general, MOFA took the lead in promoting the idea of expanded aid programs in China, and some observers expressed doubts about the scope of the programs envisioned. In fact, some ASEAN countries have criticized Japan and asked for similar treatment.

The first stage projects are seen as successes, although one dam project never was completed. (This "failure" was seen as caused by the size of the project and opposition within China.) The goal has been to assist China in improving its infrastructure. The Chinese provide a rank ordering of the projects they want, but the Japanese government has upon occasion refused (as with a chemical plant project). Japanese officials talked with pride about some of some of the large projects carried out to build China's railroads, etc. Local Chinese workers are employed and the Chinese government wants to see as much local content as possible. Such factors can sometimes present problems in the sense that they tend to raise costs.

China is seen more as an aid/ market opportunity than a commercial threat at present. For the time being, Japan is being called upon to put up a lot of money in advance to support technology transfer. Japan may be able to avoid trade competition with China by exporting standardized technology, but this has led to political problems in case of South Korea.

MITI's policies directly and importantly affect technology transfer. MITI has triple roles in administering export controls, developing general trade policy, and arranging the terms of large plant exports. To illustrate the role of MITI in financing, it's worth noting the debate that took place between MITI and MOFA during my visit. MITI attempted to support Japanese firms hoping to participate in a Chinese coal-fired thermal power generation plant in Tianjin by arranging mixed credits. The MOFA, however, blocked this plan on the grounds that Japan's commitments have already been made through the projects outlined in the second round. MITI lost this particular argument, but will continue to search for creative ways to promote Japanese exporters.

The interview I had at MITI focused more on the export control process than the other issues of trade and financing. The formal process is for all applications for export applications to be submitted first to the Machinery and Information Bureau where the contract is checked for "feasibility." Actually, it is important to note that most firms consult with MITI on a routine basis before the stage when a contract is drawn up. In practice the review often takes place quickly since problems have already been worked out. The second stage of the review is handled by the Export Division of the Trade Bureau. Here the legal aspects of the contract are reviewed and a detailed payment schedule is attached. In the case of technology or know-how exports, there is a third stage of review by the Foreign Exchange and Financing Division of the Trade Bureau where technical review is carried out, depending on the type of contract involved.

While it does not appear that delays are common, examples were provided of controversial cases that took time to resolve. The obvious example was VCR exports to China, which apparently took over a year of review. In the end, the export was permitted but in such a way that it involved "black box" exports of sensitive manufacturing process technology. The people I talked to at MITI and at the US Embassy stress Japan's positive role in Cocom. In recent months, apparently, Japan has begun to put more resources into export administration and has taken a more aggressive policy of prosecuting violators. In a country where public criticism of wrong-doers has been used to set an example, these steps are seen as significant. It was also made clear to me that Cocom and export controls more generally are sensitive subjects-- the responsible person in the Export Division declined an interview, noting that the US government knows more about Cocom than anyone in Japan. He stressed that Japan is fully complying with Cocom rules, but was unwilling to discuss Japan's system in more detail.

In comparing US and Japanese policies affecting technology transfer to China, export controls have been used more by the US and financing by Japan. I spoke with China specialists at the Export-Import Bank who provide the official credits and loans for large projects like Baoshan and offshore oil exploration. Interestingly, the ExIm people I spoke with stated that in their review of projects for support, they are particularly interested in the "political preferences" of the government and the financing terms. Technology transfer, in their view, is not really their concern. My own view is that Japan's export promotion policies and institutions were established during a period when the exclusive concern was product exports. Their choices concerning projects for support strongly influence the nature and extent of technology transfer, but they have no real strategy in this regard. During our discussion, the ExIm people clarified that Japan's strategy on mixed credits is not to use them unless other countries do so. (See above for discussion of MITI-MOF disagreement on mixed credits.)

A host of other agencies are involved in various ways in technology transfer, but the above appear to be the central actors setting policy. If it's a question of nuclear cooperation, for example, the STA would be involved and would carry out the programs. Similarly, the MOE is involved in student exchanges. The FTC (Fair Trade Commission) reviews technology export

contracts to ensure that such contracts do not adversely affect free trade. FTC officials told me that they have never denied a case on these grounds, indicating the degree to which such powers are actually utilized. Of particular interest to OTA, however, is an analysis of Japan's contracts involving international technology transfer. This report is the first of its kind, and while it does not include the values of such trade, it does indicate that the number of contracts for technology exports to China rose from 4.6% of the total in 1980 to 12.1% (106 cases) in 1984. In 1984 37% of the exports were in the electric machinery sector, 22% in general machinery and 12% in transport. FTC data also indicate that about 17% of the total number of joint ventures established in 1984 with foreign partners were in China.

I did not have the opportunity to explore the role of political parties in setting China policy. In the past, the LDP has played an important role on key decisions such as normalization of relations. It would be useful to know more of the views of various LDP and other politicians, since some of the opposition parties are establishing stronger ties to China. Unfortunately, time constraints precluded this although I was given introductions.

2. Japanese Businessmen OTA was fortunate to have an introduction from Arthur A. Klauser who is on our advisory panel to Mitsui officials in Tokyo and Beijing. Traditionally, the trading companies have been Japan's largest overseas traders, in the case of China importing raw materials in exchange for machinery and equipment exports. Dick Nanto (CRS) has outlined this traditional pattern of Sino-Japanese trade. From a technology transfer perspective, an interesting question is whether the trading companies will come to focus more of their efforts in technology transfer, as opposed to product trade.

The people I spoke with at Mitsui in Tokyo were cautiously optimistic about the China market. While they believe that China will go through a series of political changes in the years ahead, they stressed the effective leadership of Deng and his allies. China may be able to "succeed" in certain areas (perhaps space and military technology), but Japan and the United States will remain at least a decade ahead of China in technology terms, and the effects of the boomerang will be limited in Japan, but more serious problems for developing countries such as Indonesia and Thailand.

Mitsui experts view the past five years as a period during which Japanese firms suffered short-term losses, but where there were no "failures" from a technology transfer perspective. The major problem that they mentioned is the lack of assurance that confidential information will be protected by Chinese side, with the result that firms have been reluctant to transfer technology. Other legal problems were also mentioned. Because of these and other reasons, there have been cases where they have declined to transfer technology to China.

The Mitsui people I talked with stressed the need for export regulations, given the fact that so much advanced technology today has both civilian and military applications. As Cocom regulations are loosened, more technology transfer will occur. If China permits foreign firms to sell within China (not just for export), this will also improve prospects for technology transfer.

I had a very good discussion with the general manager of Mitsui in Beijing. Mitsui has 5 offices in China, with a staff 30 in the Beijing office alone. According to Mitsui, what China really needs is technology transfer associated with provision of machinery and equipment. This is the area where Mitsui has been most active, and this is the area where technology transfer from Japan to China is most likely to increase. Rather than rapidly expanding high tech trade, we will see in the near future more transfers of know-how associated with products, and in the form of technical services. Mitsui also believes that its expertise in the worldwide leasing business will be an asset of growing importance in China. This discussion suggested to me that some leaders in trading companies believe that technology transfers from Japan to China will expand, but that they will continue to be associated with plant and equipment exports (rather than licensing, etc).

I talked with the general manager of the China department at C. Itoh, the largest trader with China among the Japanese trading companies. The history of Japan-China trade was reviewed, and it was noted that company officials played roles in the early 1970s in helping to reopen trade. The fact that C. Itoh's leaders have a strong respect for China and a good rapport was emphasized. Over the long term, the prospects are good for the China market; in the immediate term, "we must help China."

The major problem area that could stand in the way of economic development is politics, and the question is whether the process of political change and its speed are appropriate. About this there are many views within in China. The technocratic leadership, of course, supports the current program. There is reason to be optimistic about Chinese development, even though its leaders are now groping for a new approach. The United States and Japan should clearly decide where and how to support China's modernization and do so in a positive way. (I had the impression, although it was never clearly stated, that unclear policies have been obstacles in the past.)

Generally speaking, since trading companies themselves don't have production technology, they work with Japanese firms that do. In some instances, C. Itoh assists firms in selling technology, in other cases (truck manufacturing) large packages with technology components are negotiated, and in still other cases (factory renovation) the trading company may facilitate participation by a whole group of Japanese firms. The boomerang problem is overstated since China has such a large domestic market.

From the perspective of C. Itoh's top China expert, it is only natural that Japan should sell China hardware, permitting China to export products to Japan. Japan will continue to supply the Chinese with the needed software. However, within conservative Japan there is no strong consensus yet that a shift from exports of hardware to software is correct. My discussions with trading company China experts left me with the impression that there is a broad range of views concerning technology transfer to China, and no clear agreement that this should be pushed across the board.

I had an interesting discussion with Yukio Mizuno, senior vice president and "Mr. Software" at NEC. NEC appears to be a firm that has developed a fairly sophisticated technology transfer strategy. The discussion of NEC's participation in the Japan-China Software Center highlighted this strategy. The Center was established in 1982 and since then more than 1000 Chinese technicians have been trained by NEC in software development and use. A number of them are trained in Japan, and herein lies a plus for NEC. Since Japan is suffering from a shortage of skilled software engineers, it is clear that the firm has benefited from the use of Chinese trainees. Therefore, while it would seem at first glance that the software center involves a one-way flow of technology from Japan to China in reality NEC is benefiting from the human resources that China supplies. The Center is now under expansion, and the major problem is funding. Mizuno has a strong view that it will take China 15 years before it will be able to be a significant exporter of computers, and in the meantime participating in the development of China's industry will push Japanese firms (and other Western firms) to maintain their technological lead. (Mizuno is thus not worried about a boomerang, or so he says. At the same time, it seems quite clear that NEC has developed a pretty clear notion of what it will transfer now and what is not yet appropriate. In other words, the technology transfer strategy seems to be aimed at staging transfers in such a way that the boomerang cannot come back too quickly.)

During my discussions, I heard a good deal about factors that limit technology transfer to China. As mentioned earlier, everyone mentioned China's lack of infrastructure and other factors pertaining to its legal system. In an interesting discussion at Toyota, I heard some other reasons. Chinese factories have up until recently imported technology from different foreign companies; this led to difficulties in integrating the technologies. Each "group" such as taxi drivers that imports technology (for auto maintenance, for example) wants to keep it to itself and therefore technology diffusion is slow or non-existent. China's distribution system and its bureaucratic sectionalism are major problems that make it unattractive for Toyota to get involved in a big production enterprise in China. If the Chinese would allow Toyota the authority to set up its own system of production, then there might be an incentive for technology transfer but right now the process is piecemeal and unlikely to result in efficient production. In addition, the Chinese government has tightened up on assembly line imports and additional reviews are required. In the meantime, Toyota is expanding its servicing activities and next year there will be 20 Toyota service centers in China.

JGC is a large construction and engineering firm that has been active in China. JGC has been involved in 21 contracts with China over the past 12 years, but this still represents only about 10% of the firm's business. The contracts include oil production, petrochemical production, fine chemicals, gas production and one in the nuclear field. Generally speaking, transfers of technology through know-how and patents involve JGC along with other foreign suppliers who have the technology needed. JGC's China expert in Tokyo stressed the following problem areas: China's undervaluation of technology; insufficient numbers of appropriately trained technicians, particularly in regional areas; and problems with inefficient production. Overall, however, the projects are viewed as successful.

JETRO is, of course, a government organization under MITI, but it works closely with Japan's private sector. Since information provided by JETRO highlights experiences of private sector firms, I choose to include it at this point. Baoshan came up in a discussion of successes and failures in technology transfer. Here is a case where state-of-the-art technology was sold. When questioned as to why this occurred, two reasons were given. First, Japan's steel companies who have pretty much saturated market opportunities in Japan, found in Baoshan a unique opportunity to train some of their younger engineers and technical people with a full-scale project. Secondly, the fact that the project became a "national" project with government support ensured that it would be a showcase. From the Japanese perspective, problems that developed at Baoshan center around the site, which the Chinese insisted upon. The Chinese say that Japan gave them dated machinery, but this is incorrect, I heard. (While it was not specifically mentioned in the Baoshan case, MOFERT's lack of technical expertise can also be an obstacle to technology transfer, since it reviews the contracts.) Despite these problems, Baoshan is viewed with pride by many in Japan.

JETRO provided me with a report on the investment climate in China, which outlines findings of a MITI-sponsored mission in early 1985. The report includes short case studies of joint ventures in China. The Hitachi JV in Fujian, established in 1980, is one of these. While the project has not met all expectations concerning exports, there are a number of factors that appear to have contributed to a comparatively successful project. Some of these factors include the high level political clout enjoyed by the Chinese partner, the cooperative attitude of the party allowing the leaders of the corporation considerable leeway in actual management and policy setting for the factory, the ability of the firm to insist upon that Chinese components suppliers attain quality standards comparable to those demanded by Hitachi in Japan, availability of energy, and training programs in Japan. It is quite striking that in this case there is apparently only one high-level (vice chairman) who is Japanese and the rest of the management is Chinese. The JV was able to turn a profit, in contrast to the financial troubles that the Chinese partner had had in the past.

Other case studies are included in the report, but more important than the details is the list of "problem points" at the end. These include: contradictions between planning and market mechanisms (between the government and the firm's leadership); the relationship between plant workers and the party; inadequate infrastructure preparation; the short period covered by the contracts; wage and land use costs; insufficient data to do a good feasibility study; uncertainty about political stability. The report stresses the need for China to allow enterprises more freedom to compete both in the domestic and export markets.

The Industrial Bank of Japan is involved in technology transfer by virtue of its financial functions, but even China experts at the bank note that technology transfer is really a by-product rather than a goal of such programs. The IBJ has turned down some requests for loans to projects that were favored by local Chinese officials but did not have strong backing by the

central government. There is a constant movement of people to and from China who are involved in discussions on various projects. The IBJ is also involved in transferring financial services technology through its training programs and its biannual financing seminars which have apparently been well received by the Chinese.

IBJ experts had some useful insights about the extent of technology transfer from Japan. They argue that because US companies emphasize technology transfer more than Japanese, contracts between China and Japan include technology and training as part of a total package (with the software component undervalued or not priced separately). In addition, some of Japan's technical assistance is provided on a grant basis, making it impossible to assess the value of technology transfer through these programs.

Statistics used by the IBJ in its latest report on China show that over the 1973-84 period the value of technology transfer contracts from Japan was 14.6% (\$ value) and 18.7% (number of cases). The respective figures for the US are 33.6% and 26.6%. (chart 18, p. 22)

Part of the problem from the Japanese perspective is that firms tend to rush forward in a group. Until one moves, they all hesitate. Then, when the ice is broken, they all push forward. This causes the Chinese to resent "Japan," rather than singling out particular firms for criticism. China should be willing to pay more technology, should adopt a more staged approach, and should show more flexibility. China faces, above all, significant challenges in managing its reform program so that various groups (such as the military) do not become resentful and so that the pace of change is not too dissimilar in the cities and countryside.

Networking Groups that Link Japanese Public and Private Efforts A characteristic feature of Japan's overseas economic diplomacy over the years has been the key role played by trade and other specialized organizations that help to provide information and coordinate government and business efforts. In the case of Sino-Japanese trade prior to normalization of relations, more than 200 "friendly companies" traded with China beginning in the 1960s. This trade which eventually gained semiofficial status went through peaks and troughs (during the Cultural Revolution), took place under the umbrella of long-term agreements. After normalization of relations, the Japan Council for the Promotion of International Trade became the coordinator for the old "friendly companies." It has receded in importance in recent years, but is still in existence and has strong political ties.

The Japan China Association for Economics and Trade (JCAET) was formed in 1972. It is partially financed by the Japanese government, and plays a key role today in Sino-Japanese economic cooperation. I was fortunate to have an excellent introduction to the JCAET through Dr. Nobuo Maruyama. During my visit I met with JCAET people on many occasions, and they were extremely helpful in making introductions to other individuals. The JCAET is chaired by Mr. Inayama, head of Keidanren. It receives funding from its more than 400 corporate members as well as from government sources. To illustrate the varied functions of the Association, it serves as a clearinghouse to

facilitate exchange of views among Japanese government and business leaders and Chinese leaders on trade, carries out surveys on China's investment climate, sends missions to China, has specialized committees looking at regional development in China, and opportunities for small and medium enterprises. In addition, the Association provides advice on technology transfer and factory renovation requirements in China, engages in trade-related negotiations, and provides extensive services to its members. (In November, it was reported that the JCAET had signed an agreement to cooperate with the PRC on expansion of port facilities in Dalian.) In 1983 alone 18 specialized missions were dispatched to China (for example, one composed of experts in electronics components technology).

There is a good deal of overlap between the JCAET, MITI and JETRO. One of the people I spoke with at JETRO mentioned that he had spent two years on detail to the Association. Another person I talked with who is a vice director is a former MITI official. The JCAET also has ties with the Institute of Developing Economies (see below), which was established by MITI. The boundaries between these various groups are fluid, and this is a major asset to the organization in coordinating activities and disseminating information. I was much impressed by the JCAET people, both in the sense that they are extremely knowledgeable and that they were quite open to my questions and willing to help.

As I discussed technology transfer issues with a number of people at the Association I learned more about some dimensions of the process. One discussion focused on the differences in US and Japanese negotiating styles. Japanese firms, according to research recently carried out on the subject, tend to send lower level technical experts to initiate negotiations, with the result that they are reluctant to make commitments to transferring technology. Instead, they examine the details and report back to Tokyo. Where the Japanese tend to say "no" to Chinese requests for advanced technology, the Americans say "yes, but..." Since US firms often send higher level people to negotiate, this matches better with Chinese style. As a result, both sides have the authority to reach a general agreement in principle, one that is later filled in by lower level representatives. The point here is that US firms may say yes in principle, but in the course of the negotiations that follow they tend to moderate and refine the original technology request, whereas the Japanese opt out early and earn resentment.

I heard many times that China undervalues software and technology, and also that Japanese firms have a healthy respect for the considerable commitments needed to make technology transfer work. These factors tend to result in a slower approach by Japanese firms. (One example cited was a case where the Chinese side felt that the training component for a project involving printing technology should run about 2 months, and the Japanese side thought it would take a year to bring the technicians up to the needed skill level.) A number of people at the JCAET argued that China is not yet ready for the most advanced technology.

I heard from one of the JCAETs more senior officials that the Chinese have "great expectations" for Japan in technology transfer and that this issue

has been raised at the highest levels of discussion. The problems arise because Japan and China are so close, and there's more expected of Japan than of some of the other countries. It is correct that the demonstrations and criticism of Japan in China reflect some division within the leadership, but these problems can be handled and should not be overemphasized. (This contrasts somewhat with a more alarmist view concerning political friction at JETRO.) Japan, and the US, should look at China as part of a larger picture-- the challenge to cooperate in the development of third world. There are ample cases where it will be difficult for one country to carry out a project and where international cooperation is needed (3 Gorges).

JCAET is the one organization that systematically tracks plant exports, trade and technology transfer to China. According to a recent analysis, during the period January, 1984 to March, 1985 there were 172 cases of plant exports from Japan to China, the largest number (57) involving electrical machinery production facilities. Ranking second and third were chemical and food products. A close examination of the plant exports indicates that the majority of those in the electric machinery area involved consumer products (TVs, refrigerators, and washing machines). Many of these plant exports were comparatively small scale (under \$30 million), due to the growth of regionally based projects of smaller scale.

According to the JCAET, during the same period there were 182 cases of technology transfer reported in the press. The level of technology transfer rapidly increased in 1984, due to the Chinese government's stress on technological revolution through imports of "software" and technology, articulated in the "gibo ketsugo" policy (linking trade and technology). (This data does not include technology supplied along with large plants, but rather includes licensing, software exports, consulting services, components supply, etc.). The components supply-related exports were by far the largest. About 75% of these technology transfers were by machinery producing firms. A more detailed look at the transfers by electronics firms (comprising about 30% of the total) indicates that the overwhelming bulk of them involved consumer production know-how (TV, washing machines, etc). There was one case involving computer technology for the period. The data are worth further study, but the general impression one gains is that Japanese firms have been most heavily involved in transferring standardized technology, particularly in the consumer products area.

Another networking group active in technology transfer to China is the Technology Transfer Institute, which has an office in New York. TTI has a staff of 46 people in Tokyo and its programs and study missions focus on many countries of the world. TTI's China staff does not compare with that of JCAET. Perhaps the most interesting thing about the organization is its use of study missions as a tool of technology transfer. The missions include one company for each technology under discussion so as to avoid internal competition. The study missions permit the Japanese experts to discuss technology transfer opportunities with potential customers on a face-to-face basis. In recent months TTI has sent missions to China to look at specialized technology needs in the printing industry and technologies needed for regional development. Reports are published.

Mr. Idota, the president of TTI, believes that technology transfer must be "industrialized" in Japan and that TTI has developed a unique process. Idota, a very energetic person, calls himself a promoter and I see him as representing a small but growing group in Japan. He believes that Japanese management thinking must be revolutionized in order for Japan to take on a larger role in this area. This, he argues, is in Japan's long-term interest, but there are many forces resisting such a switch to exporting technology rather than products-- especially some of the large trading companies. Keidanren is beginning to pay lip service to the idea, but it has not yet taken firm root. The top corporate leaders in Japan must become convinced themselves, in order to make it possible for junior people to get more involved in technology transfer. Idota's efforts (like those of the JCAET) include consideration of a role for smaller firms in technology transfer. One gets the strong feeling that Idota is an unusual personality who has been waging a kind of one man campaign. It's important to note that Idota argues MITI cannot take the lead in technology transfer -- that a new "revolution" in thinking must occur in the private sector.

TTI China staff identified examples of success and failure in technology transfer to China. One kind of problem arose in the case of a gasification project. Here the Japanese government got out ahead of industry to push the project which ultimately came up against financing problems. Another kind of problem is illustrated by a water treatment facility-- in that case the transfer never occurred because the technology that Japanese firms have is not appropriate (too sophisticated) for China's needs. An example of a success is the Shanghai port facility. In this case mid-stream reevaluation permitted relocation to a better site, with the result that the project was then successfully completed. TTI staff stressed, in particular, that the key to success of a project is that it makes sense in economic terms.

Keidanren's economic cooperation department (which deals with developing countries) advocates technology transfer and investment as a long-term solution to trade dilemmas. They note that former Prime Minister Fukuda said that China is a key to the world's future. But at a more concrete level, the people I talked with noted a long list of reasons why Japanese business is not so interested in investing in China. High costs, lack of infrastructure, requirements to balance foreign exchange, export requirements, and domestic content rules were all mentioned. The World Bank study is seen as too optimistic. The immediate problem of the trade imbalance with China will not be easily solved because Japan cannot import much more oil from China. There is no China fever in Japan right now.

China Experts in Research Institutes As the above discussion indicates, there is no clear line of demarcation between Japan's business community and the think tanks that serve it and the government. The JCAET, for example, could be seen as a think tank because of its research and information dissemination roles, but it is also directly involved in the process of technology transfer. The organizations covered here, however, are more involved in research than in the actual process of transferring technology to China.

According to Masanori Moritani, an expert on technology transfer at Nomura Research Inst., the pattern has been for Japanese firms to sell products rather than transfer technology. But firms like Fujitsu are beginning to understand that they must transfer technology, produce overseas and import to Japan. Generally speaking, there is no consensus on technology transfer or the importance of technical services such as maintenance, but this will have to change. With respect to China, the problem is that the factories have to be built from the ground up and there is good reason to be sceptical about the ability of the Chinese to provide the infrastructure and trained people that are needed. Japanese firms are much more concerned than their US counterparts that the factory actually works (US firms tend to stress contract conditions and to separate out the technology or software components).

The fact that Japanese firms and organizations have a very good knowledge of China's decisionmaking system was apparent both in Tokyo and in China. As discussed in the China trip report, a number of Chinese officials told me that the Japanese understand the system better than Americans. In Japan, I spent some time with Dr. Sakurai, a leading expert on China's legal system. Dr. Sakurai showed me a detailed chart that he developed of the contract approval process for joint ventures in China. This chart is also published in a book on joint ventures in China that I brought back.

China staff at the Mitsubishi Research Inst. stressed that Sino-Japan trade has for years been characterized by politically-driven cycles. Currently, a slight decline is occurring. We can expect another peak in 1988-89. Unlike many of the people I spoke to who argued that the boomerang was more an issue for the 21st century than an immediate problem, I heard that one reason for Japanese reluctance to transfer technology is possible competition. Another reason is that Japanese firms have investments in other Asian countries that they have to protect. More generally, Japanese firms place too low a value on technology transfer.

The Energy Economics Research Inst. has carried out exchanges with Chinese counterparts since 1979, but in early 1984 the level of activity expanded as the two sides began cooperative research to compare long-term energy forecasts. The Inst. sees Chinese oil exports doubling during the next 5 years and believes that this will have strong impacts on Asian energy trade. The problem is that Japan cannot rapidly increase its imports of Chinese energy.

I had an interesting morning of discussions at the Institute of Developing Economies, a research organization funded by MITI. On the staff of the institute are some noted China experts. It was especially interesting to hear about the history of technology transfer to China, dating back to period when Japan occupied Manchuria. Dr. Kojima stressed the long experience that some of Japan's leaders have had in China. In a sense, the US approach has been to help China through teaching students, while Japan's "repayment" to China has been made more in hardware and equipment.

Right now China's plans are too ambitious. It will be very difficult to attain the goals of the 7th plan and it would be better to proceed in a more gradual fashion. Actually, Japanese tend to believe that Japan will forever remain ahead of China in terms of technology, that this is natural. But such a concept is alien to the Chinese.

I heard quite a bit about uneven development in China-- illustrated by the construction of high rise buildings with faulty plumbing and no toilet paper. While such examples sound mundane, the problem is that they can add up to political unrest. It's important to make every effort to help China but to be realistic about what can be accomplished. China is part of a larger Asian picture. One of the senior scholars stressed that establishing a sound and peaceful security climate in Asia must be pursued. Unless this is carried out on a regionwide basis, countries like North Korea might become ostracized "terrorists." Hence, the need to make efforts to build understanding.

As a final note, I should mention that I spoke with the staff of the Japanese Studies Institute at the Chinese Academy of Social Sciences in Beijing. Despite the fact that I had a personal introduction to one of the young women researchers, this turned out to be a rather formal and large meeting. I was surprised to hear such outspoken criticism of Japan's unwillingness to transfer technology to China from this group, most of whom did not appear to know much about technology. I was also struck by the fact that the director of the institute seemed so able and willing to articulate "China's interests" without probing why US or Japanese views are different. The message there was that the US was doing a better job in transferring technology than Japan, but everyone has to work harder in order to get a slice of this fast growing market. The degree of resentment toward Japan was surprising.

### C. Selected List of Interviewees/ Organizations Visited

1. Masaharu Hishida, JETRO
2. Seiichi Yamamiya, MITI, Policy Bureau, North Asia Division
3. Tamaki Yokota, Japan-China Association on Economy and Trade
4. Takeshi Gamo, Coordination Bureau, Economic Planning Agency
5. Ryusuke Ikegami, Japan-China Association on Economy and Trade
6. Minoru Fukushima, China Division, MOFA
7. Toshikatsu Aoyama, Technical Cooperation Division, MOFA
8. Hiroshi Ota, Deputy Director General, Economics Bureau, MOFA
9. Isao Idota, President, Technology Transfer Institute

10. Masahiro Hirano, China Specialist, Research Dept., Industrial Bank of Japan
11. T. Asoh, Manager, Corporate Planning Division, Mitusi (Tokyo)
12. Staoshi Muramatsu, Loan Division, Overseas Economic Cooperation Fund
13. Fumiaki Fujino, General Manager, China Department, C. Itoh and Co.
14. Takashi Mukaibo, Deputy Chairman, Atomic Energy Commission
15. Masanori Moritani, Technology Research Dept., Nomura Research Inst.
16. Tamio Shimakura, Institute of Developing Economies
17. Masatsugu Norimoto, Loan Dept., Export-Import Bank of Japan
18. Keiichi Takeda, Japan International Cooperation Agency
19. Dr. Sakurai, Aoyama University
20. Akira Okabe, Assistant Manager, Oceana and Asia Dept., Toyota
21. Kiyoshi Inagaki, Manager China Section, Mitsubishi Research Inst.
22. Hiroya Ichikawa, Keidenaren, Deputy Director, Economic Cooperation Dept.
23. Isao Matsumiya, Director, International Affairs, FTC
24. Shinji Suzuki, Associate Director, Inst. of Energy Economics
25. Yoshimitsu Kusaka, General Manager, Mitsui (Beijing)
26. He Fank, Director, Inst. of Japanese Studies, Chinese Academy of Social Sciences (Beijing)

## TRIP REPORT:

## CHINESE DECISIONMAKING ON TECHNOLOGY IMPORTATION

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Flying into Beijing on November 30, 1985 I studied an aerial view of a vast brown plain below. As I passed a series of low-lying settlements that dot the landscape, I was struck in particular by the walls that subdivide and encapsulate them. During my visit it became clear that, just as the rural settlements stand as marking points that indicate how far China must go to bring its people fully into the 20th century, the walls suggest obstacles to horizontal communication characteristic of Chinese decisionmaking.

The major purpose of my visit to China (Beijing, Nov. 30- Dec. 7; Shanghai, Dec. 7-11; returning through Hong Kong) was to learn more about decisionmaking concerning technology importation. We knew beforehand that during 1985 a series of important changes were made in China's regulations on technology transfer, suggesting that the decisionmaking process is in flux. A number of China experts in the United States told me prior to departure that no one has a very good "map" of the structure of China's decisionmaking system for technology importation. Hence, the hope that interviews might yield new insights into the process.

Because I do not speak Chinese and have never visited China before, I arrived with few strong predispositions either about the state of Chinese technology or decisionmaking. In the words of the ancient Chinese philosopher Lao Tsu, there may be advantages to beginning as an "unformed block." On the whole, the Chinese officials I met were surprisingly open and the discussions quite useful to gaining a better understanding of the process.

Certainly, the trip would not have been as productive as it was without the generally excellent assistance of the Departments of State and Commerce, particularly in Beijing. Most of the interviews were conducted in Chinese. Although the Chinese officials often provided interpreters, my hosts from State/Commerce were frequently called in to translate, in addition to managing all the logistics. Generally speaking, it seemed that the interviews provided an opportunity for my US hosts to gain new insights into the organizations we visited, and in this sense it was a mutually beneficial effort.

The report that follows begins with a brief review of some of the major findings, followed by more detailed sections treating major actors in the decisionmaking process. The conclusion highlights a number of areas of uncertainty. I hope that we can pursue these questions in the months ahead. (A list of major organizations interviewed is also attached.)

### A. Major Conclusions

1. The major Chinese central commissions and organizations involved in technology importation have been experimenting with new procedures that often involve a devolution of authority for some aspects of decisionmaking in order to attract foreign technology and to encourage more market-oriented forces. Examples of such experiments are the institutions of "technology markets" and contract research by the SSTC (State Science and Technology Commission). In many instances, however, the organizations may not have the staff or resources to implement fully some of the measures that have been announced formally.

In addition, there are indications that during the past 6 months there has been some "pulling back" of authority, particularly in the area of foreign exchange controls. While such controls have been used primarily to control excessive purchases consumer items such as color TVs and automobiles (and thus affect Japanese firms most directly), I also heard that obtaining letters of credit and final approval for some projects is taking some time. The bottom line appears to be that the situation with regard to policy and actual implementation of technology importation continues to change, and that such modifications are likely to continue in the future.

2. It is more difficult to assess the relative weight and the interactions of the major actors involved in technology importation than it is to distinguish some of the changes that have been made within the vertical areas of responsibility of the major commission-level actors. Not surprisingly, each major actor has a natural tendency to inflate the importance of his own organization and a natural uncertainty about what is going on in elsewhere. Particularly significant limited mechanisms for horizontal communication among the major players. At the same time leaders at the highest levels appear sensitive to the need for better coordination (as evidenced by the Leading Group on Science and Technology).

3. Generally speaking, while most of the people I talked to were quite forthcoming and ready to discuss the process, much uncertainty remains about key aspects of the process. Most of the people I spoke with seemed convinced that by explaining how their system operates they can assist the process of technology transfer. I should also note that most official documentation in China remains "neibu" (confidential). Repeated requests for organization charts yielded polite explanations that either they do not exist or would be misleading if they did.

Key areas of uncertainty include: 1) who exactly has the power to control foreign exchange and precisely how such controls are administered; 2) when do major actors have the right to review or overrule each other on major projects and how often they do so; 3) exactly where do the lines of authority and power lie between the central level officials and the localities; 4) is there a significant competition for resources underway between the "older" industries that aim to renovate their facilities and the "new" industries/projects; 5) how do civilian and military sectors interact in the technology importation process?

One can speculate as to why these areas of ambiguity exist. In any complex political system the formal responsibilities of major organizations diverge somewhat from actual informal practice. China is no exception. In some instances, the information may be considered sensitive. On the other hand, it seemed to me that more often it was not possible for the actors themselves to clarify how the organizations interact. The areas of ambiguity may be the terrain of competition among the major actors. If so, it is understandable that it may be difficult to neatly define responsibility.

4. Chinese officials were able to clearly articulate what they see as their own interests in obtaining foreign technology. They generally indicated that the major obstacles to technology transfer come from the foreign suppliers. It was striking that interviewees universally argued that China needs the most advanced technology, and that they volunteered criticism of Japan for not doing more in this regard. Higher marks were given to United States firms, but there was universal criticism of US export controls (and what is apparently perceived as US influence on restrictive COCOM policies). In addition, I heard repeatedly that the United States must provide more financing or risk being left out of the picture in some projects. I should also note that MOFERT officials and some others evidenced an understanding of some of the problems faced by foreign firms supplying technology.

It was particularly striking that persons I interviewed were able to so clearly articulate "Chinese interests," despite the fact that there seemed to be no precise definition of technology transfer and an absence of aggregate statistics to support some of the conclusions.

5. In contrast to these views, I gained the impression that many foreign firms do not see China today as a particularly attractive investment market. (The Japanese perspective is covered in my trip report on Japan.) Suffice it to say that I heard from Embassy analysts as well as corporate representatives that doing business in China is terribly expensive, sometimes quite frustrating in terms of time required to finalize arrangements and to implement management changes (particularly those involving employment) at the enterprise level. Nevertheless, there is apparently a strong hope that investments will pan out over the long term, and a clear desire to foster China's development. It would seem then that foreign firms tend to see factors within Chinese control as the major obstacles to technology transfer.

#### B. Major Chinese Organizations Involved in Technology Importation

Who makes decisions about technology imports to China depends on the kind of project involved, its size, and its location. The system is complex, and what follows is an outline of some of the major actors and their perspectives as articulated in the interviews. It's important to note at the outset, however, that the process differs according to an array of factors, including those mentioned above.

My tentative conclusion is that the major central actors are MOFERT, the SEC, SPC and the SSTC. The last three all have authority to actually carry out certain types of projects involving technology importation. MOFERT's role

is to screen technology contracts of certain types. There is a general division of responsibility among the other three as follows: SPC handles new large capital construction projects of the Baoshan types and also plays a major role in allocating general levels of foreign exchange to other ministries on an annual basis; SEC handles technology imports needed for renovation of existing industry; SSTC is involved in technology imports for some of its research projects and is the central organization involved in formulating overall S and T strategy.

This sounds much more straight forward than may be the case in actual practice. Localities have been given more and more responsibility to independently import technology of certain types. There is also a certain amount of overlap in the areas of responsibility, particularly in the sense that the decisions to import technology for new projects (SPC area) and for refurbishing enterprises (SEC area) affect the Chinese technology development and absorption (SSTC concerns).

MOFERT. Technology Import-Export Department In China technology importation generally requires some level of government approval. The organization most directly involved in granting such approval in a technical sense is the Ministry of Foreign Economic Relations and Trade, MOFERT. MOFERT, for example, published the new regulations on technology import contracts which were promulgated by the State Council (China's highest governmental decisionmaking body) on May 24, 1985. MOFERT has responsibility for planning and administering foreign trade, and its Technology Import and Export Department is specifically charged with review of technology transfer contracts.

We were fortunate to have an extremely productive meeting at MOFERT. Stanley Lubman on OTA's advisory panel had met with the Deputy Director of the Technology Import and Export Department, Cao Jiarui. Although Mr. Cao was in New York at the time of the visit, he wrote a very cordial letter indicating his willingness to help with OTA research, and introduced Mr. Sun Peizheng, Deputy Chief.

The main functions of the Department, as outlined by Mr. Sun, include: 1) drafting laws and decrees (such as the May, 1985 regulations) on technology transfer; 2) examination and approval of contracts involving technology transfer; 3) preparation of statistics and exchange of information with provincial governments; 4) participation in international activities; 5) implementing along with other departments provisions of foreign trade agreements (for example, development of a program for implementing the US-China agreement on industrial renovation); 6) acting as a counterpart to the US Dept. of Commerce Office of Export Administration (which handles export controls). (We were also told in advance of the meeting that this department has interfaced with the US Trade and Development Program, although this did not come up in the discussion.)

I asked Mr. Sun what his department looks for in their review of technology contracts, and how long the process takes. Legally, MOFERT must approve or a reject a contract within 60 days of receipt. Mr. Sun indicated

that, while there is sometimes some prescreening, the review normally begins with the formal receipt of contract and that it is often complete within as little as 3 days. The following factors were included as major considerations in contract reviews: 1) whether there is a clear statement of responsibility for settling disputes such as infringement of property rights; 2) whether the level of the technology is reasonably stipulated; 3) whether the price and the means of payment are reasonable; 4) whether rights, responsibilities and obligations of the parties are clear; 5) whether there are provisions that involve exemption from tax or customs duties; 6) whether the contract includes any provisions that violate PRC law; 7) whether there are any encroachments on Chinese sovereignty.

MOFERT has come across a variety of problems in contract reviews. One typical problem arises where the exporter asks for a contract valid for more than 10 years. In a very few unusual cases such longer validation is granted, but Chinese policy is to restrict contracts to a 10 year period. Another kind of problem has arisen over arbitration, since China is not a member of the international organization that often handles disputes. Prices have also been points of dispute, and MOFERT generally does a comparison of prices from three different suppliers in order to gauge the fairness of the contract terms.

Concerning future trends in technology imports, Mr. Sun indicated that a high priority during the 7th Five Year Plan period will be renovation of existing enterprises-- particularly in the machine building, pharmaceutical and chemical industries. Energy (including energy saving equipment), transportation and telecommunications technologies were also cited as key areas. From the Department's perspective, increasing imports of consulting services and technical assistance will be important trends. During the 7th Plan more stress will be laid on imports of software and they hope that the value of licensing (payments) will be higher than the value of plant-related equipment imports. They have no rigid guidelines on royalty payments.

According to MOFERT, the basic division of responsibility among central actors is among MOFERT, the State Planning Commission (SPC) and the State Economic Commission (SEC). The SPC sets plans for technology importation for new large capital construction projects. The SEC, on the other hand, prepared the list of 3000 projects targeted to refurbish existing enterprises during the 6th Plan period. The SSTC, from MOFERT's perspective, is more a second-level actor which (like many other government agencies) provides suggestions to the SPC for new projects.

MOFERT has delegated some of its authority for contract approval to localities and to industries. Specifically, projects costing less than \$5 million can be locally decided upon, while those involving more funding must be included in the formal SPC plan before they can be approved by MOFERT. I gained the impression that while the SPC makes general decisions annually about funding for its projects, MOFERT makes more technical decisions affecting the level of foreign exchange funding for SPC projects, and that the Bank of China then actually provides the funding for SPC projects. The SPC list provides some general ballpark expectations about levels of expenditure, but apparently more technical decisions are handled by MOFERT. In the case of

SEC projects, apparently MOFERT consults the SEC directly on the level of foreign exchange allocation, but it is not clear how this occurs or precisely how much authority MOFERT has to determine levels of foreign exchange allocations.

MOFERT agreed that the contract approval system is complex, but questioned the utility of organization charts. Depending on the type of project, different agencies play different roles. For machinery and equipment, for example, the Machine Building Ministry and its Corporation of Machinery Imports have key roles, while in the case of petroleum projects the Ministry of Petroleum Industry and the Public Health Ministry (because of safety and environmental concerns) may play key roles. In 1986 MOFERT intends to publish a set of guidelines for technology importation that will include a description of the roles of various departments and divisions. I indicated that OTA would be most interested in receiving a copy.

China National Technical Import Corporation The actual negotiations on technology transfer contracts are in many cases handled by the foreign trade corporations (FTCs). The oldest and one which reports directly to MOFERT is the China National Technical Import Corporation (CNTIC). I met with Mr. Dong Siqi, Vice General Manager of CNTIC who explained the role of the organization in technology imports.

CNTIC officials stress that MOFERT sets the general policy guidelines and does the screening of contracts. CNTIC's role is to let foreign tenders and negotiate contracts. Historically, it has been involved in some of China's largest development whole plant import projects such as Baoshan. CNTIC officials see their role as one of middlemen who keep Chinese and foreign partners "informed" about joint venture and coproduction opportunities. In recent months CNTIC has spun off new firms active in consulting, international tendering and imports of components. Mr. Dong serves in the Technology Trading Consultant Company, one of these firms which provides consulting services on Chinese legal regulations, and provides price comparisons of foreign technology for MOFERT. CNTIC has since 1984 established 10 regional branches and has representatives overseas in six foreign countries. CNTIC's varied activities are illustrated by the fact that it now holds shares in three leasing companies and has recently been active in imports of used machinery.

The projects that CNTIC assists include some that MOFERT assigns and some that are generated by local governments. Although the process remains somewhat unclear to me, it appears that MOFERT screens projects at a stage when CNTIC has obtained a list of 3 candidate foreign suppliers, and that it also finally approves the contract. CNTIC lets international tenders in instances where projects involve foreign credits. In such cases, the tenders are announced in the China Daily, and the information relayed by the FCS to the US Dept. of Commerce which alerts US firms.

CNTIC officials stress that China puts a premium on getting the newest technology. There was a good deal of discussion of problems that CNTIC has encountered relating to US export controls, particularly for large computers

and sophisticated electronics products. CNTIC would greatly appreciate information clarifying changes in US and Cocom regulations.

CNTIC believes that its special advantage is its long 30 year experience with foreign trade. Mr. Dong is himself an engineer and the staff apparently includes a number of people with technical training. On the other hand, many new FTCs and other organizations have been established and play roles in technology transfer. SINOPEC, for example, is seen as a competitor of CNTIC, as are other powerful FTCs of the Light Industry, Textile and Metallurgical Industry Ministries.

State Planning Commission. Foreign Economic Affairs Bureau Seen from the viewpoint of the SPC, the three most important organizations involved in technology imports are the SPC, SEC and the SSTC. The SPCs major roles include drafting the five year plans, identifying and carrying out large new capital construction projects, and allocating foreign exchange to the SEC and the SSCT. On a routine basis, the SPC coordinates more with the SEC than with the SSCT. According to the SPC, the SSCT is primarily involved in scientific and research-related projects and not directly involved on a routine basis in technology importation outside those research projects.

It might be fair to say that the SPC was the most important actor in years past when central economic planning was the keystone of China's economic policymaking. As more market-oriented measures have recently been applied the SPC may have logically relinquished some of its powers, but it still maintains vast authority by virtue of its continuing responsibilities in allocating foreign exchange among the major commissions and ministries. SPC officials noted that certain ministries and provinces may now approve contracts up to \$5 million in value, and that certain cities such as Shanghai may independently approve contracts up to \$30 million in value.

The discussion revealed some interesting differences between the SPC and the SEC. The SEC drew up the list of "3000 items" of technology needed to renovated existing industries under the 6th Five Year Plan. The SPC spokesmen were somewhat critical of the SECs definition of "technology," noting that the term "item" is rather vague. These SPC officials believe that the UNCTAD definition of technology transfer should be adopted so that the statistics will more accurately reflect actual trends in technology transfer. When asked about the number of SPC projects undertaken during the 6th Plan period, they provided a number of 900.

According to the SPC, when an enterprise wants to import technology for a new capital construction project, it sends a feasibility study to a local government authority. After the study has been approved, the enterprise can begin formal negotiations. Enterprises above the county level must obtain approval directly from the SPC. The SPC provides MOFERT with a list of approved projects, and MOFERT signs off on the contracts.

The SPC representatives agreed that foreign firms, particularly US firms, do not understand the Chinese contract approval system very well. They cited a cases where negotiations have continued for more than 7 months (with no

conclusion reached) to set up a joint venture with a US firm to produce refrigerators. The documentation apparently indicates that the US firm did not understand that after the Chinese enterprise sends a report to the SPC and the SPC approves the project in principle, the Chinese and US JV partners must submit a feasibility study which the SPC reviews in order to determine the level of foreign exchange allocations.) These steps must all be taken before final approval of the contract. It appears that contracts often stall over the question of financing. Even when projects are approved (in principle) by the State Council, there can still be problems arranging foreign exchange-- this was the case for a West German partner in a tractor manufacturing plant in Shanghai. From the SPC perspective, the Japanese understand the system quite well-- better than the US firms.

State Economic Commission, Import-Export Division The SEC plays the major role in projects designed to upgrade existing enterprises, including drawing up the list of 3000 target projects for the 6th Five Year Plan. (According to the SEC the 3000 list covers projects-- some of which involve imports of a number of different kinds of technology-- rather than "items.") More than is the case for the SPC projects, small and medium size firms are included. During the 6th Plan, technology imports for the machinery and electronics industries were prominent.

The SEC representatives interviewed such as Mr. Wang Yi, Deputy Manager, were able to provide us with some relevant data. The following cover 1983 imports for SEC projects only:

	# of projects	% of total involving software
U S	95	54%
Japan	182	40.1%
FRG	146	40.4%
UK	33	20%
Total-	666	

These officials of the SEC expect no great change from these trends when 1984 and 1985 data is available (in that overall shares of software are likely to remain unchanged), but they do expect the overall volume of imports to increase.

The SEC list of 3000 projects (valued at about \$3 billion used to renovate 400,000 factories) for the 6th Plan was adjusted during each year, as more detailed plans for that particular year were prepared. The lists are revised, based on China's development needs and foreign exchange availability. The SEC process is for the ministries that want to carry out projects to submit feasibility studies to the SEC. The SEC (or today often the ministries or provinces) then approves some of the larger projects. The approved projects are filed with the SEC and the contracts are approved by MOFERT. The

SEC apparently allocates foreign exchange on an annual basis. The goal is to simplify and speed up the process of technology importation. While the general trend has been to give more authority to the local authorities, the SEC began in 1984 a required approval process for all imports of assembly lines. The reason given for this change was a dissatisfaction with the amount of technology actually acquired via such imports.

Some coordination occurs with the SPC on a routine basis, and significantly the SPC has recently established a bureau for coordination with the SSTC. In order to better bridge the gap between the SSTC sponsored research projects and the end-user factories (where the SEC exercises a more leading role), plans were announced during my visit to establish "permanent advisory centers" to handle technical services transactions-- in other words, to use the centers as "bridges" for technology diffusion within China. This effort follows the decision made by the State Council about 6 years previous to view technology as a tradable commodity rather than common property. It reflects the fact that technology transfer within China's economy has been impeded by a number of institutional obstacles, including weak horizontal communications among ministries and commissions.

The SEC is now working to complete a list of target projects for the 7th Plan period. We asked whether this list would be published, and the reply was that it is not yet clear when this might occur or whether it might be published in segments. As far as the 7th Plan is concerned, they expect to target another 3000 or so projects, but more stress will be placed on export-oriented projects, on improving quality control, and on supply of spare parts and maintenance. I was left uncertain as to whether all of the 3000 projects designated under the 6th Plan have been completed to their satisfaction.

State Science and Technology Commission Thanks to the help of the S and T office of the US Embassy, I had a number of very useful meetings with Chinese science and technology policy officials. One of these meetings involved a group from various departments of the SSTC.

The SSTC officials I talked to mentioned research on technology policy in China that has been compiled in a written report to the State Council. This report was the first of its kind, and the aim was to develop a long-term strategy for technology transfer. Along with the SSTC, the SEC, SPC and MOFERT also participated in this effort by exchanging views in a number of meetings. (These meetings have now ended, but they indicate increased efforts to coordinate at the highest levels.)

The SSTC alone has about 200 research projects in high technology areas, some of which involve imported technology. It seems that the SSTC can independently approve such projects (after foreign exchange is provided by the SPC), but that MOFERT is notified. MOFERT, according to these officials, checks for duplication of efforts.

The work of the SSTC includes: 1) a statistical survey on the performance of imported technology by regions which provides the basis for a report to the State Council; 2) preparation of a management module in order to optimize use

of imported technology; 3) use of economic mechanisms such as prices to influence technology importation and development; 4) study of relationships between domestic research and imported technology; 5) development of a technology import strategy on a fairly detailed sectoral basis covering appropriate imports in the year 2000; 6) comparison of foreign government policies. Assisting the SSTC in this work are specialized affiliated organizations, in particular the NCSTD as discussed below.

In looking at past technology transfers, the SSTC has identified a number of problems. A lack of attention to "digestion" of the technology is one. Failure to look at long-term implications is another. In particular, they stressed the pressing need to reform Chinese management in order to improve technology absorption.

In an attempt to distinguish the types of technology transfer going on in conjunction with SSTC projects, a few cases were cited. The 36 "key" projects which the SSTC now supports all include some technology transfer. One example cited was the develop of a computer system for the Harbin railroad station. Such projects, it was suggested, involve applications of imported technology needed for more efficient operations. It was nevertheless difficult for me to assess how typical this case is of SSTC research projects.

SSTC officials noted that each of the big four organizations involved in technology transfer have a certain independent authority, although they do submit joint proposals through the Leading Group on Science and Technology to the State Council. (See below.) They joked that there is "some chaos" in this system, and that more central control of certain aspects such as financing may be necessary.

SSTC. National Center for Science and Technology for Development The NCSTD is an organization affiliated with the SSTC, a kind of think tank. The Center has four divisions involved, respectively in: 1) long-term research on Chinese science and technology for development aimed at developing a comprehensive strategy; 2) development of technology policies for 12 specific sectors such as energy, computers, transport, and telecommunications (focusing on a comparison of the state of Chinese technology and what China needs to import and what it needs to develop indigenously in each of these sectors; 3) analysis of management of Chinese S and T, including issues such as links between research institutes and industries; 4) multidisciplinary study of system engineering for key projects. These reports are not available to the public. Major clients for these studies are the SSTC and State Council, as well as local state enterprises.

NCSTD interviewees expressed the view that China really has no technology transfer policy right now. In practice, the SSTC, SEC, SPC and MOFERT all discuss these issues and work out answers for specific cases, but there is no real strategy.

One illustration of the innovation that is underway within the SSTC is the recent establishment of Venturetech, China's first venture capital company under its auspices. The major goal is to involve more small and medium size

firms. On a yearly basis, there are about 1400 applications for projects but only about half of them can be funded by existing institutions. Venturetech hopes to select just a few (perhaps 10 or 20) from that group and provide guarantees and some financing. Their expectations are that these projects are likely to yield a high rate of return (30-60% annually). Mr Zhang Xiaobing, formerly with the NCSTD, will head up Venturetech. He believes that the new venture company can provide (along with MacKenzie and Co. of Hong Kong which will be a joint venture partner) advice on potential sources of technology from abroad. He mentioned that Europeans, in particular, may be interested in participating in some of the projects involving smaller Chinese firms. Venturetech is one of a host of new organizations recently established by the major actors in an attempt to experiment with novel approaches to technology transfer.

Leading Group on Science and Technology The Leading Group is important because it reports directly to the State Council and includes representatives from all of the major organizations (SEC, MOFERT, CASS, SPC). Its importance is indicated by the fact that the Premier himself is the director. Membership also includes a representative from the National Defense Science, Technology and Industry Commission. Representatives from financial institutions also sit in on the meetings, according members of the staff of the Leading Group with whom I spoke. The Leading Group itself meets fairly frequently, about once a month.

The Office of the S and T Leading Group is chaired by Song Jian, SSTC Director. Deputy Director Qian Zhenmeng, with whom we met, stressed that the staff focuses attention on overall issues of national policy, leaving more detailed issues to the ministries themselves. The staff is composed of individuals from various ministries concerned and includes about 20 people. Apparently, appointment to the staff of the Leading Group is much desired, indicating that the qualifications and abilities of the staff are considerable. These people apparently are up and comers, with technical and managerial backgrounds that the ministries recommend but the Leading Group itself chooses.

The staff of the Leading Group has been involved in analysis of critical national S and T issues. Sometimes studies are initiated by the Leading Group members themselves. In 1983, for example, the Leading Group organized three committees to work on an overall national S and T plan. The staff took responsibility for the study, coordinating with other agencies and preparing the final report for submission to the State Council.

A contrasting example cited was a study, initiated by the staff itself, dealing with possible improvements in use of S and T personnel. The general issue was apparently raised at some point by Deng himself, but the staff of the Leading Group (working with the Ministry of Labor in particular) took the initiative in producing a document that ultimately became a national policy document (#11).

Still another example cited to illustrate the various ways that the staff works was a study on the use of gas in the cities. In this case, the staff

brought together members of a large number of relevant ministries and organizations and helped to coordinate. In some instances, then, the staff responds to directives from above, but in others it takes more of an initiative in introducing new subjects for discussion or in coordinating exchange of views among a number of ministries.

The staff members we met with discussed the overall rationale for technology importation under the "open" policy. Imports of technology should be above the level of what's available within China, be of practical use, help to increase China's self-sufficiency, stimulate economic and social development, and help to general foreign exchange. Staff members indicated that there is a need for a "plan" dealing with technology absorption, and a need for coordination of science and economic plans.

Specifically, the basic division of responsibility is that the SEC has the lead in developing technology import policies involving production technologies, while the S and T Leading Group is charged with policies for research and other types of technology imports. I had the impression that the definition of "technology transfer" used by SSTC staff is quite broad, and extends well beyond know-how and knowledge needed for production of goods and services.

Recently, the Leading Group and the SEC have both noted problems involving technology transfer in industries, such as low quality of production and overlapping technology imports. The SEC is in charge of actually overseeing these imports, but the staff of the Leading Group apparently had a role in the recent S and T Progress Meeting on Enterprises. At the meeting, technologies were categorized as follows: 1) those that should no longer be imported; 2) those that should temporarily not be imported; 3) those that should be imported; 4) those that should be produced locally. We asked whether we might receive these lists, but they apparently will not be made public.

There are two important points to be stressed here. First, the staffs of the Leading Group and SEC (which has the lead on industrial technology importation) realize the need to work together to solve some of these problems. Second, there is an understanding that China has entered a "period of adjustment" concerning technology imports, and that imports of certain types (such as color TVs) must be restrained in order to ensure that overall goals are met with regard to use of foreign exchange and stimulation of domestic industrial capabilities.

There was some discussion of the rationale for and approaches to contract research, which has been an important recent development. Staff members stressed that the SSTC has not really reduced funding for research, but has rather changed the way it is allocated. They admitted that there are natural tendencies for the institutes to resist the new trend because it means they are cut off from their secure annual allocations. Among the many research institutes in China, some will fail. The basic goal is to put the research institutes into closer contact with the user institutions. This is an area where the Leading Group staff played a major role in developing a policy that

was ultimately approved by the State Council. Of interest is the fact that one contract research project involves a West German firm.

Shanghai and Technology Importation Shanghai provides an interesting contrast to Beijing, and reminds one that China is an extremely big and varied country. The general patterns of decisionmaking in Beijing are met with significant variations elsewhere. In this regard Shanghai has the bustle of entrepreneurialism and the aura of past Western influence that combine to give the visitor an impression of a much more free wheeling place.

To sit by the window eating dumplings in the Peace Hotel restaurant is to observe a major channel (the river) for technology trade. On the rainy, foggy day I was there, long strings of small boats plied the river. Periodically, a huge ship from some far off port interrupted the local traffic. The movement seemingly never ends and one can only speculate on the volume of trade, the foreign suppliers and the relevance to technology transfer. The roofs of the Western buildings on the Bund reveal a history of varied Chinese experience with technology transfer in the past century. The crowds of shoppers gathered around the rather simple display of wares for sale in the Shanghai #1 Department Store make it clear that China is very much a developing country--albeit one aiming to make up for lost time.

Shanghai officials (Planning Commission) have considerable leeway in approving "productive" joint venture projects up to a \$30 million level (and up to \$5 million for technology and training). City bureaus and districts are said to now have negotiating authority for approval of investment up to \$5 million in value. For large projects, the approval process still involves 5 or 6 levels of review. For computer-related technologies, the factory that wants to import technology, the corporation with which the factory is affiliated, the Shanghai S and T Commission, Foreign Economic Relations and Trade Commission, and finally the Economic or Planning Commission/ Mayor's office may all be consulted. If the decision is made at the highest level to go ahead with a project, this process can apparently be carried out quickly. If not, it can take quite a bit of time.

Shanghai aspires to become another silicon valley, but it also has a very aged capital stock and exports have fallen recently. This can be explained in part by the fact that while Shanghai used to be one of the few windows for technology trade, today many other localities have the authority to independently import. Shanghai must also contribute foreign exchange to the national government. Estimates are that today about 75% of revenues must be turned over (down from 90% a few years ago, but still substantial). Yet Shanghai has a very gung-ho leadership who see advanced technology in Shanghai's future. Observers note that these key leaders, many of them technocrats (such as the new mayor who was formerly Minister of Electronics at the National level) now more often "huddle together" to build consensus on technology policy.

Shanghai Computer Factory A visit to the Shanghai Computer Factory is a lesson in some of the problems associated with technology transfer. The factory is seen as a showpiece, but it is really under construction and

appears quiet. Since its establishment in 1966 factory has produced 18 kinds of computers, but in the early period (up through 1975) these were not compatible. Between 1980 and 1984, they began to produce computers compatible with DEC, IBM, and NOVA primarily by importing components from Hong Kong and Japan (originally US designs). Thus the factory moved from production of mainframes to minicomputers and today microcomputers. While it does produce several types of small calculators in large numbers, the annual production for computers is said to be only about 1000 annually. The new construction that is now underway is a microcomputer production facility to be completed within the next two years.

To date, it appears that much of the technology transfer that has occurred has been somewhat limited. Components imports have permitted "KD" (knock down) assembly. In addition, there are many new and sophisticated machines (machines for cutting and cleaning silicon wafers, test machines and other types of instruments from first such as Fluke, HP, and Ginrad), but none of them are currently in use. About a quarter of the 400 technicians were said to be involved in softwear, but most of the "testing" of programs that I observed appeared to involve trial runs only. Softwear development is obviously still a major problem.

Concerning the procedure for technology importation, the Deputy Chief Engineer explained that the factory generally submits 3-4 applications annually for new technology import projects, and that 1 or 2 are generally approved. The first step is to submit a technical report with proposed budget to the Shanghai Computer Corporation. The Corporation submits the application to the Shanghai Economic Commission, which looks particularly at the budget. The factory can proceed once the SEC has given its approval, and can operate within a leeway of about 10-20% possible increase in expenses. The factory is required to return to the local government about 50% of its revenues.

The factory has not yet established any joint ventures with foreign firms. One reason is that Ministry of Electronics' relationship with a Japanese firm allows the factory to receive designs free of charge. Perhaps the major reason, however, is that potential foreign partners are reluctant to involve themselves in a joint venture, because the factory is required to employ so many more people than technology needs dictate. Therefore, despite the fact that discussions have been held with US firms a joint venture seems unlikely.

Shanghai Federation of Commerce and Industry Meetings with the Federation provided interesting insights into the process of technology transfer. The Federation is composed of about 20,000 members, most of them former ("retired") entrepreneurs who serve as middlemen in making introductions for foreign partners. They are mostly leading figures in Shanghai industry and trade, and those I met with are technically trained. Vice President Charles Y. Wang, for example, is MIT trained. He and two colleagues appeared on the February 18, 1985 cover of Fortune magazine as representatives of a new breed of Chinese entrepreneurs.

It is not surprising that foreign firms have trouble understanding the contract system, my hosts said. Decisionmaking involves a large number of people outside the end-user factory, and this can be confusing. The thing that most facilitates technology transfer is to get the project included in the plan. This usually involves a general statement about the project and a general financial plan. Once a project is approved the appropriate ministry or bureau designates a factory and the factory (along with bureau representatives) begin actual negotiations on the technical aspects. The Foreign Trade Commission then makes the financing decisions. The biggest obstacle has been a lack of sufficient investment, because the government can directly finance only so many projects. The Federation has played a role in helping to find financing. Mr. Wang noted that Premier Zhao wants Shanghai to develop to the level of Hong Kong within 15 years, but also expects it to provide its own financing. A recent decision allowing them to borrow from private international sources will be an important breakthrough, they hope.

In the past, Japanese firms have been eager to get involved, but they are seen as less willing to provide technology than US firms. For example, GE was able to sell locomotives primarily because of the technology and training it was willing to offer. US firms, on the other hand, too often expect quick results. The Federation sees itself as uniquely able to help potential partners build a long-term understanding. It is primarily a networking group that has worked in the past with some of the biggest US firms such as GE.

Shanghai Foreign Economic Relations and Trade/ Science and Technology Commissions The big four organizations in Shanghai are the Shanghai Federation of Economic Relations and Trade, the Planning Commission, the Economic Commission and the Science and Technology Commission, mirroring the situation at the national level. SFERT and the SPC generally approve non-industrial projects and the SEC has a major role in industrial projects, according to the officials I met with. In the case of big projects the SSTC also reviews. SFERT must review the contracts if they involve foreigners. Approval must be given for imports of industrial property, know how or technical services. If the funding comes exclusively from Shanghai, then the SPC can make key decisions for most projects. Today, however, there is a need to look to more sources of financing, including private financial institutions. This is a significant development.

The SSTC (like its national counterpart) provides general policy guidance in areas such as training in S and T fields, organization of technology markets, coordination of major projects. The staff numbers over 100, and includes a comprehensive planning division. While the SSTC has primary responsibility in research areas, it is also involved when major projects involving new high technologies (such as IC production) are under consideration.

### C. Questions for Further Research

The discussions highlighted the transformation that continues as China searches for ways to obtain foreign technology while at the same time preserving its own autonomy. Practically speaking, these dual purposes create

the need to involve foreigners more extensively but at the same time a concern that that involvement be circumscribed so that Chinese organizations remain in control.

Clearly, Chinese leaders have made significant changes that indicate their willingness to respond to the requirements of foreign firms in such areas as patent protection and increased transparency and devolution of authority in the decisionmaking process.

et much remains uncertain about the functioning of the Chinese decisionmaking structure on technology importation. I came to think of the structure as resembling an accordion, where the power and resources of the vertical organizations expand and contract along with changes in the external political and economic environment. Each of the ribs or compartments (vertical agencies) have begun to experiment with new approaches, but it is extremely difficult to evaluate their relative positions unless you look at particular cases. For certain types of technology imports, the vertical actors each have extensive authority, but it is unclear when they can and do overrule each other or how this occurs.

The level of horizontal communication among the ribs (vertical agencies) appears constrained, and possibly a major problem. Each agency has the resources to move ahead with projects of certain types, but these various projects at times overlap or run at cross purposes, and in such cases it may be difficult to reach a consensus save at the highest levels and for the largest projects that receive the attention of high level officials such as the S and T Leading Group. In this sense, the experiments initiated by each of the major actors may be difficult to implement because of limited resources to carry them out and problems in coordination horizontally.

The appropriate conclusion to draw may be that, under these circumstances, a foreign firm can best assume that approval must be gained from a large number of agencies in a process that may be rather time consuming. Even projects approved in principle at the yearly plan level may be subject to foreign exchange constraints when contract terms are finalized. An important question that remains unanswered is who controls foreign exchange and how this occurs. In the current context, this is a key issue.

Other important issues concern the precise division of responsibilities between the central and local officials, as well as between the new projects and the older industries. In addition, it is far from clear how the civilian technology importation process interacts with the military.

List of Organizations/ Persons Interviewed (Dec. 2-10, 1985)

1. China National Technical Import Corporation (MOFERT), Dong Siqi, Vice General Manager
2. China Venturetech Investment Corporation (SSTC), Zhang Xiao Bin, President

3. National Research Center for Science and Technology for Development (SSCT), Bai Yiyian, Division Chief for Technology Transfer
4. State Planning Commission, Foreign Economic Affairs Bureau, Lu Dingwen, Deputy Director
5. State Economic Commission, Bureau of Import and Export, Wang Yi, Deputy Chief of Division
6. MOFERT, Technology Import and Export Division, Sun Peizheng, Deputy Chief
7. Chinese Academy of Social Sciences, Inst. of Japanese Studies, He Fang, Director (see trip report on Japan)
8. Leading Group on Science and Technology, Qian Zhenmeng, Deputy Director
9. Shanghai Science and Technology Commission, Zhang Qi Biao, Deputy Director
10. Shanghai Foreign Economic Relations and Trade Commission, Foreign Investment Division, Wang Jianqing
11. Shanghai Computer Factory, Mao Tsung Chun, Deputy Chief Engineer
12. Shanghai Federation of Industry and Commerce, Charles Y. Wang, Vice President
13. Mitsui and Co., Peking Office, Yoshimitsu Kusaka, General Manager (see trip report on Japan)

Note: In most cases I met with a number of officials when I visited an organization. This list includes one name from each of the meetings. In addition, I met with US commercial, economic and S and T officials.