Technology Export and National Goals

The flow of U.S. technology to other nations is now becoming an integral element in foreign policy. The author reviews current issues being raised and offers general guidelines for developing future policy

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There is a profound and increasing demand for U.S. technology by nations abroad. That was brought out very explicitly to me on visits to seven countries last year while I was in the White House. These countries covered the gamut of Western and Eastern, developed and developing, but the common element among them was that they wanted to talk about U.S. policies for regulating the transfer of technology from the U.S. to their countries. And they were anxious to know if the U.S. intended to restrict the flow of technology, or in the case of the Eastern countries where we have restricted that flow, how those restrictions could be relieved.

Now, all these countries sense what is perfectly obvious; namely, that the flow of technology is the key to their domestic development, to their foreign trade balances, and to their national well-being. Also, they recognize that civilian technology is an increasing factor in world influence. It is not so much space feats and military technology any longer, but civilian technology that is growing in importance. Our government is somewhat less aware of the power of civilian technology for shaping the world. And yet, in the past few years, there has been a growing tendency in our government to look at technology transfer as an integral part of foreign affairs and foreign policy. It is not too much to say that technology, and to some degree science, too, are becoming preferred currencies of foreign dealings.

Technology Transfer and Trade Policies

Federal concerns with technology transfer abroad are, of course, closely tied to trade policies, and that is the subject of considerable current ferment. The Burke-Hartke Bill stirs the blood of businessmen who have international operations or ambitions. That bill, of course, is highly restrictive in its regulation of overseas production and investment. It stems very clearly from the populist and labor philosophy, and it is directed at preventing the export of jobs rather than the export of technology. However, Burke-Hartke does address

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ing industrial infrastructure. Thus, we help them to grow by introducing additional funds and additional technology into the region. At the same time, as the local aspirations grow and change we also learn more about what is available locally and how to take advantage of it.

The Future

Let us now turn briefly to the future. Traditionally, General Electric has tended to deal principally with private companies in other countries. Also our relationships have been more or less open-ended with respect to time. There is an implicit assumption, and sometimes even a contractual obligation, that a commercial relationship will go on for a very long period. At the very least a specific near-term termination of a relationship is rarely specified.

In the future, it is quite clear that we will be dealing in a major way with governments rather than with private companies in the negotiations for technology transfer, particularly with the USSR and with China. And we will sell technology, per se, and not just through products and not just with know-how and exchange agreements. Rather we will see the creation of an on-site technical capability including facilities and trained manpower which will then be operated by the local government. And that will put us in a different kind of world.

In closing, I'd like to emphasize that we must begin to change our point of view in technology transfer. Traditionally we have tended to regard technology as a sunk cost. The money has already been spent and anything one can get back by way of export sales or licensing is incremental income. This point of view very strongly influences the way one thinks of the value of his technology and I think leads to its being undervalued.

We must learn to price value and avoid handing other countries a competitive advantage by selling them technology for much less than it would cost them to develop it themselves. We will in many cases, particularly in dealing with the Russians and the Chinese, be dealing with discrete transactions where one has essentially a one-shot sale. There is no continuing stream of income coming for a period of years from royalties or from future sale of products and the pricing of that large one-shot arrangement determines whether or not the transaction was profitable. This situation calls for a different way of thinking and one which I think is going to be very challenging.

technology transfer in the same terms; namely, preventing export of jobs.

Not yet above the noise level, either in the Burke-Hartke Bill or elsewhere, is the question of overseas research and development by U.S. companies. As professional societies begin to take on the representation function for scientists and engineers, and as the cost of research and development done in the U.S. goes up, I expect to see this aspect; namely, the export of research and development jobs emerge as a major issue, too.

At the other end of the spectrum from the Burke-Hartke and this concern about export of jobs is the Administration's trade bill which would be much less restrictive. It merely changes the tax structure on profits made overseas so as to give less incentive for foreign investment. Just which approach is going to be taken by Congress is not yet entirely clear. However, it is very significant in my view that these bills rest with Congressman Wilbur Mills and his Ways & Means Committee in the House. He has expressed very little interest in restricting trade or the flow of technology. Rather his approach is more creative; namely, he asks, how business can be induced to capture overseas markets while minimizing the export of jobs and technology. I believe that you will see some very imaginative proposals from the Congress in the months ahead when action on the trade bill become imminent.

Some further background and straws-in-the-wind, generated by the federal bureaucracy, arise from Michael Boretsky, Senior Policy Analyst in the Commerce Department. Boretsky has been analyzing the import-export balance of the United States for some years. His theme, which is extensively documented by statistical analysis is now familiar, though it was quite original when it was first put forward. Boretsky says that high technology products are the basis of our exports, for it is only in these high technology exports (including agriculture) that the U.S. has a positive balance of trade. You may very well ask how high technology product is defined, as opposed to a low technology product, or no technology product. Some people have claimed that the Boretsky definition is that a high technology product is any one in which we have a positive balance of trade.

In my view, this bit of attributed tautology is not an adequate put-down of Boretsky's work. He lists six reasonably well-defined product areas (seven with agriculture) that account for the lion's share of our exports. These are: aircraft, computers, instrumentation, pharmaceuticals & drugs, chemicals, and machine tools.

Boretsky's outlook is completed when he urges that we as a nation stop exporting technology "on-the-cheap". He points out that we sign about five times as many licenses sending technology to Japan, for example, as they sign with us for the reverse flow. He views that as alarming since we have a negative balance of trade in high technology products with Japan — and increasingly with other Western countries, such as the Federal Republic of Germany.

The former Secretary of Commerce, and former president of Bell & Howell, Peter Peterson, has further documented the Boretsky approach and has published an extensive document on the subject. This report was a best seller in 1971 and 1972 and gave important insights into trade flows in the world, their size, and the resistance to those flows in each direction. Peterson's analysis indicates that tariffs and duties are only the surface indications of a nation's protective mechanisms. There are a number of others which have been lumped under the now familiar term, non-tariff barriers. These include such items as government regulations for preferred domestic procurement, and restrictions on foreign ownership of domestic industries. The Japanese have been expert in erecting such barriers in pursuing their goal of developing certain preferred internal industries, such as computer manufacturing. The Japanese have found this an effective way to answer the challenge of foreign control of their domestic industries, without at the same time, violating the "Marquis of Queensberry Rules" of international trade. Europe, too, has used this technique to answer Servan Schriver's "American Challenge".

Peterson's conclusion is clear enough. It is, namely, that in our trade and technology transfer policy, we should insist on equal market access in both directions. Peterson makes some exceptions in the case of underdeveloped nations, but they are less than critical in the total U.S. trade picture. Rather, it is Western Europe and Japan today, and Eastern Europe and the U.S.S.R. tomorrow where we must focus on these matters. China seems unlikely to be a large factor soon.

Nevertheless, the Administration sees a five-sided competition in the world of the 70's and 80's. The corners of this pentagon of competition are the United States, Western Europe, Japan, U.S.S.R., and China. To compete in this five-sided contest calls for equal market access to the other elements of the pentagon. This view is what Secretary of the Treasury Shultz was implying when he recently ruffled feathers by saying that our trade and monetary negotiations with the non-Communist world would be non-reciprocal, implying that there are unilateral constraints against us which are to be righted. There has been at least some modest progress in relieving Japanese non-tariff barriers in the past year. The word, liberalization, has been used, but it remains to be seen how the new Japanese policy of "Buy American" and "Welcome U.S. Industry" will be executed in practice.

However, we must admit that not all constraints on trade are on the foreign side. We, too, have our non-tariff barriers, both on exports and imports. We have a number of export restrictions, and these are based upon two Acts, The Munitions Control Act, and the Export Administration Act. Under the former, the President is authorized to control export and import of arms, munitions, and implements of war, including technical data. The Export Administration Act establishes export control on commercial items in three categories; first, items in short supply; second, items necessary to further foreign policy; and third, items which affect national security. There are no restrictions, however, on published data, journal articles, or symposium procedures. Technical publications, however, which are sold for profit do come under the Export Administration Act.

It is significant that there are no formal mechanisms for the control of technology transfer abroad based purely upon economics. However, we must add the following. As a nation we have begun to relate economic well-being to the technological-industrial base of the country. Furthermore, both are related to national security. And so the distinction between economic advantage and the well-being of our economy on one hand, and national security on the other, is being lost. Therefore, U.S. mechanisms for export and import control are more widely applicable than it would first appear.

In short, we have non-tariff weapons to control technology transfers to our own advantage, just as other nations do. As usual, in instances of this kind, the issues of international technology transfer have both pros and cons, and conflicting advantages and disbenefits for our nation. Liberal technology transfer and investment overseas are favored by those who see foreign markets to be captured and spheres of influence to be widened or sustained. Many people in government have become increasingly conscious of the cultural influence of technology. Ways of life and thought can be influenced profoundly by communication, transportation, and labor-saving technology, for example. Also on the liberal trade side are those who would use the foreign yearning for our technology to exact foreign policy concessions. For example, it has been said by a recent New York Times editorial that the mild Soviet reaction to the U.S. bombing in North Vietnam around Christmas last year was due in no small way to the desire for liberalized trade and high technology. On the negative side, there are those who want to preserve the U.S. technological lead in fields such as computers for economic reasons, those who want to preserve U.S. jobs, and those who would worry lest technology transfer add to foreign military capabilities.

Technology Transfer Examples

It is against this backdrop of conflicting goals that several landmark cases of technology transfer were decided in the past few years in government. First, there is the case of the Thor Delta rocket technology in Japan. These arrangements were made in about 1969. The arrangements were for the Japanese to build a version of the Thor Delta in Japan for launching civilian payloads into space. More recently, the Japanese have requested additional technology in the form of an advanced third stage. That request has not yet been acted upon. That additional capability would permit the Japanese to put a much larger payload into orbit. The Thor Delta technology is over 15 years old. My guess is that this vintage technology will be exchanged for trade or investment concessions — perhaps not explicitly, but perhaps as part of a larger package.

The second case which has been decided recently is the one involving General Electric and the SNECMA Company in France. SNECMA is a French, partially government-owned, aircraft engine manufacturer. GE and SNECMA propose a joint development and production arrangement for a ten-ton thrust civilian aircraft jet engine. The issues in this case are complicated but certainly one of them is national security. The core of the ten-ton engine to be developed was to be drawn from the core of the engine for the B-1 bomber. It turns out that that is the least expensive way to go about the ten-ton development. Second, on the economic side, this arrangement could put SNECMA into the General Electric, Pratt &Whitney,Rolls Royce class as an engine manufacturer and would increase competition in an already overcrowded field. Third, and on the positive side, this arrangement could or might result in a wider market in Europe and perhaps elsewhere for the U.S. manufacturer of the ten-ton engine. This viewpoint assumes that if GE/SNECMA did not manufacture the engine, there would be a European consortium that would build it and would preempt the European market. The fourth issue was one of technological and managerial transfer. The latter was raised when it was proposed that the B-1 core not be exported to France (to maintain security), but be kept here so that the only part of the engine to be manufactured in France would be the front-end fan. With respect to this arrangement, certain elements said that it was not so much the technology of the B-1 core which was of value, but rather it was knowledge of management techniques for engineering and production of complex systems. The pros and cons were considered and the request for an export license was at first denied. On June 4, 1973, a decision to grant an export license to GE was announced. Engineering management of the joint project was to be centered at GE. There would be an R&D recoupment for partial recovery of Air Force R&D funds. The French conceded that for the duration of the agreement there would be no reinstatement of the suspended European Commission tariff on U.S. aircraft jet engines and airframes.

Third Case

The third case was that of Post-Apollo cooperation with Western Europe. The issue here was whether the Europeans should be invited to jointly finance the space shuttle and to participate in its development. The Europeans were willing to finance about 10% of the shuttle costs in return for 10% of the production contracts. A corollary issue, but not coupled directly, was launch assurance. This would be an agreement by the U.S. to give the Europeans an assured, independent launch capability for civilian payloads. This desire for an independent launch capability on the part of the Europeans is attributable at least in part to the restrictions that might be placed by Intelsat on the launching of communication satellites. For example, one issue that was brought up was whether the French would be allowed to launch a transatlantic satellite for direct television broadcast into French Canada. The coupling to Post-Apollo arose in European minds when it was pointed out that participation in the shuttle and creation of a European launch capability seem logically to be alternatives, not parallel developments.

In the end, the Europeans were offered participation in the Sortie Module; that is, the shuttle payload container. They had already been offered launch assurances subject to an Intelsat review under certain conditions. My understanding is that there has been acceptance by some of the European countries of both proposals, but there is continued work in Europe on an independent launch vehicle, so the situation is still somewhat fluid.

These are examples of the sorts of issues that are going to arise in the years ahead. There are many others. There is the issue of Aerosat, and how that satellite which is to provide communication for transatlantic aircraft should be launched and operated. There is the question of advanced computers for the Kama River truck plant in the Soviet Union. There is the issue of the sale of the Atlas Centaur space launch vehicle to other countries. There are the issues of passenger jet aircraft to China, the joint effort by Boeing and Air Italia on STOL aircraft, the question of air traffic control systems to be sold to the U.S.S.R., and the question of an international consortium to construct a uranium enrichment plant.

Policy Guidelines

As such cases multiply, a general policy guideline will be needed. So far the major general principle that we see operating is that such issues should be carefully coupled to the achievement of U.S. foreign policy objectives, and should take into account the economic health of the U.S., our national security, and international political considerations. There have been several high-level studies looking for policy guidelines. None reached unanimous agreement. It is impossible, I think, to reconcile permanently such diverse views as are represented by the Departments of Commerce and Defense on one hand, and the Department of State on the other. However, I can give you my own personal viewpoint, which is shared by many on the Washington scene.

First of all, historical U.S. policy has assumed that free trade, including the transfer of technology, was desirable. There is no compelling reason to reverse or compromise that principle at the present, despite the fact that there will be a limited number of exceptions due to national security, extreme dislocations of our domestic industries, or extreme adversary foreign relations. Mostly, these exceptions will involve technology which is funded in whole or in part by the government.

Secondly, exported technology should be adequately reimbursed by the recipients. There are some fundamental difficulties here including the pricing of technology. Not much is known about how to price technology competitively with other sources of the same or comparable technology, or with a do-it-yourself option. In addition, payment brings up the important question of financing, including most-favored-nation treatment, and export-import bank credits. As you know, these matters in the Soviet case have become entangled with Soviet emigration policies, particularly emigration to Israel. Then, too, many deals with the Soviet Union and Eastern countries involve barter. We have little modern experience with barter in this country.

Thirdly, case-by-case consideration of technology transfer is appropriate to avoid setting premature precedents with foreign nations. Case-by-case consideration will aid in the long run in building up a body of well-considered precedents to act as a guide for both industry and government agencies. Finally, there are trade-offs to be considered, and these often appear paradoxical. Restraints on some U.S. exports, for example, can generate counter-constraints on other U.S. exports. Restraints on U.S. exports can generate counter-restraints on beneficial technological inflow to the U.S. from other countries. On a more subtle level, any constraints on U.S. exports must consider the potential for foreign exploitation of the transferred technology and how rapidly that can and will happen.

Far-reaching and astute analysis of technological-transfer issues in the dimensions that I just talked about have not been the usual procedure. Such analysis is becoming much more fashionable, and it behooves industry to have their own analysis of the benefits and risks of technology transfer abroad. Indeed, there are some relevant characteristics of technology that are very little recognized on the Washington scene. Yet they are the most important for both government and industry to bring into their calculations in formulating policy for technology transfer. There are many ways of stating these fundamentals but let me try one.

Trade advantage from technological superiority rests not on technology itself but technology combined with innovation; that is, bringing products and services to the market-place effectively and expeditiously. If an innovation appears first in the United States, there will be a subsequent time period in which the very existence of the innovative product or service provides us with a trade advantage. That advantage does not depend on cost competition with other nations. Later, the innovation will inevitably be duplicated abroad, and any remaining residual advantage to us would hinge on lower manufacturing or service costs here. This logic suggests that the critical factor in determining the relative advantage of a proposed technological outflow is one of timing. One is tempted to say that technology should not be exported until the primary competition being created has more to do with costs than with the technology per se. Timing here seems synonymous with the distinction between exporting hardware on one hand and exporting know-how on the other. Export of goods and services does not compromise an innovative competitive advantage because it is at best a difficult and time-consuming task to duplicate a technology by copying its surface manifestation; namely, a product or service. On the other hand, export of know-how greatly eases this task.

This view highlights another fundamental. It is that trade advantages rest not on a particular new technology or an innovation, but on a continuing flow of new technologies and resulting innovations. Innovations will be imitated, improved upon, and made obsolete by still newer innovations. So the advantages of any particular one tends to be very volatile. In view of the hesitant federal incentives for civilian R&D, and the recent studies by the U.S. Tariff Commission which indicate that multinational electronics corporations are at the low end of R&D funding, it seems that this necessity for a continuing innovative flow is not being acted upon adequately by some of the principals involved. In closing, then, let me suggest that research directors have a particular responsibility to influence government, labor, and management toward continuing innovation as the only sound policy for the U.S. to sustain its competitive edge.