ORIGINAL

Transcript of Hearings

Before The

United States Senate

COMMITTEE ON FINANCE

EXECUTIVE SESSION

Washington, D.C.

THURSDAY, SEPTEMBER 27, 1990

ACE-FEDERAL REPORTERS, INC.
Official Reporters
444 North Capitol Street
Washington, DC 20001

Telephone:
(202) 347-3700
(800) 336-6646

NATIONWIDE COVERAGE - DAILY

EXECUTIVE SESSION

TO CONSIDER A SECTION 332 STUDY BY THE INTERNATIONAL TRADE COMMISSION (ITC) ON THE ECONOMIC EFFECTS OF A FREE TRADE AGREEMENT WITH MEXICO

AND

TO APPROVE THE INTERNATIONAL TRADE COMMISSION'S (ITC) RECOMMENDATIONS IN CONNECTION WITH A SECTION 332 STUDY ON THE COMPETITIVENESS OF ADVANCED TECHNOLOGY MANUFACTURING INDUSTRIES

- - -

THURSDAY, SEPTEMBER 27, 1990

- - -

United States Senate

Committee on Finance

Washington, D. C.

The Committee met, pursuant to notice, at 10:18 a.m. in Room 215 of the Dirksen Senate Office Building, the Honorable Patrick Moynihan, presiding.

Present: Senators Bentsen, Moynihan, Baucus, Daschle, Pryor, Packwood, Danforth, Heinz, Symms, Roth and Chafee.

Senator Moynihan. We have two 332 studies to be considered. One is on the economic effects of a free trade agreement with Mexico, and the other has to do with the competitiveness of advanced technology manufacturing industries.

May I ask that we be recorded with respect to approving these two 332 studies. That is items 2 and 3 on the agenda.

Senator Chafee. Mr. Chairman, I must confess. Item 2 I'm obviously for, but Item 3 I'm sure what their recommendations are. Have we seen those. Do we have to approve them?

Senator Moynihan. We approve asking for them.

Senator Chafee. We approve asking for them or we approve the recommendations?

Mr. Kyle. Senator Chafee, I might be able to help with that.

Earlier in the year in June, Senator Danforth had requested a 332 study to focus on three industries, and that the ITC would come back after three months and recommend three industries for further study.

The criteria for choosing those industries was that they, first of all, be critical in terms of U.S. competitiveness and, second of all, that they require a high degree of R&D and so forth.

They were then to choose three, and then they would go

back to take a year to examine both the extent to which government policies influenced those industries, both abroad and in the United States and the importance of those industries further.

They have come back now and are recommending to us the three industries that would be subject to further study.

Senator Chafee. So all we're saying is the three they choose is fine and go ahead and study those.

Mr. Kyle. That's right. Now the three industries are communications technology and equipment, pharmaceuticals and semiconductor manufacturing and testing equipment.

Senator Moynihan. I take it that that is agreeable and we will record the votes as they are polled.

Who is recording?

(Ms. Marcia Miller stepped forward.)

I want the Senators to be polled and recorded and you're in charge.)

Senator Packwood. Aye.

Senator Chafee. Aye.

Senator Symms. Aye.

Senator Moynihan. Aye.

Senator Chafee. Mr. Chairman?

Senator Moynihan. Yes.

Senator Chafee. I wonder if it would be in order before Ms. Archibald speaks if we could consider and report out the

Kelmar and Powell nominations

Senator Moynihan. We certainly could do that, Mr. Chafee.

Senator Symms. So moved.

Senator Moynihan. All those in favor will say Aye.

(Chorus of Ayes.)

Senator Moynihan. The other Members will be polled. I think we can't do it by voice though. We have to do it by a roll call.

May we have a roll call, please. I just want the names recorded of those who are present.

Senator Packwood. Aye.

Senator Chafee. Aye.

Senator Daschle. Aye.

Senator Pryor. Aye.

Senator Symms. Aye

Senator Moynihan. Aye.

Senator Moynihan. The other Senators will be polled.

Senator Packwood. I would move that we favorably report Mrs. Archibald.

Senator Moynihan. I second the motion.

All in favor will say Aye.

(Chorus of Ayes.)

Senator Moynihan. See how easy it is.

Mrs. Archibald. It's a very efficiently operated

Committee.

(Laughter.)

Senator Moynihan. Thank you very much.

Mrs. Archibald. Thank you very much, Senator.

* * * * *

(The Executive Session concluded at 10:23 a.m.)

- - -

John H Chafee

STATEMENT FOR SENATOR CHAFEE AT FINANCE MARK-UP
CONCERNING PROHIBITION ON USE OF SUPERFUND MONEY
IN NATURAL RESOURCE DAMAGE ASSESSMENT PROCESS

MR. CHAIRMAN, THERE IS ONE PARTICULAR ASPECT OF SECTION 9507 RELATING TO THE USE OF SUPERFUND MONEY THAT MERITS OUR ATTENTION, AND THAT I WOULD URGE THE COMMITTEE TO CONSIDER AMENDING TODAY WERE IT NOT FOR THE FACT THAT WE ARE ON THE VERGE OF RECESS. NEVERTHELESS, ALTHOUGH I WILL NOT OFFER AN AMENDMENT ON THIS MATTER TODAY, I DO WANT TO HIGHLIGHT IT SO THAT THE COMMITTEE CAN PLAN TO CORRECT THE PROBLEM AT ITS EARLIEST OPPORTUNITY DURING THE NEXT SESSION OF THIS CONGRESS.

I REFER SPECIFICALLY TO THE VERY LAST CLAUSE IN SECTION 9507(c)(1)(a)(2). THAT CLAUSE PROHIBITS THE USE OF AMOUNTS OTHERWISE AVAILABLE IN THE SUPERFUND FOR DEFRAYING THE COSTS OF ASSESSING DAMAGES TO NATURAL RESOURCES THAT MAY HAVE RESULTED FROM THE RELEASE OF HAZARDOUS SUBSTANCES. IN MY VIEW, THERE IS NO GOOD REASON FOR THIS PROHIBITION, AND IT SHOULD BE ELIMINATED.

MR. CHAIRMAN, SO LONG AS THIS PROHIBITION IS IN EFFECT, BOTH THE FEDERAL GOVERNMENT AND THE STATES ARE HANDICAPPED IN THEIR EFFORTS TO ASSESS THE ADVERSE IMPACTS UPON NATURAL RESOURCES OF HAZARDOUS SUBSTANCE CONTAMINATION. TO PUT THE MATTER BLUNTLY,

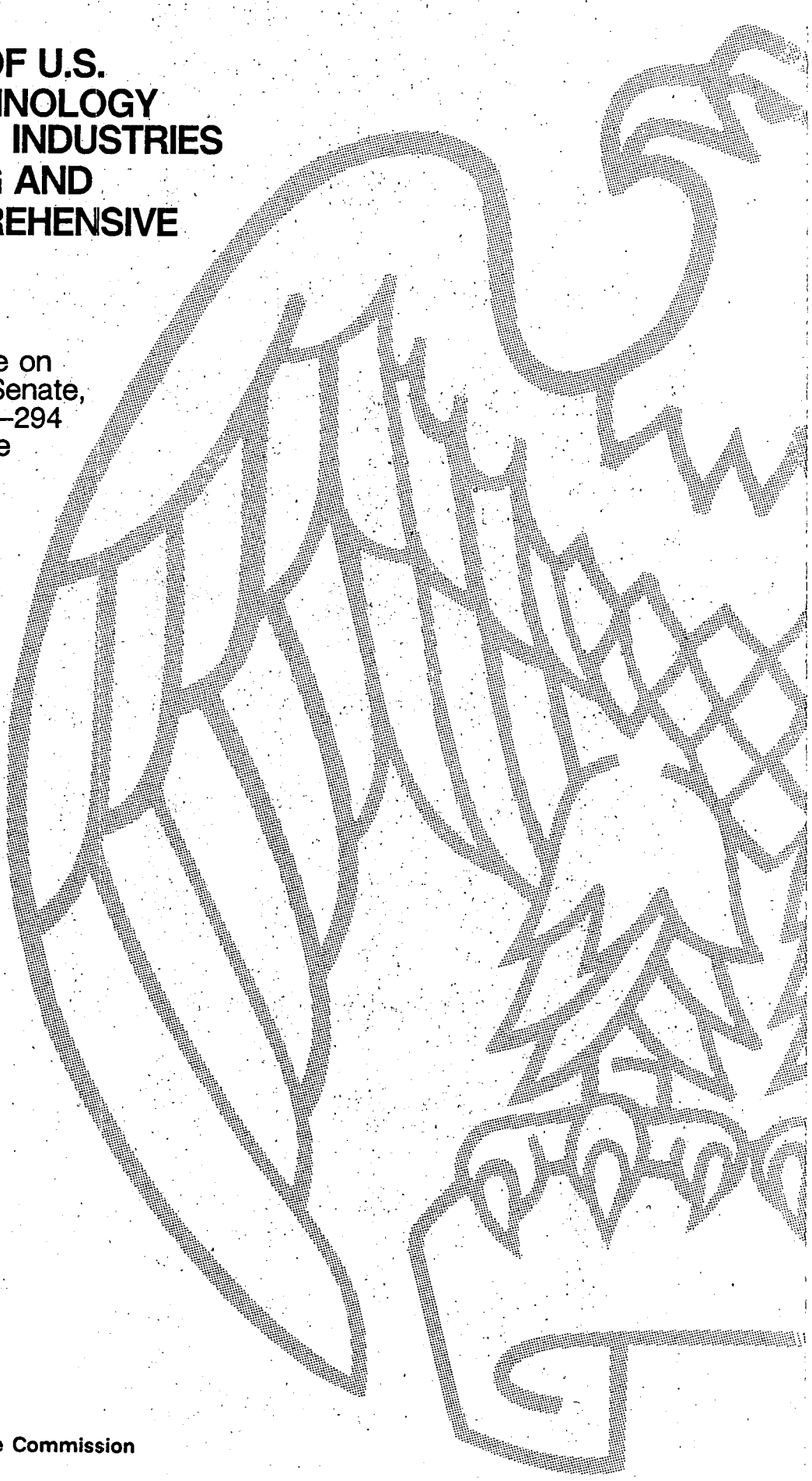
THEY ARE FORCED TO LOOK ELSEWHERE FOR A SOURCE OF FUNDS TO CONDUCT THEIR INITIAL NATURAL RESOURCE DAMAGE ASSESSMENTS.

THESE ASSESSMENTS ARE IMPORTANT IN THEIR OWN RIGHT, FOR THE REASON THAT THEY CAN GIVE US A HANDLE ON THE TRUE NATURE OF THE DAMAGES CAUSED BY CONTAMINATED SUPERFUND SITES. EQUALLY IMPORTANT, HOWEVER, IS THE FACT THAT THESE ASSESSMENTS ARE REQUIRED AS A PRECONDITION TO DEMANDING MITIGATING PAYMENTS FROM THOSE PRIVATE PARTIES THAT ARE RESPONSIBLE FOR THE CONTAMINATION.

SO, MR. CHAIRMAN, I AM MOST HOPEFUL THAT THE COMMITTEE WILL SEE FIT TO AMEND SECTION 9507 AT ITS EARLIEST OPPORTUNITY NEXT SESSION BY ELIMINATING THE PROHIBITION ON USE OF SUPERFUND MONEY FOR NATURAL RESOURCE DAMAGE ASSESSMENT FROM THAT SECTION OF THE INTERNAL REVENUE CODE. I INTEND TO PRESS FOR THAT AMENDMENT AT THE APPROPRIATE TIME. THANK YOU.

IDENTIFICATION OF U.S. ADVANCED-TECHNOLOGY MANUFACTURING INDUSTRIES FOR MONITORING AND POSSIBLE COMPREHENSIVE STUDY

Report to the Committee on Finance, United States Senate, on Investigation No. 332-294 Under Section 332 of the Tariff Act of 1930



USITC PUBLICATION 2319

SEPTEMBER 1990

United States International Trade Commission
Washington, DC 20436

UNITED STATES INTERNATIONAL TRADE COMMISSION

COMMISSIONERS

Anne E. Brunsdale, Acting Chairman
Seeley G. Lodwick
David B. Rohr
Don E. Newquist

Office of Industries
Robert A. Rogowsky, Director

This report was prepared principally by

Stephen L.S. Smith and Nelson J. Hogge

with assistance from

John Cutchin and Andrew Malison
Office of Industries

and

Joseph Flynn
Office of Economics

under the direction of

Aaron H. Chesser, Chief

Machinery and Equipment Division

Address all communications to
Kenneth R. Mason, Secretary to the Commission
United States International Trade Commission
Washington, DC 20436

PREFACE

On July 20, 1990, at the request of the Senate Committee on Finance, and in accordance with section 332(g) of the Tariff Act of 1930 (19 U.S.C.) (1332(g)), the U.S. International Trade Commission (Commission) instituted investigation No. 332-294, Identification of U.S. Advanced-Technology Manufacturing Industries for Monitoring and Possible Comprehensive Study. (See app. A for request letter.) The committee requested the Commission to expand its collection of, and ability to analyze, information on the competitiveness of advanced-technology manufacturing industries in the United States, pursuant to sections 332(b), 332(d), and 332(g) of the Tariff Act of 1930. Specifically, the committee requested that the Commission, under a two-stage investigation, provide the following:

- Within 3 months of the receipt of the letter, provide a list of U.S. advanced-technology industries for which the Commission will develop and maintain up-to-date information. The industries are to be identified by considering the following criteria, as well as any other criteria the Commission may choose to establish: the industries produce a product that (1) involves new or advanced technology; (2) involves high added value and research and development expenditures that are substantially above the national average; and (3) benefits in foreign markets from coordinated policies that include, among others, protection of the home market, assistance in developing technology and bringing it to market, and export promotion and regulatory policies.

- Recommend from the list three advanced-technology manufacturing industries for comprehensive study. The Commission's report on these industries should include information on existing or proposed foreign government policies that assist or encourage these industries to remain or become globally competitive, existing U.S. Government policies that assist or encourage these industries to remain or become globally competitive, and impediments in the U.S. economy that inhibit increased competitiveness of these U.S. industries.

Notice of the Commission's investigation was posted in the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and published in the Federal Register (55 F.R. 30530) of July 26, 1990 (app. B). All persons were afforded the opportunity to submit written views concerning the industries to be included on the list and that may be the subject of a comprehensive study.

In the course of its investigation, the Commission collected information on U.S. advanced-technology manufacturing industries from various sources, including the U.S. Bureau of the Census, the U.S. Department of Defense, the U.S. Department of Commerce, the National Science Foundation, and industry and trade association officials. In addition, information was collected from scholarly research and other private sources. A public hearing was not scheduled for the investigation.

CONTENTS

EXECUTIVE SUMMARY

On June 21, 1990, the Senate Committee on Finance requested the U.S. International Trade Commission to conduct a two-phase investigation covering a broad range of advanced-technology manufacturing industries. Under phase I and within 3 months of the receipt of the letter, the committee requested the Commission to provide a list of advanced-technology manufacturing industries about which the Commission will develop and maintain up-to-date information. The committee also requested the Commission under phase I to recommend three industries from the list for future comprehensive study. These three comprehensive studies, each taking approximately 1 year to complete, are to be conducted under phase II of the investigation.

The Identification of Advanced-Technology Manufacturing Industries

Advanced-technology manufacturing industries are difficult to identify because their basic characteristic--dependence upon new knowledge--is embodied in their output and production processes. A variety of methods exist to define advanced-technology (or, high-technology) industries. Various studies have identified groups of high-technology industries and analyzed trade in those product industries over the past 20 years.

- One prominent approach depends on the subjective but expert analysis of industry analysts. On this basis, the U.S. Department of Commerce has established a list of advanced-technology products (ATP) based on the Harmonized Tariff Schedule, which is used by the Bureau of the Census to monitor trade in these products.

- Another prominent approach, and one that has come into common usage, is to use the level of an industry's research and development (R&D), in absolute terms or as a share of sales, to measure its technological intensiveness. This report examines several of these existing R&D measures and evaluates two new R&D lists containing more recent data. The inherent strength of R&D-based measures is that R&D serves as a good index of the creation of new knowledge, allowing industries to be ranked by their degree of technological intensiveness.

- A comparison of the R&D-based lists of advanced-technology products and the Census ATP list reveals that most of the advanced-technology industries identified in the various studies are, indeed, common to all such lists. As a result, and based on these lists, the Commission identifies for the committee the advanced-technology industries shown below for which the Commission will develop and maintain up-to-date information.

Advanced-Technology Industries Identified by the Commission

1. Chemicals and plastics,
2. Drugs,
3. Machine tools, including semiconductor manufacturing equipment,
4. Computers, software, and peripherals (including displays),
5. Communications equipment,
6. Microelectronic components, including semiconductors,
7. Motor vehicles and parts,
8. Aircraft and parts,
9. Missiles, spacecraft, and parts,
10. Scientific and professional instruments, including fiber optics.

- The Commission will explore a variety of ways to develop a long-term capacity to monitor U.S. advanced-technology manufacturing industries through current and potentially new Commission work products.

Recommendation of Three Industries for Comprehensive Study

Although advanced-technology industries commonly are assumed to be important for an economy, such an assumption does not always provide sufficient guidance upon which to choose specific advanced-technology industries for comprehensive study:

- On the basis of theoretical and practical concerns, the industries chosen should meet the following criteria: (a) individually and as a group, the industries should be those the study of which will offer lessons on how market forces operate to drive competition and technological development; (b) domestic and foreign producers are affected significantly by government programs; and (c) the named industry holds the promise of having strategic importance because of its technological spillovers and externalities.

- Accordingly, the Commission recommends the following industries for indepth comprehensive study:

  (a) Communications technology and equipment;
  (b) Pharmaceuticals; and
  (c) Semiconductor manufacturing and testing equipment.

- The overall objective in each of these studies will be to analyze the determinants of the economic structure and performance of the industry. Each study will take a global perspective of the marketplace, analyze the nature of competition and technological change, consider the existing and proposed U.S. and foreign government policies, and integrate these components to determine how these markets operate and how they are influenced by government policies. A second major objective of each study will be to examine the significance of the linkages and spillovers between the industry under study and the U.S. economy in general.

INTRODUCTION

On June 22, 1990, the Commission received from the Chairman of the Senate Committee on Finance a letter requesting that the Commission expand and enhance its capacity to develop and maintain up-to-date information on U.S. advanced-technology manufacturing industries. The Commission was requested by the committee to undertake a two-step investigation. The first step requires the Commission to submit to the committee a list of advanced-technology manufacturing industries on which to develop and maintain up-to-date information and a recommendation of three industries from the list for comprehensive study. Preparation of the three industry studies is the second step of the investigation.

In response to the committee's request, this report addresses the difficulty of defining advanced-technology manufacturing industries, develops a substantive list of such industries, and discusses the Commission's plans to monitor these industries. The report subsequently takes up the issue of which industries to recommend for indepth study. To this end, the Commission's recommendations are laid out, along with proposals for the content and coverage of the phase II comprehensive competitiveness studies.

IDENTIFICATION AND MONITORING OF ADVANCED-TECHNOLOGY INDUSTRIES

In order to choose the industries to analyze in a substantive manner, a sound definition of a high-technology or, advanced-technology industry is needed. This section goes about that task in two ways. First, it outlines and evaluates the various approaches that have been used to define high-technology industries. Despite the variety of approaches that have previously been used and the intrinsic difficulties of the task, a consensus does appear to exist within the Government and the academic community that the technological intensity of an industry is best reflected in its research and development (R&D) spending (in absolute terms or as a share of sales). However, the existence of a consensus does not necessarily mean that R&D-based measures of technological intensity are exact. Several of the intrinsic shortcomings of R&D-based measures, as well as difficulties with the availability of R&D data, are therefore explored.

Second, on the basis of the best R&D data available for the 1980s, a group of industries can be identified as being the most technologically advanced in the United States. A comparison of the lists based on available R&D criteria and the previous, subjective lists of high-technology industries indicates that they are similar. In conclusion, industries can be satisfactorily classified as advanced-technology industries if they are characterized by above-average shares of R&D expenditure relative to sales.

Methodological Considerations and Survey of Past Attempts

The hallmark of a high-technology industry is its dependence on "new knowledge" and the creation of advanced products, processes, and procedures for producing a product. However, there is no exact way to measure the

creation of new knowledge, and because measures of technological intensiveness are necessarily indirect, the use of proxies is inevitable. Technological advancement is a continuous process and "new knowledge" represents a moving target as products advanced in one period often become routine or mature in the next. Hence, a list of advanced-technology industries is likely to change over time, if defined with specificity. Therefore, measures employed in discriminating between high-technology and low-technology industries should be well understood.

Measures used in the past two decades to define advanced-technology industries fall into three categories and are discussed below. Despite certain drawbacks, however, R&D-based measures offer the most sound basis for identifying high-technology industries and ranking them according to their degree of technological intensiveness.

Measures of Scientists, Engineers, and Technicians

The share of scientists, engineers, and technicians employed in an industry (often called the S/E share) is a measure that has been used to identify advanced-technology industries. The greater the number, the more advanced the technology is considered to be. The share can be calculated by using all scientists and engineers engaged in R&D (for which the U.S. average is 66.2 per 10,000 workers).[1] High-technology industries are then defined as those industries having an S/E share greater than an all-industry average, or some other appropriate measure. Obviously, choosing a dividing line is arbitrary; studies that have used the S/E ratio have usually also used other measures (see below).

The advantage of the S/E ratio is that it captures an important part of any industry's investment in new knowledge. Scientists and engineers are crucial to the invention of new goods and processes, as well as to the adoption of new technologies. However, this measure does not reveal the full extent of an industry's or firm's investment in new knowledge, which goes beyond the number of scientific personnel employed to include such things as spending on research and experimental equipment, prototypes, support staff, libraries, and travel.

Consensus-Based Lists

Consensus-based approaches have been frequently used to develop lists of high-technology industries. However, there are two fundamental drawbacks with subjective classifications because they are inherently inexact and cannot easily be used to rank industries by their degree of technological intensity. On the other hand, the approach has the merits of drawing on the insights of experienced industry observers and yields lists that can be updated quickly when any particular industry ceases to be "advanced." It is reassuring to find substantial overlap among these lists, which are surveyed below.

---

[1] National Science Board, Science & Engineering Indicators - 1989, p. 262 (data are for 1986).

U.S. Bureau of the Census Advanced-Technology Products List

The U.S. Bureau of the Census (Census) developed a list of advanced-technology products to report U.S. trade performance in high-technology products as part of its general responsibility to provide U.S. trade statistics. Using what the Bureau describes as a "consensus approach," the U.S. Department of Commerce (Commerce) conducted surveys of U.S. firms and trade associations to determine industry's views on which products are considered advanced. Based on those surveys, Census selected a list of more than 500 Harmonized Tariff Schedule (HTS) import and export items as representing "advanced-technology products." The items appearing on the list meet the following criteria: (1) they are from a "recognized high-technology field," such as biotechnology; (2) they represent leading-edge technology in that field; and (3) they constitute a significant part of all items covered in each selected classification code. After it was compiled, Census analysts reviewed the list to avoid problems inherent in canvassing firms to determine whether they classify their own products as "leading-edge" or "high-technology" products, particularly since high technology is a term often used by firms as a marketing tool to increase the sale of their products.

Based on this work, Commerce publishes in Census publication FT 920 (U.S. Merchandise Trade: Selected Highlights) statistics on U.S. imports and exports of advanced-technology products.[2]

Products appearing on the Census list that account for a large number of HTS import and export items include the following product categories:

1. Semiconductors;
2. Office machines (including computers);
3. Pharmaceuticals;
4. Aircraft and spacecraft;
5. Machine tools;
6. Telephone and telegraph apparatus;
7. Communications equipment;
8. Medical equipment;
9. Scientific instruments;
10. Optical fibers and other optical goods;
11. Special machinery (e.g., machine tools, robotics, etc.);
12. Industrial inorganic chemicals; and
13. Plastics and resins.

---

[2] Information on the Census approach was collected from staff conversations with Census officials and at a presentation to Office of Industry staff by Dr. Robert McGuckin of the Center for Economic Studies of the Bureau of the Census (June 20, 1990). See also T. Abbott and others, Measuring the Trade Balance in Advanced Technology Products, U.S. Bureau of the Census, Center for Economic Studies, 1989, 89-1.

Militarily Critical Technologies List

The U.S. Department of Defense is required under the Export Administration Act to identify strategic U.S. technologies whose export could yield a "significant contribution to the military potential of other countries." This list has included 20 technologies since 1986;[3] the prominent ones are listed below:[4]

1. Computer hardware technology;
2. Computer software technology;
3. Semiconductor and electronic-component technology;
4. Instrumentation technology;
5. Telecommunications technology;
6. Chemicals and biotechnology;
7. Communications, navigation, and identification technology;
8. Vehicular technology;
9. Materials and production technology;
10. Information systems and network technology;
11. Optical technology; and
12. Energy systems technology.

Of these two lists, the Census approach is more congruent with the Commission's interests because it seeks to identify all high-technology sectors per se, whether or not they are militarily significant or are the target of foreign intervention.[5]

---

[3] The 20 categories can be broken down further into about 120 subcategories which represent the basis for the official Coordinating Committee (COCOM) list, and which are currently being discussed for liberalization given recent developments in the Warsaw Pact nations.

[4] These technologies are not listed in order of military priority. For information on the Defense Department's allocation of internal R&D funds across these technologies, see the U.S. Department of Defense's Critical Technologies Plan submitted to the Congressional Committees on Armed Services on Mar. 15, 1990.

[5] The Office of Science and Technology Policy is also preparing a consensus-based list of "critical technologies," to be released in a public report in the fall of 1990. Finally, academic literature has also contained a number of subjective classifications of goods into the "high-tech" category. One particularly prominent example is the judgmental categorization made by Hufbauer and Chilas (1974), which was then used by Stern and Maskus (1981) and Lawrence (1984). G. Hufbauer and J. Chilas, "Specialization by International Countries: Extent and Consequences," ch. in H. Giersch, ed., The International Division of Labor: Problems and Perspectives (New York: J.C.B. Mohr, 1974); R. Stern and K. Maskus, "Determinants of the Structure of Foreign Trade," Journal of International Economics, vol. 11, (1981) pp. 207-224; R. Lawrence, "Can America Compete" (Washington, DC: Brookings), 1984).

R&D-Based Measures

Conceptual background.--These measures are based on absolute R&D, R&D as a share of industry sales, or both. High-technology industries are identified as those industries whose expenditures on R&D exceed a level specified by the researcher. This approach has two immediate and attractive features. First, and foremost, it measures the value of most of the resources committed to the creation of knowledge, and therefore can presumably be taken as a lower bound on (and index of) the value to firms of their new knowledge. Second, since these measures can allow comparisons to be made across industries of the relative importance of R&D, they offer a way of ranking industries by degree of technological intensiveness. Although there is an unavoidable subjective element in deciding which industries are high technology and which are not, the dividing line between the two can be weighed explicitly and the sensitivity of any analysis to that dividing line can be evaluated.[6]

Absolute and relative R&D are the best measures when they are used together because relative R&D is sensitive to output levels. Industries with the same absolute amount of R&D can have different technological intensiveness if their sales levels differ, leading one mistakenly to conclude that an industry is not "advanced" even when it is innovative. A measure based solely on absolute R&D could ignore industries for which R&D is at relatively small levels, and from which substantial new knowledge is being added.

R&D data may also understate the extent of knowledge creation if learning-by-doing is significant. R&D data by definition may exclude certain expenditures made for production engineering--toolmaking and tool tryout, creating detailed construction drawings and blueprints, and preproduction planning, all of which embody and facilitate learning. R&D data cannot include the financial losses firms may experience while moving down their learning curves, even though such losses represent investments in the learning (often of a noncodifiable variety) that take place.

To solve this problem, some researchers have used patent data as an index of technology creation, but decisions by firms to obtain patents are often strategic moves whose outcome may have little to do with how much new technology is developed. For instance, some firms may choose not to obtain patents to protect the secrecy of their research, whereas others may obtain patents for each trivially different innovation they make. As long as the distribution of learning-by-doing across industries corresponds more or less to the distribution of R&D (which seems a reasonable assumption given the complementarity between R&D and learning by doing), R&D data are likely to serve as the best available general indicator of knowledge creation.[7]

---

[6] It is interesting to note that the dividing line between "capital intensive" and "labor intensive" products in traditional two-factor economic models has exactly the same ambiguity.

[7] For the contrary view, and a discussion of the merits of patent data, see K. Pavitt and P. Patel, "The International Distribution and Determinants of Technological Activities," Oxford Review of Economic Policy, vol. 4, No. 4 (1988).

Since about 1980, R&D-based measures of technological intensiveness have become the norm. Prior to that time, R&D measures were often used together with S/E measures. Since then, most of the studies attempting to identify high-technology sectors have done so on the basis of R&D alone, although R&D-based measures are not easy to construct.[8]

In fact, R&D expenditures can be measured in many ways, and fundamental problems exist in the availability of data.[9] One problem arises because large firms often have R&D expenditures that cross several product lines. For instance, the General Electric Co. does research in such diverse areas as aircraft engines, aerospace, and consumer appliances. However, since 1983, the data collected by the National Science Foundation assigns all of the R&D conducted by a firm to a single industry category. This can obviously, result in some distortion in the data being generated.[10]

A problem also arises because of concerns about confidentiality in the NSF industry data. Total R&D spending by industry source has two major components: (1) spending out of firms' own funds and (2) spending out of Federal funds.[11] For some industries, in order to protect firms' identities

---

[8] For instance, Boretsky's (1971) measure defined high-technology industries as those with at least a 10-percent R&D share of gross value added, and/or at least 10 percent S/E employment. (International Trade Administration (ITA) (1983) and Hatter (1985) also provide details.) Similarly, the National Science Foundation (NSF) defined R&D-intensive goods as those with R&D of at least 3.5 percent of net sales and 2.5 percent S/E employment (Hatter (1985), citing NSF's Science Indicators 1982). M. Boretsky, "Concerns About the Present American Position in International Trade," ch. in National Academy of Sciences, Technology and International Trade (Washington, DC: NAS, 1971.

[9] The National Science Foundation defines R&D expenditures as being basic research, applied research, or development. According to the National Science Foundation (NSF), basic research has as its objective "to gain fuller knowledge or understanding of the fundamental aspects of phenomena and observable fact without specific applications toward processes or products in mind", where as applied research has as it goal "to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met." NSF defines development as "systematic use of knowledge gained from research, directed toward the production of useful materials, devices, systems or methods, including the development of prototypes and processes."

[10] For details, see NSF 89-323, especially the technical notes and tables B-26 and B-28. It appears from USITC staff conversations with NSF statisticians, that the major reason that R&D spending is no longer reported by product field is that responses to the product field question (in the biannual R&D survey conducted by Census under NSF supervision) were too low. However, data on R&D by product field are available from firms reporting such data.

[11] Several other sources of funds exist--universities, state and local governments, and non-profit private research institutions or foundations--but

(continued...)

and their proprietary information, only data for one of the groups (total, firms' own, or Federal) are reported. Through 1980, the rule at the NSF was to report the total, leaving the company and Federal shares suppressed. However, starting in 1981, the NSF has not reported the total, but instead has reported companies' own spending.[12]

Although, there are significant problems in using R&D data to identify high-technology industries, the use of available R&D data yields virtually the same set of industries identified as "technologically advanced" regardless of which R&D measure is used. Furthermore, it turns out that the list parallels the consensus-based lists discussed earlier.

High-technology industries identified by R&D data.--The most widely cited study on identifying high-technology industries with R&D data is by Lester A. Davis (1982).[13] Davis' list has proven popular and has been used in numerous studies, including NSB (1989), ITA (1983), Hatter (1985), and Kreinin (1987).[14] Davis' list covered the period 1977-79 and used applied R&D data (Federal and firms' own) by product field. Furthermore, he included both "direct" R&D that was spent in each product field and "indirect" R&D spent in each field--that is, the R&D embodied in the inputs firms purchased from outside sources. This particular calculation was done by using input-output tables, which detailed the degree of mutual interdependence across industries that arises because of the use by each industry of other industries' outputs for its own inputs.[15]

Over all U.S. industries, Davis found the weighted average of total (direct plus indirect) R&D spending as a share of sales for the period 1977-79 to be 3.3 percent. He designated as "high technology" only those industries that exhibited a "significantly" higher R&D share than the average, and developed the list in table 1 below, in which the industries exhibit a total R&D intensiveness greater than 4 percent.

---

[11] (...continued)
their funding of R&D is relatively small compared to the contributions of industry and the Federal government.

[12] Source: USITC staff telephone conversation with NSF staff on Aug. 8, 1990.

[13] Commerce, ITA, Technology Intensity of U.S. Output and Trade, by L. Davis (Washington, DC: U.S. Department of Commerce, 1982).

[14] National Science Board, Science and Technology Indicators, 1989, 89-1, 1989; ITA, An Assessment of U.S. Competitiveness in High Technology Industries; Hatter, "U.S. High Technology Trade and Competitiveness;" M. Kreinin, "Comparative Advantage and Possible Trade Restrictions in High Technology Products," ch. in D. Salvatore, ed., The New Protectionist Threat to World Welfare, (New York: North-Holland, 1987).

[15] For instance, the R&D intensiveness of the aircraft industry was ranked not only on the basis of R&D expenditures on aircraft, but also on the basis of R&D used in producing the inputs used in the aircraft industry.

Table 1
High-technology industries identified by L. Davis: R&D expenditures as a percent of sales, 1977-79, and applicable SIC codes

Industry[1]	Direct plus indirect R&D: percent of sales, 1977-79	SIC code
1. Guided missiles and spacecraft	63.86	376
2. Communications equipment and electronic components	16.04	365-67
3. Aircraft and parts	15.40	372
4. Office computing and accounting machines	13.65	357
5. Ordnance and accessories	13.64	348
6. Drugs	8.37	283
7. Industrial inorganic chemicals	8.23	281
8. Professional and scientific instruments	5.70	38, except 3825
9. Engines, turbines, and parts	5.49	351
10. Plastics materials and synthetic resins	5.42	282
11. Agricultural chemicals	4.19	287
12. Motor vehicles and equipment	4.14	371
Weighted average, all industries	3.30	

[1] The industry categories are from the NSF's 1980 classification scheme, and for the sake of later comparisons, the corresponding SIC codes are listed.

Source: U.S. Department of Commerce, International Trade Administration, Technology Intensity of U.S. Output and Trade, by L. Davis (Washington, DC: U.S. Department of Commerce, 1982).

It is no longer possible to calculate a completely accurate measure of R&D intensiveness because the NSF no longer reports R&D by product field. Total R&D spending by industry (that is, Federal plus companies' own funds) is also no longer reported. However, one can identify a group of technology-intensive industries on the basis of an industry classification of firms' own R&D expenditures. It appears that the constituent industries of such a list are relatively insensitive to changes in how the R&D is measured and to changes in the SIC-based definitions of the industries themselves. For example, although Davis includes both "direct" and "indirect" R&D in his analysis, the ranking of industries is similar if only direct R&D is used.[16]

[16] From Davis' figures, an industry's total R&D intensiveness is highly correlated with its direct R&D intensiveness. The Pearson product-moment sample-correlation coefficient is 0.998; the Spearman rank correlation coefficient is 0.950.

The NSF collects and reports R&D data on a three-digit SIC basis. During the period 1984-87, the NSF reported R&D only as a share of net sales by industry source, and for companies' own funds, i.e., excluding Federal funds. Table 2 below ranks all the industries with above-average R&D-to-sales ratios, using the industry classifications and names by which the NSF reports the data. The corresponding SIC classes for each of these industries are also listed. Apart from slight differences due to variations in aggregating industry groups, the list is virtually the same as that compiled by Davis. (Data for all industries are reported in app. D.)

Table 2
High-technology industries with above-average R&D-to-sales ratios, by rank, 1984-87, and applicable SIC codes

Industry[1]	R&D net sales ratio 1984-87 average	SIC code
	Percent	
1. Office, computing, and accounting machines	11.58	357
2. Professional, scientific measuring instruments	8.30	381, 382
3. Drugs	8.28	283
4. Electronic components	8.18	367
5. Professional, scientific instruments: other	8.15	383, 387
6. Communications equipment	5.35	366
7. Industrial chemicals	4.25	281, 282, 286
8. Aircraft, missiles, and spacecraft	3.83	372, 376
9. Radio and TV receiving equipment	3.70	365
10. Machinery: other, except electrical	3.25	351-356, 358-359
11. Motor vehicles	3.18	371
12. Other chemicals	3.15	284, 285, 287-289
Weighted average, all industries	3.03	

[1]The most recent year for which the National Science Foundation provides data is 1987.

Source: National Science Foundation, R&D in Industry, 1987, 1987, 89-323, tables B-21, B-22, and USITC staff calculations.

Finally, consider the following data from 1989. Although the NSF's complete official survey of all 1989 company-funded R&D by industry may not be available until 1991, much of the data is already publicly available in the

10-K Reports that firms file with the Securities and Exchange Commission.[17] In 1989, 894 U.S. firms reported sales of $35 million or more and R&D expenditures in excess of either 1 percent of sales, or $1 million. Together, these firms reported sales of $1,897.8 billion and R&D expenditures (from their own funds, excluding R&D performed under contract for the Federal Government or others) of $65.2 billion, with a composite average R&D share of sales of 3.4 percent. These firms accounted for the vast majority of U.S. company spending on R&D in 1989. (In fact, a subgroup of 99 firms--each with more than $100 million in R&D expenditures--accounted for 82 percent of total reported R&D expenditures and 69 percent of the sales of the group as a whole.) Thus, an accurate picture of the nature of U.S. R&D spending in 1989 by industry can be formed by focusing on these 894 firms, placing them in their respective industries, and aggregating their R&D expenditures and sales by industry.

The ranked list in table 3 below is derived from the firm-specific data for 1989 described above. Industries have been labeled by SIC code, although the groupings do not exactly match those used by the NSF. Only industries with above-average R&D shares are listed, but complete data for all industries are provided in appendix table D-2.

[17] The data that follow in this section come from firms' 10-K Reports, as reported in "R&D Scoreboard," Business Week, special ed., June 1990.

Table 3
High-technology industries ranked by R&D to sales for 1989, and applicable SIC codes

Industry	Company R&D percent of sales, 1989	SIC code
1. Semiconductors	9.3	3674
2. Computers	9.0	3571
3. Drugs	8.6	283
4. Photographic equipment and supplies	6.8	386
5. Office equipment and services except computers: software, displays, peripherals	6.1	357, except 3571
6. Instruments	5.8	381, 382, 384
7. Electronics, except semiconductors	5.0	367, except 3674
8. Communications equipment	4.7	366
9. Aerospace	4.1	372, 376
10. Chemicals	3.8	281, 286
11. Autos: cars, trucks, parts and equipment.	3.4	371
Weighted average, all industries	3.4	

Source: "R&D Scoreboard", Business Week, special ed., June 1990, and USITC staff calculations.

Commission's Methodology and List of High-Technology Products

Comparison of lists of high-technology products

The R&D-based lists are directly comparable although they report data in slightly varied SIC groups. Further, it is difficult to compare R&D-based lists with the Census Advanced Technology Product (ATP) list because the ATP list is product based and does not contain entire SIC categories, but only narrowly defined individual products. Nevertheless, one can get a sense of the coverage of the list and compare it with the R&D lists by determining the SIC categories that are represented by products on the ATP list. Appendix table D-4 provides this comparison and displays the relative coverage of the four lists by SIC category. Without reproducing the full table here, several general points can be made.

First, although with the R&D-based lists there is always a question about what benchmark level of the R&D-to-sales ratio to use to identify high-technology industries, in practice there appears to be a natural break at or around the weighted average for all industries. For instance, for the 1984-87 NSF data, the next highest industry under the average for all industries (of 3.03 percent) has an average of 2.73 percent (SIC 361-364, 369). For the 1989 data, the R&D ratio drops from 3.4 percent (for the automotive sector) to 2.7 percent (for the manufacturing machinery sector, SIC 354-355). A similar,

natural breaking point appears in Davis' data. Second, and more importantly, the group of industries identified as "high-technology" is similar across the R&D measures and compared with the ATP list. The following industries (listed in order of their SIC codes) are found on all lists:

1. (281) Industrial inorganic chemicals;
2. (283) Drugs;
3. (357) Computers and office equipment;
4. (366) Communications equipment;
5. (367) Electronic components and accessories;
6. (372) Aircraft and parts;
7. (376) Missiles, spacecraft, and parts;
8. (381, 382) Scientific and professional instruments;
9. (384) Medical instruments and supplies; and
10. (386) Photographic equipment and supplies.

Only two major differences exist between the R&D lists and the ATP list. The R&D lists together include motor vehicles and accessories (SIC 371), but the ATP list does not, and the ATP list includes machine tools (SIC 354, 356), whereas only one of the R&D lists includes these products. The R&D-based lists include automobiles because a high level of R&D is consistently done in that sector. The ATP list on the other hand excludes automobiles because of the impression on the part of analysts that much of that R&D in this sector goes into substantial yearly model changes and the sector is not on the "leading edge." The ATP list includes machine tools because of the widespread perception that, through the application of robotics and numerical controls, the industry is "advanced," even though the R&D performed by the industry as a whole as a percent of sales is below the national average for all industries. The differences in coverage among the R&D-based lists are minor and attributable to differences in reporting categories.[18]

One minor difference between the R&D and ATP lists is also worthy of note. The ATP list includes fiber optics and advanced optical equipment (SIC 383). Only one of the R&D measures captures that category. This difference exists because categories for fiber optics were not separately provided for in the SIC codes until 1987. Beginning in 1987, the R&D expenditures covering these products were separately reported after fiber optics were removed from the SIC category covering products of stone, clay, and glass.

---

[18] The 1989 list is virtually identical to the 1977-79 (Davis) list, except that it excludes SIC 348 (ordnance, because it was not broken out separately in 1989), and SIC 365, 385, and 387 (household audio/visual equipment, ophthalmic goods, and watches, respectively; again they were not broken out as separate categories in 1989). The list based on 1984-87 data also includes virtually everything on Davis' list, the major difference being that it adds SIC 384-385 and 352-355. This is probably because these industries were not specifically provided for in the 1984-87 NSF's data in the way that they were in Davis' 1977-79 data.

Commission's List of Advanced-Technology Products

On the basis of the R&D data cited above, and the consistency of alternative measures of high-technology industries, table 4 lists industries by SIC order designated as advanced-technology industries for the purposes of further monitoring and study within the Commission. This list includes high-technology industries that are common to the R&D based lists, such as fiber optics (SIC 383), and machine tools (SIC 354, 355) from the ATP list. This list is consistent with the best available theory and evidence on identifying high-technology industries.

Table 4
Advanced-technology industries identified for further monitoring and study by the Commission, and applicable SIC codes

Industry	SIC code
1. Inorganic chemicals and plastics	281, 282
2. Drugs	283
3. Machine tools, including semiconductor manufacturing equipment	354, 355
4. Computers, software, and peripherals (including displays)	357, 505, 737
5. Communications equipment	366
6. Microelectronic components, including semiconductors	367
7. Motor vehicles and parts	371
8. Aircraft and parts	372
9. Missiles, spacecraft, and parts	376
10. Scientific and professional instruments, including fiber optics	38(pt.), 322(pt.), 335(pt.)

Monitoring High-Technology Industries

A basic function of the Commission is to maintain an ongoing expertise on industries important to the economy and to U.S. trade. Hence, the objective to monitor the identified high-technology industries has, in large part, been reached. Nevertheless, it is important to ensure that the substantial industry-specific expertise housed in the Commission is fully leveraged by increasing the availability of that knowledge to policymakers and other analysts throughout Government and the academic community. The knowledge generated on the designated high-technology industries takes on a special need for dissemination. A number of initiatives have already been started to accomplish this goal. The Commission, already monitoring and reporting on shifts in trade from available import and export data, will consider the creation of additional data categories to focus on high-technology products. Staff reports, working papers, and trade summaries reports have already been launched to examine competitiveness issues in

selected high-technology industries and in certain leading technologies from which future industries will arise. These efforts will be continued to maintain up-to-date information and provide targeted analyses of advanced technologies.

Industries Recommended by the Commission for Comprehensive Study[19]

It is recommended that the advanced-technology manufacturing industries selected for comprehensive study under phase II be broadly defined. Defining industries broadly provides the opportunity to address a wide range of leading-edge and supporting technologies and to assess how they are affected by U.S. and foreign government policies. Further, advances in technologies have often been observed to move in waves and affect broad areas of the economy. Technology waves relate to the interdependencies of innovations and the notion that certain product areas combine to form integrated systems. For instance, advances in one product area may become highly dependent on advances in another product area. The modern digital computer would not have been possible without advances in solid-state technology, and advances in integrated circuits would not have been possible without significant improvements in scientific instruments and equipment. These upstream and downstream linkages are apparent in many advanced-technology industries. Following the completion of the initial three comprehensive studies, subsequent studies could be focused on more narrowly defined advanced-technology industries. The Commission therefore recommends for the consideration of the committee the following broadly defined industries for comprehensive study: (1) communications technology and equipment; (2) pharmaceuticals; and (3) semiconductor manufacturing and testing equipment.

Communications technology and equipment would include computers, digital switches, video-imaging apparatus, digital radios, satellites, fiber optics, and the software needed to run these as integrated systems. Communications and display technologies are expected not only to revolutionize the way industries innovate and bring their products to market, but also to serve as drivers for other advanced-technology industries. Foreign governments have already recognized the importance of advanced-communications systems to their economies and the impact that these systems may have on the global competitiveness of their industries. Foreign governments are known to provide significant support to their communications industries, and regulations in countries, such as France, permit telephone companies to bring video through optical fibers to its households. U.S. telephone companies are currently prohibited by Government regulations from bringing video to U.S. households.

Pharmaceuticals would include medicinal chemicals, bioengineering, botanicals and diagnostics, and other biological products such as serums and vaccines. Some drugs have significant externalities with the potential for the prevention of disease, improving the health of the general population, and increasing the yields of agricultural products. Bioengineering has already demonstrated the potential for altering the way health care is provided and

[19] Views received from interested parties by the Commission regarding industries recommended for comprehensive study are found in app. D.

making health-care delivery systems more effective. The development of advanced pharmaceutical products can be affected by factors such as lengthy governmental drug-approval processes and the acceptance of gene-altering substances.

Semiconductor manufacturing and testing equipment is needed to produce integrated circuits and other microelectronic products. These would include wafer-manufacturing equipment, mask fabrication and repair equipment, film-formation equipment, doping equipment, etching and stripping equipment, and photolithography equipment. Also included are assembly apparatus, such as dicing equipment, die and wire-bonding equipment, packaging equipment, and testing and inspection equipment. In addition, the critical materials used by the semiconductor industry will be discussed; principal among these are silicon wafers, lead frames, ceramic packages, bonding wire, and photolithographic materials. The semiconductor manufacturing and testing equipment industry is critical to the success of the semiconductor industry, which in turn is critical to the U.S. computer and telecommunications industries. The U.S. industry's share of the world market for this equipment has declined from 80 percent in 1980 to 45 percent in 1990.

These three broadly defined industries appear high on the list of technology-intensive product industries measured in terms of absolute R&D and R&D as a percentage of sales. They are almost universally recognized for their future impact on the competitiveness of the United States both in U.S. and foreign markets. In the future, the U.S. balance of trade and U.S. technical superiority in these industries may be adversely affected by various Government policies and foreign government support.

Objectives and Methodology for Future Comprehensive Studies by the Commission

Each of the Commission's competitive studies will be unique in that it will analyze the particular circumstances of the chosen industry. Even so, the studies will share a set of overall objectives and methodologies.

Objectives

In each case, the fundamental goal of the study will be to analyze the determinants of the economic performance of U.S. firms in the world market place. The studies not only will provide information on the performance of the U.S. industry, but also an analysis of the important factors that have influenced the development and competitiveness of the industry over time. Such coverages will require for each study--

1. Global perspective. U.S. industry's performance cannot be evaluated apart from the behavior of foreign rivals and the nature and size of the international market for the industry's output.

2. Technological change. This should include an analysis of the nature and importance of technological developments in the industry, an economic analysis of the strategic choices firms face in making R&D decisions, and an analysis of the legal, commercial, and

institutional factors in the United States that influence the ability to manufacture and market advanced-technology products.

3. The nature of competition. On the demand side, this analysis should address the nature, sources, and degree of demand for the industry's products. On the supply side, it should include consideration of the nature of interfirm rivalry and pricing decisions.

4. Consideration of existing or proposed U.S. and foreign government policies that influence firms' performance. This section will include sector-specific policies and general policies that affect technological changes that may have significant implications for developments in the industry.

The overall goal of the studies will be met when each of the above elements--global perspective, technological change, competition, and government policy--is integrated to provide an overall explanation of the performance of the industry. The second objective of the studies will be to analyze the nature of the interconnections between the industry in question and the rest of the domestic economy. Are there now, or are there likely to be, significant economic spillovers and externalities? To what extent are developments in upstream and downstream industries important for, or contingent upon, the industry of interest? These questions, when answered substantively, can provide much useful information to policymakers.

There are two important issues that these studies will not likely address. First, although U.S. macroeconomic policy is important in determining the performance of the economy as a whole and influences the performance of particular firms, the studies will consider macroeconomic issues only to the extent to which particular economywide events, such as changes in exchange rates, have had clearly identifiable influences on the industry in question. Second, while the general relationship between private firms and government policies presents many important and interesting issues, the studies--because they will focus on particular industries--will not attempt to survey the significance of foreign and U.S. economic policies on a macroeconomic level.

Methodology

The studies will draw heavily on the knowledge and analytic capabilities of the Commission's Office of Industries' international trade and technology analysts. Staff will conduct primary research through interviews with industry and Government officials and through extensive data and information gathering, possibly including the use of surveys. Input from academic and U.S. Government and foreign experts will also be sought.

APPENDIX A

LETTER FROM THE COMMITTEE ON FINANCE, UNITED STATES SENATE, REQUESTING THE INVESTIGATION

United States Senate

COMMITTEE ON FINANCE
WASHINGTON, DC 20510-6200

June 21, 1990

The Honorable
Anne Brunsdale
Chairman
United States International
Trade Commission
500 "E" Street, S.W.
Washington, D.C. 20436

Dear Madam Chairman:

As part of its policymaking process, the Senate Committee on Finance anticipates a need for impartial and detailed information on the competitiveness of advanced technology manufacturing industries in the United States. As an independent Federal agency with the authority to investigate the impact of international trade upon domestic industry, it would be a logical extension of the Commission's responsibility to expand and enhance its capacity to provide information on an ongoing basis concerning the relative global competitiveness of American industry.

Accordingly, the Committee hereby requests the Commission to expand its collection of, and ability to analyze, information on the competitiveness of such industries pursuant to sections 332(b), 332(d), and 332(g) of the Tariff Act of 1930.

While the Committee wants the Commission to develop a long-term capacity on a broad range of industries, it recognizes that this expertise must evolve in stages. Thus, the Committee requests initially a two-step investigation. Within three months of the receipt of this letter, the Commission is requested to provide to the Committee a list of industries about which the Commission will develop and maintain up-to-date information. In identifying these industries, the Commission should consider the following criteria, as well as any other criteria it may choose to establish:

-- Those industries producing a product that:

(1) involves use or development of new or advanced technology, involves high value-added, involves research and development expenditures that, as a percentage of sales, are substantially above the national average, and is expected to experience above-average growth of demand in both domestic and international markets; and

(2) benefits in foreign markets from coordinated -- though not necessarily sector-specific -- policies that include, but are not limited to, protection of the home market, tax policies, export promotion policies, antitrust exemptions, regulatory policies, patent and other intellectual property policies, assistance in developing technology and bringing it to market, technical or extension services, performance requirements that mandate either certain levels of investment or exports or transfers of technology in order to gain access to that country's market, and other forms of Government assistance.

At the time the Commission provides this list of industries, the Commission is requested to recommend to the Committee three industries for comprehensive study. In selecting these industries, the Commission should consider, among any other factors it considers relevant, the importance of the industries producing these products to future U.S. global competitiveness; and the extent of foreign government benefits to industries producing competing products.

The Commission's report on these three industries should include, but is not limited to, the following information:

-- Existing or proposed foreign government policies that assist or encourage these industries to remain or to become globally competitive, existing or proposed U.S. Government policies that assist or encourage these industries to remain or become globally competitive, and impediments in the U.S. economy that inhibit increased competitiveness of these U.S. industries.

The Commission should complete the study of these three industries within 12 months of the Committee's approval of the list of recommended industries.

It would be the Committee's intention to review the report carefully in order to determine how to expand, extend, or otherwise modify this request, if necessary, to ensure that future reports continue to yield worthwhile results.

Sincerely,

Lloyd Bentsen

Lloyd Bentsen
Chairman

APPENDIX B

THE COMMISSION'S NOTICE OF INVESTIGATION

This Notice constitutes the public Notice of Availability of environmental documents required under the NEPA regulations.

Dated: July 17, 1990.

P. Tweedt,

Acting Regional Director.

[FR Doc. 90-17426 Filed 7-25-90; 8:45 am]

BILLING CODE 4310-MR-M

INTERNATIONAL TRADE COMMISSION

[Investigation No. 337-TA-309]

Athletic Shoes With Viewing Windows; Initial Determination Terminating Repondents on the Basis of Settlement Agreement

AGENCY: U.S. International Trade Commission.

ACTION: Notice is hereby given that the Commission has received an initial determination from the presiding officer in the above-captioned investigation terminating the following respondents on the basis of a settlement agreement: Reebok International Ltd. and H.S. Corporation.

SUPPLEMENTARY INFORMATION: This investigation is being conducted pursuant to section 337 of the Tariff Act of 1930 (19 U.S.C. S1337). Under the Commission's rules, the presiding officers' initial determination will become the determination of the Commission thirty (30) days after the date of its service upon the parties, unless the Commission orders review of the initial determination. The initial determination in this matter was served upon the parties on July 6, 1990.

Copies of the initial determination, the settlement agreement, and all other nonconfidential documents filed in connection with this investigation are available for inspection during official business hours (8:45 a.m. to 4:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, SW Washington, DC 20436, telephone 202-252-1000. Hearing imparied individuals are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on 202-252-1810.

WRITTEN COMMENTS: Interested persons may file written comments with the Commission concerning termination of the aforementioned respondents. The original and 14 copies of all such comments must be filed with the Secretary to the Commission, 500 E Street, SW., Washington, DC 20436, no later than 10 days after publication of this notice in the Federal Register. Any person desiring to submit a document (or portion thereof) to the Commission in confidence must request confidential treatment. Such requests should be directed to the Secretary to the Commission and must include a full statement of the reasons why confidential treatment should be granted. The Commission will either accept the submission in confidence or return it.

FOR FURTHER INFORMATION CONTACT: Ruby J. Dionne, Office of the Secretary, U.S. International Trade Commission, telephone 202-252-1805.

Issued: July 19, 1990.

By order of the Commission.

Kenneth R. Mason,

Secretary.

[FR Doc. 90-17461 Filed 7-25-90; 8:45 am]

BILLING CODE 7020-02-M

[Investigation No. 332-294]

Identification of U.S. Advanced-Technology Manufacturing Industries for Monitoring and Possible Comprehensive Study

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation; opportunity for public comment.

EFFECTIVE DATE: July 20, 1990.

FOR FURTHER INFORMATION CONTACT: Nelson J. Hogge (202-252-1395), or Aaron H. Chesser (202-252-1380) Machinery and Equipment Division, Office of Industries, U.S. International Trade Commission, Washington, DC 20436. Hearing-impaired persons can obtain information on this study by contacting the Commission's TDD terminal on (202) 252-1810.

BACKGROUND: On June 22, 1990, the Commission received a request from the Senate Committee on Finance to expand its collection of, and ability to analyze, information on the competitiveness of advanced-technology manufacturing industries in the United States, pursuant to sections 332(b), 332(d), and 332(g) of the Tariff Act of 1930. In response to that request, the Commission instituted investigation No. 332-294 under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)), in order that it may (1) Identify for the purpose of monitoring, using criteria provided by the Committee, U.S. advanced-technology manufacturing industries, and (2) recommend to the Committee three of those industries as subjects for comprehensive Commission studies. The Committee asked that the Commission provide its list of industries and recommendation of three for special study within 3 months of receipt of the letter (by September 21, 1990), and that is submit its report on the three industries the subject of comprehensive studies within 12 months or receipt of the Committee's approval (or modification) of the Commission's recommendations.

In its letter the Committee stated that it anticipates a need for impartial and detailed information on the competitiveness of advanced technology manufacturing industries in the United States. It stated that it would be a logical extension of the Commission's responsibility under section 332 of the Tariff Act of 1930 to expand and enhance its capacity to provide information on an ongoing basis concerning the relative global competitiveness of American industry.

In identifying the industries to be monitored, the Committee requested that the Commission consider the following criteria as well as any other criteria it may choose—

(1) Industries producing a product that involves use or development of new or advanced technology, involves high value-added, involves research and development expenditures that, as a percentage of sales, are substantially above the national average, and is excepted to experience above-average growth of demand in both domestic and international markets; and

(2) Benefits in foreign markets from coordinated—though not necessarily sector specific—policies that include, but are not limited to, protection of the home market, tax policies, export promotion policies, antitrust exemptions, regulatory policies, patent and other intellectual property policies, assistance in developing technology and bringing it to market, technical or extension services, performance requirements that mandate either certain levels of investment or exports or transfers of technology in order to gain access to that country's market, and other forms of Government assistance.

The Committee requested that the report on the three industries to be selected include at least the following information—

Existing or proposed foreign government policies that assist or encourage these industries to remain or to become globally competitive, existing or proposed U.S. Government policies that assist or encourage these industries to remain or become globally competitive, and impediments in the U.S. economy that inhibit increased competitiveness of these U.S. industries.

Comments Received From Interested Parties

In the course of conducting this phase I investigation, the Commission received written comments from four interested parties suggesting that the Commission recommend to the committee three U.S. advanced-technology manufacturing industries for comprehensive study. The interested parties included Planar Systems Inc., a major U.S. producer of high-definition displays, the Zenith Electronics Corp., which is the only remaining U.S.-based producer of color television receivers, the Semiconductor Equipment Materials International (SEMI), which represent, about 850 U.S. producers and 150 foreign producers of semiconductor equipment and materials, and the National Tooling & Machining Association (NTMA), which represents about 12,000 small and medium-size U.S. users of machine tools.

Planar Systems suggests that the Commission select high-definition displays as one of the advanced manufacturing industries that it will recommend to the Senate Committee on Finance as a subject for comprehensive study. Planar indicates that recent reports by the American Electronics Association and various U.S. Government agencies have all identified high-definition displays as a critical component in future electronic systems; Planar identifies high-definition displays as including both cathode-ray tubes and high-information flat-panel displays. According to Planar, the United States lags behind Japan and Western Europe in understanding the critical role of high-definition displays in the future competitiveness of the domestic electronics market.

Zenith Electronics recommends to the Commission that high-definition displays be selected for comprehensive study. Zenith indicates that its "flat tension mask" cathode-ray tubes (CRTs) are the key high-definition display technologies for the foreseeable future. The firm suggests that, while other U.S. and foreign firms are actively working on alternate display devices such as liquid crystal, electroluminescent, and gas plasma panels, these segments of the industry are of longer range and are not likely to have major impact on the display-device market until the cost of these devices can be reduced. Zenith reports that Stanford Resources, Inc. estimates that the electronic-display market is expected to grow from $12 billion today to $30 billion by 1996.

SEMI recommends that semiconductor equipment and materials (SEM) be selected as an industry candidate for comprehensive study and monitoring. SEMI indicates that the SEM industry is the heart of the microelectronics industry and that the equipment this industry produces is critical to the ability of the semiconductor industry to produce solid-state devices at sufficiently low cost to enable U.S. industries, such as those producing computers and telecommunications equipment, to offer their products on world markets at competitive prices. SEMI indicates that because of the diffusion of SEM technology world-class industries have emerged in foreign countries and many of these industries are better financed than those in the United States. The association reports that the U.S. share of the global markets for these equipment and materials declined from 80 percent in 1980 to 45 percent in 1990.

The NTMA is a member of the National Coalition for Flexible Automated Manufacturing whose goals are to promote the interests of small and medium-size firms that use machine tools. The NTMA recommends that the Commission consider this industry for comprehensive study because its members are being challenged to change their process technologies. These process technologies are changing rapidly, and at the same time, new processes, new materials, finer tolerances, and specifications are also affecting the way the firms do business.

APPENDIX D

DATA TABLES

Table D-1
Selected industries: R&D as share of net sales, 1984-87

Industry	SIC code	Companies' own and Federal R&D				Companies' own R&D			
		1984	1985	1986	1987	1984	1985	1986	1987
Food, kindred, & tobacco...	20, 21	(1)	(1)	(1)	0.7	0.5	0.7	0.7	0.7
Textiles and apparel.....	22, 23	(1)	(1)	(1)	(1)	0.5	0.5	0.5	0.4
Lumber, wood prods, furn...	24, 25	0.9	1.0	0.8	0.6	0.9	1.0	0.8	0.6
Paper & allied prods.....	26	(1)	(1)	(1)	(1)	0.8	0.8	0.7	0.7
Chemicals & allied prods...	28	4.7	5.0	5.2	5.3	4.6	4.9	5.1	5.2
Industrial chems.....	281-282, 286	4.0	4.4	4.6	4.8	3.8	4.2	4.4	4.6
Drugs & medicines.....	283	(1)	(1)	8.5	(1)	8.2	8.0	8.4	8.5
Other chemicals.....	284-285, 287-289	(1)	(1)	3.3	(1)	2.9	3.1	3.3	3.3
Petroleum.....	13, 29	(1)	(1)	(1)	1.0	0.7	0.9	1.1	1.0
Rubber prods.....	30	(1)	(1)	(1)	(1)	2.4	2.3	2.2	1.8
Stone, clay, glass prods...	32	(1)	(1)	2.5	2.6	1.9	2.3	2.4	2.6
Primary metals.....	33	(1)	(1)	(1)	(1)	0.9	0.9	1.0	0.8
Ferrous metals.....	331-332, 398-399	(1)	(1)	(1)	(1)	0.7	0.6	0.8	0.6
Nonferrous metals.....	333-336	1.2	1.3	1.4	1.2	1.1	1.3	1.4	1.2
Fabricated metal prods.....	34	1.9	1.9	1.9	1.7	1.7	1.8	1.8	1.6
Machinery.....	35	6.4	7.6	(1)	(1)	5.8	6.7	7.4	7.6
Office, computing, & accounting mach.....	357	(1)	(1)	(1)	(1)	10.3	11.7	11.7	12.6
Other, except elect.....	351-356, 358-359	(1)	(1)	3.9	3.6	2.7	3.0	3.8	3.5
Electrical equipment.....	36	7.2	8.0	8.3	8.2	4.8	5.1	5.4	5.4
Radio, TV receiving.....	365	(1)	(1)	3.6	3.2	3.7	4.3	3.6	3.2
Communication equip.....	366	8.3	9.3	9.2	9.3	5.2	5.5	5.3	5.4
Electronic compon.....	367	7.8	9.6	(1)	(1)	6.6	8.2	9.2	8.7
Other electric equip.....	361-364, 369	(1)	(1)	(1)	(1)	2.7	2.5	2.7	3.0
Transportation equipment...	37	(1)	(1)	8.1	8.5	3.3	3.4	3.6	3.4
Motor vehicles.....	371	3.4	3.8	(1)	(1)	3.0	3.1	3.3	3.3
Other trans equip.....	373-375, 379	(1)	(1)	(1)	(1)	2.0	2.3	2.7	2.4
Aircraft, missiles.....	372, 376	15.4	14.9	13.4	15.0	3.9	3.8	3.9	3.7
Profess., scientif. inst...	38	8.5	9.1	9.0	8.8	7.7	8.4	8.3	8.4
Measuring inst.....	381-382	(1)	(1)	(1)	(1)	8.3	8.4	8.4	8.1
Other.....	383-387	(1)	(1)	(1)	(1)	7.4	8.4	8.3	8.5
Other manufacturing.....	27, 31, 39	(1)	(1)	1.2	(1)	1.1	1.0	1.2	1.1
Total.....		3.9	4.4	4.7	4.8	2.6	3.0	3.3	3.2

[1] Data withheld to avoid revealing operations of individual companies.

Source: National Science Foundation, R&D in Industry: 1987 (NSF 89-323), tables B-21 and B-22.

APPENDIX E

BIBLIOGRAPHY

Bibliography

Abbott, T., R. McGuckin, and others. Herrick, P. and L. Norfolk, "Measuring the Trade Balance in Advanced Technology Products." Washington, DC: Bureau of the Census, Center for Economic Studies, 1989.

Bartel, A. and F. Lichtenberg. "The Comparative Advantage of Educated Workers in Implementing New Technology" Review of Economics and Statistics, vol. 69 (1987), pp. 1-11.

Boretsky, M. "Concerns About the Present American Position in International Trade." ch. in National Academy of Sciences, Technology and International Trade: Washington, DC: Natural Academy of Sciences, 1971.

Davis, L., "Technology Intensity of U.S. Output and Trade." International Trade Administration, Washington, DC: U.S. Department of Commerce, 1982.

Grossman, G. "Strategic Export Promotion: A Critque." ch. in P. Krugman, ed. Strategic Trade Policy and the New International Economics., MIT Press, 1986.

Hatter, V., "U.S. High Technology Trade and Competitiveness", Washington, DC: U.S. Department of Commerce, International Trade Administration.

Hufbauer, G. and J. Chilas. 1974, "Specialization by Industrial Countries: Extent and Consequences" ch. in H. Giersch, ed. The International Division of Labour: Problems and Perspectives, New York, NY: J.C.B. Mohr, 1974.

International Trade Administration; "An Assessment of U.S. Competitiveness in High Technology Industries." Washington, DC: U.S. Department of Commerce.

"Innovation: The Global Race" (Special Edition), Business Week, McGraw Hill Inc., New York, NY: June 15, 1990, pp. 33-224.

Kreinin, M. "Comparative Advantage and Possible Trade Restrictions in High-Technology Products." in D. Salvatore, ed. The New Protectionist Threat to World Welfare. North-Holland, 1987.

Lawrence, R., Can America Compete?, Washington, DC: Brookings, 1984.

Mowery, D. and N. Rosenberg, Technology and the Pursuit of Economic Growth, Cambridge, U.K.: Cambridge University Press, 1989.

National Science Board: Science and Technology Indicators -1989. Washington, DC: 1989.

National Science Foundation; "Research and Development in Industry: 1987" (NSF 89-323). Washington, DC: January 1988.

Office of Secretary of Defense; "Critical Technologies Plan." Washington, DC: U.S. Department of Defense, March 15, 1990.

Pavitt, K. and P. Patel, 1988, "The International Distribution and Determinants of Technological Activities" Oxford Review of Economic Policy, vol. 4, (1988) no. 4.

Reich, R., "Beyond Free Trade" Foreign Affairs. Cambridge, U.K., 1983.

United States Senate

COMMITTEE ON FINANCE
WASHINGTON, DC 20510-6200

MEMORANDUM

TO: **Finance Committee Members**

FROM: **Senator Bentsen**

DATE: **September 25, 1990**

RE: **Committee Request for an ITC Study on the Economic Effects of a Free Trade Agreement with Mexico**

Later today, President Bush is expected to formally notify the Finance Committee, as well as the House Ways and Means Committee, that the Administration plans to begin free trade negotiations with Mexico. Canada, while not likely to be a formal participant at the outset, will be "consulted" concerning the planned negotiations and may be a full participant at a later stage.

Under the law, the Finance and Ways and Means Committees now have 60 legislative days to determine whether or not to allow the negotiations with Mexico to proceed under "fast track" procedures. During that time, it will be important for the Committee to be able to analyze the likely economic benefits and costs of a free trade agreement with Mexico.

Therefore, subject to your approval at the Executive Session on Thursday, September 27, 1990, the Committee, jointly with the Ways and Means Committee, plans to request the International Trade Commission (ITC) to conduct a section 332 investigation on the likely effects of a free trade agreement on the U.S. economy. The investigation will focus both on the potential aggregate economic impact and on the likely impact on key U.S. industrial sectors and agriculture. The ITC also will identify the regions that would be most affected by an agreement and will analyze the nature of these regional effects.

Because negotiations (if not disapproved) are likely to begin sometime next spring, the Committees will request that the ITC investigation and report be completed by next February.

If any Member has concerns about the request, please let me know as soon as possible. Please contact the Finance Committee (Eric Biel, x 4-4515) if you or your staff have any questions about the planned investigation.

United States Senate

COMMITTEE ON FINANCE

WASHINGTON, DC 20510-6200

MEMORANDUM

TO: **Finance Committee Members**

FROM: **Senator Bentsen**

DATE: **September 25, 1990**

RE: **Committee Request for an ITC Study on the Competitiveness of Advanced Technology Manufacturing Industries**

On June 21, 1990, the Finance Committee requested the International Trade Commission (ITC) to conduct a section 332 investigation on the global competitiveness of advanced technology manufacturing industries. As an initial step, the Committee requested the ITC to identify by September 21 the industries it will examine and monitor, and to identify three industries on which it will prepare a comprehensive study. Once the Committee approves the three industries selected for in-depth study, the ITC will have 12 months to complete the studies.

As the attached report indicates, the Commission proposes to conduct comprehensive investigations of the following three industries: computer communications equipment; pharmaceuticals; and semiconductor manufacturing and testing equipment. It also proposes to monitor the following industries: inorganic chemicals and plastics; drugs; machine tools (including semiconductor manufacturing equipment); computers, software and peripherals (including displays); communications equipment; microelectronic components (including semiconductors); motor vehicles and parts; aircraft and parts; missiles, spacecraft and parts; and scientific and professional instruments (including fiber optics).

At the Executive Session of the Finance Committee on Thursday, September 27, 1990, I intend to propose that the Committee accept the ITC's recommendations. Please contact the Finance Committee (Deborah Lamb, x 4-4515) if you or your staff have any questions about the ITC's proposal.

Attachment