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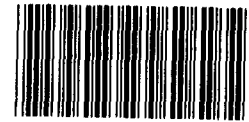
United States General Accounting Office

Report to the Honorable
Helen Delich Bentley, House of
Representatives

July 1990

INTERNATIONAL TRADE

Revitalizing the U.S. Machine Tool Industry



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United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

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July 17, 1990

The Honorable Helen Delich Bentley
House of Representatives

Dear Ms. Bentley:

This report responds to your request that we review the President's Domestic Action Plan for revitalizing the U.S. machine tool industry and evaluate the voluntary export restraint agreements with Japan and Taiwan. In this report we discuss (1) the Commerce and Defense Departments' implementation of the President's plan, (2) Commerce's program to monitor and ensure compliance with export restraints, and (3) the impact of these voluntary export limits on the domestic machine tool industry.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to the Secretary of Commerce, the U.S. Trade Representative, and appropriate congressional committees. We will also make copies available to others upon request.

As agreed with your office, we did not obtain formal agency comments for this report. This report was prepared under the direction of Allan I. Mendelowitz, Director, International Trade, Energy, and Finance Issues. Please contact him at (202) 275-4812 if you or your staff have any questions concerning the report. Other major contributors are listed in appendix III.

Sincerely yours,

A handwritten signature in black ink that reads "Frank C. Conahan". The signature is written in a cursive, flowing style.

Frank C. Conahan
Assistant Comptroller General

Executive Summary

Purpose

In December 1986, the President initiated a plan to help revitalize the U.S. machine tool industry. This plan was the result of several studies concluding that high levels of imports could erode the domestic industry's capacity to manufacture certain machine tools critical to the national defense. The plan directs that actions be taken in nontrade and trade areas to improve the capacity and competitiveness of the domestic industry. The nontrade actions required the government to assist, encourage, and fund a variety of research and development activities to help modernize machine tool and manufacturing technology. The trade actions included 5-year voluntary export restraint agreements with Japan and Taiwan to give the domestic industry an opportunity to increase sales and improve production capacity.

Congresswoman Helen Delich Bentley asked GAO to determine how well the President's plan is being implemented and if it is having a positive impact on the domestic industry.

Background

In March 1983, the National Machine Tool Builders Association (now called the Association for Manufacturing Technology) filed a petition, under section 232 of the Trade Expansion Act of 1962, for temporary relief from a high level of imports in several machine tool markets. Section 232 of the act gives the President authority to limit imports if he determines that they threaten to impair the national security. In February 1984, the Commerce Department concluded that imports in certain machine tool markets did threaten the U.S. national security. In May 1986, the President announced that the United States would seek voluntary export restraint agreements with the major machine tool exporting countries as part of an overall plan to support the machine tool industry's modernization efforts.

In December 1986, the United States concluded 5-year voluntary restraint agreements with Japan and Taiwan to limit their exports in certain categories of machine tools. At the same time, the United States requested that nine other countries limit their U.S. machine tool market shares to specific amounts or to 1986 levels. These latter requests were made to help ensure that domestic manufacturers rather than foreign competitors would be able to take advantage of the reduction in Japan's and Taiwan's market shares. The restraint agreements assure Japan and Taiwan that the United States will monitor all imports to ensure that this occurs.

Results in Brief

Work on all of the President's nontrade-related proposals to share information and to encourage and fund research and development activities on machine tools and manufacturing technology has begun or has already been completed. However, it is too early to determine if actions taken by the Defense Department and the civilian agencies will be effective in achieving the long-term objective of improving the industry's competitiveness; however, progress is being made.

GAO found that Commerce's Office of Agreements Compliance did not have documentation of the policies, procedures, or criteria used to monitor Japan's and Taiwan's compliance with export restraints or the import penetration levels of other countries. In addition, Commerce did not use the most timely methods available to measure quota compliance. Moreover, Commerce did not use the most accurate data or timely methods available to measure import penetration.

While the domestic industry's share in all of the restricted machine tool markets has improved, it has not always reached the levels intended by the President's plan. This shortfall is due to less than full compliance by Japan and Taiwan with the provisions of the export agreements and increased exports to the United States from all other countries, including those that were requested to limit them.

GAO and Commerce agree that Japan and Taiwan have exceeded their export quotas, but disagree on the extent of overages.

Principal Findings

Implementation of the Nontrade Measures of the President's Plan Has Begun

Currently, all of the nontrade activities under the President's plan have either begun or been completed. For example, the Department of Defense has (1) provided the industry with detailed information on its future machine tool needs, (2) shared its data on manufacturing technology, and (3) participated in joint efforts to prioritize research and development funding to the projects offering the most benefits. Also, the private sector has been funding its own projects. These efforts have produced a number of advances with potentially significant impact. For instance, the National Center for Manufacturing Sciences, which was initially funded by the Department of Defense, the industry association and the state of Michigan, has sponsored numerous projects to help the

machine tool industry, including one for the development of a more efficient machine tool.

Need to Document and Improve Monitoring Activity

Federal standards and guidelines require agencies to identify or develop internal control objectives for each of their key activities. Also, internal control systems and all transactions must be documented, and this documentation must be readily available for examination. However, Commerce's Office of Agreements Compliance does not have written policies or procedures for monitoring the agreements and does not maintain complete records of the monitoring it does. Thus, GAO could not review the accuracy, completeness, or validity of Commerce's monitoring methods, calculations, or conclusions.

Commerce did not use the most timely methods available to monitor Japan's and Taiwan's quota compliance. By May of each year, Commerce has sufficient data to determine Japan's and Taiwan's compliance with the preceding year's annual export quotas, but generally does not reach agreement with Japan or Taiwan on their compliance until 5 months or more have passed. This method of reaching agreement on export quota compliance will extend adjustments for the 2 final years' overages beyond the life of the 5-year agreements, thereby nullifying the intended goals of these agreements. Commerce officials acknowledge this problem and informed us they plan to address it by monitoring imports on a monthly basis during 1991. Commerce could also determine the impact of other countries' import penetration of these markets using more timely methods and more accurate data than it does.

GAO and Commerce Do not Agree on Japan's and Taiwan's Exports

GAO's and Commerce's analyses of Japanese and Taiwanese exports show that both countries have exceeded their export quotas. However, GAO believes that Commerce should have found more Japanese and fewer Taiwanese annual overages for the period 1986 through 1988. For the 3-year period, Commerce estimated overages for 250 Japanese and 2,127 Taiwanese machine tool exports, while GAO estimated overages for 1,353 Japanese and 1,856 Taiwanese machine tool exports. See appendix II for an explanation of the difference between the GAO and Commerce calculations.

Other Countries Exceeded Requested Market Share Levels

GAO found that several countries that were asked to limit their shares of the domestic machine tool markets did not do so. For example, in 1987, the United Kingdom increased its penetration of the U.S. non-numerically controlled lathes market 12 percentage points above its 1986 levels, and West Germany increased its penetration of the U.S. numerically controlled punching and shearing machines market 4 percentage points above the requested market share limit.

Commerce said it had not contacted the governments of any of these countries about their increases in U.S. market shares because none of the increases have harmed the domestic industry. However, Commerce has no documentation supporting how it came to this conclusion.

Recommendations

GAO recommends that the Secretary of Commerce direct the Office of Agreements Compliance to

- establish written policies and procedures to document how it monitors (1) foreign countries' compliance with trade restraint agreements, (2) changes in other countries' import penetration, and (3) the U.S. share of each restricted market;
- adopt more timely methods to monitor Japan's and Taiwan's quota compliance;
- use the more accurate data and more timely methods available to monitor the changes in other countries' import penetration; and
- establish written criteria for evaluating the significance of changes in import penetration by other countries.

GAO also recommends that the Secretary of Commerce and the U.S. Trade Representative establish criteria and guidelines for contacting the governments of countries that increase their import penetration of domestic machine tool markets before penetration levels can prove harmful.

Agency Comments

As requested, GAO did not obtain official agency comments on a draft of this report; however, GAO discussed the report's contents with Commerce officials whose comments were incorporated in the report where appropriate.

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Abbreviations

GAO General Accounting Office
OAC Office of Agreements Compliance

Introduction

In December 1986, the President initiated a Plan to help revitalize the U.S. machine tool industry. This plan was the result of several studies concluding that high levels of imports could erode the domestic industry's capacity to manufacture certain machine tools critical to the national defense. The plan directed that actions be taken in the nontrade and trade areas to improve the capacity and competitiveness of the domestic industry. The nontrade actions of this plan called for the government to assist and fund a variety of research and development activities to help modernize machine tool and manufacturing technology. Under the trade-related proposals of this plan, the United States acted to reduce foreign competition and to help the domestic industry increase sales through 5-year voluntary export restraint agreements with Japan and Taiwan and by requesting nine other countries to restrict their exports to the United States.¹

The Departments of Defense and Commerce and a number of other agencies are responsible for implementing the nontrade activities of the Domestic Action Plan. The Commerce Department's Office of Agreements Compliance (OAC) is responsible for monitoring compliance with the export restraints.²

Machine tools are essential to the manufacture of almost every man-made product and are vital to maintaining a strong national defense. Machine tools are used to produce a number of defense-related items, ranging from rifle ammunition to strategic nuclear weapons. During the late 1970s and early 1980s, domestic machine tool manufacturers' ability to compete with foreign producers declined.³ Studies conducted at that time showed that the decline in U.S. competitiveness was due to a number of factors, including the cyclic nature of the domestic market, the small size of the average domestic machine tool company, the growing cost of research and development, the shorter delivery times of foreign manufacturers, the greater subsidization of foreign governments' own industries, and the changes in the value of the U.S. dollar.

¹West Germany, Switzerland, Brazil, Italy, Korea, Singapore, Spain, Sweden, and the United Kingdom were the nine countries identified as the largest machine tool supplier countries (other than Japan and Taiwan) and asked to restrict their exports to the United States.

²The U.S. Customs Service is responsible for helping OAC monitor the agreements by providing data on the imports of restricted machine tools.

³According to the Secretary of Defense, from 1975 to 1985, the domestic share of all U.S. machine tool markets fell from 88 percent to 65 percent.

In March 1983, the Association for Manufacturing Technology filed a petition, under section 232 of the Trade Expansion Act of 1962, for temporary relief from the high level of imports in several machine tool markets. Section 232 of the act gives the President authority to adjust imports if he determines that they threaten to impair the national security. In February 1984, the Commerce Department concluded that imports in certain machine tool markets did threaten the U.S. national security. Subsequently, the President announced in May 1986 that the United States would seek voluntary export restraint agreements to reduce machine tool imports as part of an overall Domestic Action Plan supporting the industry's modernization efforts.

In December 1986, the United States concluded 5-year voluntary restraint agreements for Japanese and Taiwanese machine tools.⁴ At the same time, the U.S. Trade Representative and the Secretary of Commerce requested that nine other countries limit their exports of these machine tools to the United States.⁵ The United States made these latter requests to help ensure that the reduction in Japan's and Taiwan's market shares would be made available to domestic machine tool manufacturers rather than to other foreign competitors. The agreements assure Japan and Taiwan that the United States will monitor imports to make certain that this occurs.

Objectives, Scope, and Methodology

Congresswoman Helen Delich Bentley requested that we evaluate the implementation of the President's plan to revitalize the domestic machine tool industry, including the nontrade activities of the Domestic Action Plan, the agreements with Japan and Taiwan, and the restraints

⁴The agreements with Japan and Taiwan extend from 1987 through 1991, with respective 2- and 7-month transition periods in 1986. The agreements restrict both countries' exports of numerically and non-numerically controlled lathes, machining centers, and milling machines. Numerically controlled machine tools are those operated by numerically coded programs inserted or fed into a machine tool control system on tape, punched cards, dials, or by other means. The agreements also restrict Japan's exports of numerically and non-numerically controlled punching and shearing machines. See appendix I, table I.1, for a list of the market share limits for each machine tool category and country. Machining centers are metal-cutting machine tools that consist of a table that holds the work piece, a vertical or horizontal spindle that drives the cutting tool against it, and an automatic tool changer. Lathes, also called turning machines, are generally cylindrical, metal-cutting machine tools for shaping the work piece. Milling machines are metal-cutting machine tools that remove metal by moving the work piece into a rotating cutting tool that has one or more cutting teeth. Punching and shearing machines are metal-forming tools.

⁵The United States requested that West Germany (five types) and Switzerland (one type) limit their U.S. machine tool market shares to specific amounts and discouraged seven other countries from increasing their shares of the U.S. markets for the six types of machine tools noted in the voluntary restraint agreements. See appendix I, table I.1, for a list of the market share restraints on West German and Swiss machine tools.

on the U.S. market shares of nine other major exporting countries. She also asked us to determine if the plan is having a positive impact on the domestic machine tool industry.

We interviewed Department of Defense and Commerce officials and reviewed Commerce's documents and records to obtain information on the implementation and effectiveness of the nontrade efforts of the Domestic Action Plan. We interviewed and obtained documents and records from Department of Commerce officials in four different offices: the Bureau of the Census, the Bureau of Export Administration's Office of Industrial Resources Administration, the OAC, and the Office of General Industrial Machinery, Capital Goods, and International Construction; and from Department of Treasury officials in the U.S. Customs Service, representatives of the Association for Manufacturing Technology, and an official at the Office of the U.S. Trade Representative to determine the effectiveness of the voluntary restraint agreements and other measures to limit imports. We reviewed the OAC's requirements and system for monitoring compliance with the quotas and imports to determine whether they have achieved the agreements' objectives. We measured this achievement by analyzing (1) the impact of trade restrictions on the domestic machine tool industry, (2) Japan's and Taiwan's compliance with their voluntary export quotas, and (3) the changes in other countries' shares of domestic markets. We used different methods and data to perform each of these analyses.

We analyzed changes in the U.S. shares of the domestic machine tool market to determine the impact of the export restrictions on the domestic industry.⁶ We compared the annual U.S. machine tool market shares with the "ideal" that would have existed if the United States had obtained the entire market shares that were to be vacated by Japan, Taiwan, Switzerland, and West Germany and if all other countries, as requested or assumed, maintained their 1986 market shares. We also compared the increases in domestic market shares with the decreases in Japan's and Taiwan's shares to determine which countries have benefited from these reductions.

To verify OAC's determinations of Japan's and Taiwan's compliance with the voluntary export quotas, we obtained and analyzed data on their exports and quota levels. We compared exports against the quota levels (in units) for each machine tool type. We then compared the results of

⁶We did not measure the change in the machine tool industry's capacity because Commerce and the Association for Manufacturing Technology do not have these data.

our analysis of exports and quotas with the OAC's analysis and found a number of differences. We computed the number and dollar value of the exports that exceeded the quotas.

We also measured other countries' shares of the domestic machine tool markets. We analyzed Swiss and West German compliance with requested limits on specific machine tool exports by matching their annual shares of each machine tool market against these limits. For each of the seven other countries that Commerce identified as major machine tool exporters, we matched their annual market shares with the 1986 shares they were requested to maintain. We used 1986 market levels because the United States sent letters to these seven countries in December 1986 that requested each of them to maintain their market shares.

We compared the domestic market shares of all other countries against their 1986 shares to determine if there were any significant changes. We defined significant changes in market share as those involving increases of 5 percentage points or more by any one country in any one of these restricted markets.⁷ We calculated the dollar value of the increases in import penetration to determine the value of sales each country gained by increasing its market shares beyond requested levels.

Appendix II describes the data and analytical methods we used in the above analyses. Our audit work was conducted from July 1988 through December 1989 in accordance with generally accepted government auditing standards.

As requested, we did not obtain official agency comments on a draft of this report; however, we discussed the report's contents with Commerce officials whose comments were incorporated in the report where appropriate.

⁷The Association for Manufacturing Technology told us that domestic market share increases of 5 percentage points or more by any one country would be considered significant.

Long-Term Plans to Increase Competitiveness

The President's Domestic Action Plan to revitalize the domestic machine tool industry involves a variety of long-term activities to be undertaken primarily by the Departments of Defense and Commerce. At the same time, the industry is expected to improve its future domestic and international competitiveness. This plan proposes actions to (1) encourage federal funding of research projects that seek to advance machine tool and manufacturing technology, (2) share the available information on this technology, and (3) work with the industry to develop a private sector organization with the ability to advance technology and encourage exports. Currently, all of the activities envisioned by the plan have either begun or been completed. It is still too early to determine the long-term impact that these actions will have, but progress is being made.

New Research Projects

Funding for research and development projects involving machine tool and manufacturing technology comes from the Defense Department, civil agencies, and the machine tool industry. These organizations fund projects individually and in joint ventures. The projects are primarily funded by the Defense Department; the National Science Foundation; the National Institute of Standards and Technology; and the industry's National Center for Manufacturing Sciences.

Beginning in 1987, the Department of Defense and industry officials met on several occasions to discuss ways of jointly identifying which needs were most important in advancing machine tool technology and which projects would most likely meet those needs. Two projects that arose from these discussions are already underway. One project sponsored by the Department of Defense involves the "next generation controller" for running the more complex machines and manufacturing processes of the future. Another involves improved sensors to measure the results of manufacturing operations more precisely and to provide this information for quality control. Ideas for a number of other innovative projects have been received and will be funded in the near future.

Other research and development programs already begun cover many areas of machine tool technology. Two such projects that offer substantial benefits are (1) a new software package, nearing commercial use, that integrates the various manufacturing and design operations, thus allowing large increases in cutting speed and shortening production time (several sources, including the National Science Foundation, funded this project), and (2) a joint effort by the U.S. Navy and the National Institute of Standards and Technology to develop a fully automated process

that makes spare parts for submarines at substantial savings in time and money.

Sharing Information

The Defense Department has collated and cross-indexed 11 volumes of information on machine tool and manufacturing technology. It provides this updated information annually to the industry through the Association for Manufacturing Technology, which restricts use to U.S. citizens. In addition, Defense provides the industry annual 5-year estimates of its needs for machine tools. Every other year, Defense participates in a procurement conference where its component organizations describe their current needs for machine tools and explain how to bid on projects to fulfill these needs. These efforts encourage more domestic bidders and allow a more efficient focus on the industry's production.

Encouraging Exports

To encourage and facilitate increased exports of domestic products, including machine tools, Commerce has (1) streamlined and automated the process of obtaining export licenses, (2) removed a number of machine tools from the list of those needing special reviews and approvals, and (3) issued an export trading certificate to the Association for Manufacturing Technology which, according to Commerce, allows the association to develop joint export ventures without violating U.S. antitrust laws. In addition to Commerce's activities, the Export-Import Bank has broadened its programs to provide financing for U.S. exports through special insurance coverage. This insurance program permits the Association for Manufacturing Technology to develop export ventures by smaller firms that may not be able to finance such ventures without such assurances. In addition to the U.S. government's efforts, the private sector has (1) arranged new ventures for exporting machine tools to Egypt and China, and (2) encouraged increases in exports, by sponsoring about 20 trade shows promoting U.S.-made machine tools.

Industry Research and Development

In 1986, the National Center for Manufacturing Sciences was established to help determine the most productive areas for industry research and development efforts. The Center involves both large and small companies in joint projects where the results could have direct commercial benefits. It initially received grants from the Manufacturing Technology Association (\$1 million), the state of Michigan (\$2 million), and the Department of Defense (\$5 million for each of its first 3 years of operation). The Center, now in its fourth year of operation, has over 90 dues-

paying members and is one of the largest research consortia in the country.

The Center has brought together industry representatives to identify high-priority projects for funding. Currently, it is sponsoring over 40 projects in varying stages of development. One of its most successful projects so far has been the development of a machine tool that combines both tap and drill functions. By combining these functions, the new machine tool requires 90 percent less floor space than earlier machine tools performing the same functions and vastly increases productivity. It is already being sold to a commercial market estimated at \$1 billion.

Conclusions

The impact on domestic machine tool sales of the advances in technology and efforts to increase exports will not be fully realized for several more years. Therefore, we believe that it is too early to assess the long-term effect of the nontrade activities of the President's plan on the machine tool industry's competitiveness. However, all of the activities the plan proposes are either underway or have been completed, and progress is being made.

Short-Term Plans to Lower Import Levels

The short-term objective of the President's plan for the domestic machine tool industry is to provide relief from foreign competition by lowering the level of certain machine tool imports critical to defense needs. To achieve this objective, the United States obtained voluntary restraint agreements from Japan and Taiwan and requested nine other major machine tool exporting countries to restrict the level of their machine tool exports to the United States. OAC monitors how Japan and Taiwan are complying with the quota levels and reviews all imports to ensure that the agreements' objectives are met.¹

According to the agreements, Japan and Taiwan are responsible for restricting their machine tool exports by issuing export licenses and certificates and by using other administrative procedures. Japan and Taiwan restrict their exports to specific quota levels that are based on the amount of U.S. apparent consumption for each machine tool type. An independent forecaster, Data Resources, Inc., estimates apparent consumption for each machine tool market 5 times a year, and OAC determines actual apparent consumption once a year.² OAC is also responsible for monitoring imports to ensure that Japan and Taiwan have received fair treatment (i.e., to ensure that the market share reductions made by Japan and Taiwan are primarily made available to domestic manufacturers rather than to foreign competitors). At the end of the third year of the 5-year agreement periods, the United States, Japan, and Taiwan were required to assess how well the agreements have worked. At the time of our review, OAC and the representative offices from the agreement countries were in the process of conducting this assessment.

Our review of the OAC's system and requirements for monitoring quota compliance and import penetration indicated that several factors weakened their effectiveness. These factors include a lack of (1) written policies and procedures, (2) documentation of monitoring activities, (3) criteria for judging the level of increased import penetration by nonagreement countries that would threaten achievement of the agreements' objectives, and (4) routine data coordination with other responsible agencies. In addition, the non-use of (1) more timely methods for monitoring quota compliance, and (2) more accurate data and timely methods for monitoring import penetration also weakened the effectiveness of monitoring efforts.

¹The U.S. Customs Service assists Commerce's import monitoring by forwarding to the OAC all entry documents, invoices, and licenses for machine tool imports under the agreements.

²Apparent consumption is defined as imports plus shipments minus exports.

Need to Identify Policies, Procedures; Document Monitoring Activities

OAC officials do not have written policies or procedures for monitoring the agreements and do not maintain complete records of the monitoring they do. An OAC official said there never have been any written procedures for monitoring the agreements, and that written procedures would limit their flexibility.

According to the Comptroller General's "Standards for Internal Controls in the Federal Government," each agency must identify or develop internal control objectives for each key activity: These controls must be logical, applicable, and reasonably complete. Also, internal control systems and all pertinent aspects of transactions of an agency must be documented, and this documentation must be readily available for examination.

Without written policies and procedures or documentation of monitoring activities, it is difficult to ensure continuity and reliability in the monitoring system. For example, OAC officials did not readily know what shipment data they used for some of their prior year consumption calculations. These officials told us that their earlier calculations used shipment tables different from the ones they now use. Also, they told us that these prior calculations used unrevised shipment tables when more accurate ones that were available should have been used.

Because OAC officials do not record their monitoring activities, we could not review their system for completeness, accuracy, and validity. Without such documentation, their figures are open to challenge from the agreement countries. Also, without records of policies, procedures, and monitoring activities, it is difficult to establish continuity of operations, to trace the data sources used for calculations, and to detect any arithmetic or recording errors that may have been made.

OAC Lacks Criteria to Evaluate Other Countries' Import Penetration

OAC officials have no written criteria for determining what level of increased import penetration by other countries would threaten achievement of the agreements' objectives. They said that this is not unusual, and that written criteria would only encourage foreign countries to match their exports to the highest levels allowed.

According to OAC officials, they have monitored import penetration by following certain unwritten procedures. They measured import penetration of each machine tool market by all countries in aggregate as well as for individual countries for the nine countries asked to restrict exports to the United States. They looked at the interaction between each of

these nonagreement countries to see if reductions in import penetration by some countries offset increases by others. According to these officials, there were no increases in import penetration that could have harmed achievement of the agreements' objectives. However, they have no criteria on which to base this conclusion.

According to the industry officials in the Association for Manufacturing Technology, a 5 percentage point or more increase in import penetration by any one country in any machine tool market would be significant and could harm achievement of the agreement objectives. We reviewed OAC's import penetration figures for each country and machine tool type and, using the industry's criteria, found substantial increases in import penetration for certain machine tool markets. For example, according to OAC's figures, British import penetration of the non-numerically controlled lathes market rose by 10 percentage points from 1986 to 1987; this represented an increase from 11 percent to 21 percent. The United States had only a 3 percent share of the 1986 market and an increase in 1987 to 10 percent of the market. Since each country was separately requested to limit exports, separate evaluations of their individual compliance with these requests and responses to any large increases in import penetration seem logical and prudent. OAC has not found any increases it believes are harmful to the domestic industry and, therefore, worthy of a response. However, these large increases in import penetration should have generated some form of response.

OAC's Data Documentation and Coordination Efforts Need Strengthening

According to Commerce officials, OAC monitors agreement countries' exports to the United States by following certain unwritten procedures and by using the best available data sources. However, because they do not keep complete records of their adjustments to these data, their results are not verifiable.

To obtain total figures on agreement countries' exports to the United States, OAC reviews Customs' entry documents and commercial invoices for machine tool imports. OAC compares the export figures derived from this review with official Census data to determine if they have received all entry documents. The Census data are derived from the same Customs entry documents used by OAC.

OAC's calculations of annual exports by Japan and Taiwan do not always match the official Census data. OAC's data differ from Census data

because OAC corrects the data for the number of reexports, kits,³ misclassifications, and key punch errors detected in its review of Customs' documents and commercial invoices. Although numerous errors have been found in these entry documents, affecting all types of restricted machine tools, OAC officials only maintained a cumulative total of these errors, which they used in their calculations of total exports. While they updated their own database with these figures, they did not routinely inform Customs or Census about such errors. Consequently, they could not justify the changes made in their data for errors found in their review of Customs entry documents, and we could not verify their results. In addition, because OAC does not always inform Customs or Census of their corrections to these data, the official trade statistics Census produces are not corrected to account for these errors. We believe OAC should inform Customs and Census about the errors found in their data to provide them an opportunity to correct the entry documents and the official Census statistics.

Need for More Timely Methods to Monitor Compliance

OAC officials did not monitor Japan's and Taiwan's quota compliance in the most timely way available. The current methods of determining and agreeing on quota compliance create a lag period of 5 months or more before adjustments are made to the current year's quotas in order to correct for overages occurring in the prior year. In May of each year, OAC officials determine final figures for Japan's and Taiwan's exports of machine tools and how these compare to each quota. Although they have this information in May, it is not until October, at the earliest, that they have been able to reach agreement with Japan and Taiwan on the total number of exports in the preceding year.⁴ Adjustments to subsequent years' quotas are then made to compensate for the prior years' overages. Also, many of the overages have been so large that OAC officials have allowed Japan and Taiwan to spread out their impact over the following 2 to 3 years, rather than reducing the next year's quota for the full amount.

OAC officials were not able to reach agreement with Japan or Taiwan on the amount of 1987 exports until November 1988 and January 1989, respectively. Taiwan's 1987 overages were so large that they were allowed to reduce 1989, 1990, and 1991 quotas to lessen the impact of the overage adjustment to the following year's quota. This untimely

³ A machine tool kit is a group of spare parts that represent a complete machine tool in disassembled form.

⁴ As of the end of March 1990, OAC had not reached agreement on Japan's total 1988 exports.

method of reaching agreement on total export figures would not allow export quotas for the last 2 years of the 5-year agreements to be adjusted for prior years' overages before the agreements expired. Therefore, the adjustments for overages would extend beyond the lives of the agreements and thereby nullify their intended goals.

OAC officials acknowledge this problem and informed us they plan to monitor imports on a monthly basis during 1991. They believe this will allow them to properly adjust quota levels through the end of the agreements.

More Accurate Data and More Timely Methods Exist for Monitoring Other Countries' Import Penetration

While the agreements do not define the methods or data that OAC should use to monitor imports, its data and methods are not the most timely available. OAC uses the monthly Census import report that counts each country's imports as of the date they are entered into the Census' database. Since there is a lag between the time imports actually enter the United States and the date they are entered into the Census database, this report is not as accurate as the monthly Census report that counts imports on the day they enter the country. For example, by December 1988, OAC officials had data only on import penetration current through June 1988. Because these data lag 4 to 6 months behind the actual imports entering the country, OAC's import penetration calculations cannot identify or respond in a timely manner to any increases in import penetration.

The Census import report that lists all imports by their date of entry is available earlier than the report OAC uses. The forecasts of annual consumption for each machine tool market are available 5 times a year. In our opinion, if OAC officials used these more accurate monthly import reports and calculated import penetration using the available forecasts of consumption, they could estimate monthly import penetration earlier to detect and react to large increases in imports from any country.

Conclusions

We identified the following weaknesses in the analytical methods and data used in OAC's system for monitoring quota compliance and other countries' imports:

- OAC officials do not document the data they use or steps they take to monitor the agreements or calculate import penetration. Thus, it is difficult to ensure continuity of operations, trace analytical steps, or find out if any errors have been made. Without such documentation, OAC's

analyses are subject to challenge by agreement countries that may contend that they have not reached their import limits.

- OAC has no written criteria for determining the level of increase in import penetration by other countries that would be harmful to the domestic industry.
- OAC officials adjust the data recorded on Customs' entry documents that are used to produce Census trade data without recording the reasons for these adjustments or routinely informing Customs or Census of these adjustments. Therefore, it is not possible to fully reconcile the differences between the OAC's and Census' machine tool statistics.
- The current methods for reaching agreement on Japan's and Taiwan's quota compliance create lags of 5 months or more. OAC recognizes it has to change its procedures to be able to respond to overages that may occur during 1991.
- The current methods for measuring import penetration are not the most timely available; more accurate and timely data exist.

Recommendations

We recommend that the Secretary of Commerce direct the Office of Agreements Compliance to strengthen its monitoring system by

- 1) establishing written policies and procedures to document how it monitors Japan's and Taiwan's compliance with the agreements, changes in other countries' import penetration, and the U.S. share of each restricted market,
- 2) establishing criteria for evaluating the changes in import penetration by other countries,
- 3) recording its adjustments to Customs' documents and Census data in a format that indicates why adjustments were made and routinely informing Customs and Census of the errors found.
- 4) adopting more timely methods to monitor Japan's and Taiwan's quota compliance, and
- 5) using the more accurate data and timely methods available to measure other countries' import penetration of the restricted machine tool markets.

The Domestic Machine Tool Industry Has Made Advances but Gained Less Than Intended

Since 1986, the voluntary restraint agreements have helped strengthen the domestic share of the machine tool markets. However, these gains have been less than those intended by the President's plan. This situation occurred because (1) Japan and Taiwan did not reduce all their exports to specified market share limits, and (2) other countries, including those requested to limit their exports to the United States, increased their shares of these markets. Our analyses of compliance with export restraints and the changes in domestic and foreign shares of these restricted markets show the following:

- In four of the six restricted machine tool markets, the domestic industry did not gain all of the market shares intended by the President's plan.
- Using the same methods and data that OAC claimed it used, we found the amounts by which Japan and Taiwan exceeded their voluntary restraint limits should have been greater than those determined by OAC, especially for Japan.
- Eight of the nine other countries asked to do so did not limit their shares in the domestic machine tool markets, and four of these countries acquired substantial portions of the markets in which Japan and Taiwan had reduced their shares.
- Commerce has not contacted the governments of any of the countries (other than Japan and Taiwan) about the large increases in their U.S. market shares.
- Two countries that were not among the major exporters identified in 1986 have emerged as significant exporters.

Domestic Market Share Changes

The President's plan does not require anyone to analyze the annual impact of the agreements on the domestic machine tool industry. However, OAC officials said that they measured the annual changes in domestic shares of each restricted machine tool market and found the agreements have had a positive impact on the domestic machine tool industry. However, OAC officials have not documented their analyses or criteria and, therefore, we could not confirm their conclusions.

We, therefore, did our own analysis of the change in annual domestic shares of each restricted machine tool market. As indicated in tables I.2 through I.7 of appendix I, our analysis showed that since the signing of the agreements in 1986, the domestic market shares have risen in most restricted machine tool markets. These tables show the domestic share in five of the six individual markets (excluding milling machines) increased by 2 to 19 percentage points above 1986 market share levels. Further, from 1986 to 1988, the overall combined domestic share of all

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six restricted markets increased by 6 percentage points (worth about \$130 million).

Table 4.1: Actual Versus Intended Domestic Market Shares (As a Percent of Total Market Units)

	Actual			Intended ^a	
	1986	1987	1988	1987	1988
NC ^b lathes	13	24	24	20	20
Non-NC lathes	5	7	9	22	22
Machining centers	16	20	33	35	37
Milling machines	53	53	53	57	53
NC punching and shearing machines	42	48	61	59	65
Non-NC punching and shearing machines	58	70	66	62	62

Note: The intended U.S. share for each machine tool market is what the domestic industry would have achieved if Japan, Taiwan, Switzerland, and West Germany had restricted their exports to specific market shares, and if all other countries had maintained their exports at 1986 levels. The intended market share levels differ each year, depending on the number of special licenses that Commerce grants Japan and Taiwan yearly.

^aBecause the restrictions did not affect the full year of 1986, intended levels are not computed for 1986.

^bNC denotes numerically controlled.

Source: Derived from Census Bureau data.

We found, however, as indicated in table 4.1, that the domestic machine tool industry did not gain all of the intended market shares in four of these restricted markets (non-numerically controlled lathes, machining centers, milling machines, and numerically controlled punching and shearing machines). For example, while the domestic share of the non-numerically controlled lathes market increased from 5 percent in 1986 to 7 percent in 1987 and 9 percent in 1988, it did not rise to the intended 22 percent in each year.

As displayed in table 4.3, one reason the United States did not gain all the potential market shares intended by the President's plan was because Japan and Taiwan exceeded export limits for some of the restricted machine tool products in 1986, 1987, and 1988. In addition, table 4.2 shows that several other countries increased their U.S. market shares and acquired substantial portions of the markets in which Japan and Taiwan had reduced their shares. For the 1986 transition periods, and for 1987 and 1988, sales of these countries' machine tools above agreement and requested market shares totalled an estimated \$236 million.

As shown in table 4.2, in four machine tool markets where Japan and Taiwan had reduced their market shares, other countries, and not the

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United States, were the primary recipients of these shares. For example, in the 1988 non-numerically controlled lathes market, the domestic industry only gained 2 percent of the 7 percent market share vacated by Japan and Taiwan.

Table 4.2: Percentage Point Changes in Domestic Market Shares (1987 and 1988)

	1986 to 1987			1987 to 1988		
	Japan & Taiwan	U.S.	All others	Japan & Taiwan	U.S.	All others
NC ^a lathes	(3)	11	(8)	(1)	0	1
Non-NC lathes	(14)	2	12	(7)	2	5
Machining centers	(6)	4	2	(17)	13	4
Milling machines	(2)	0	2	(6)	0	6
NC punching & shearing machines	(12)	6	6	(9)	13	(4)
Non-NC punching & shearing machines	(7)	12	(5)	(1)	(4)	5

^aNC denotes numerically controlled.

Source: Derived from Census Bureau data.

Agreement Countries' Overages Were Greater Than Those Determined by OAC

To the extent that Japan and Taiwan did not reduce their exports to the agreed levels, the domestic machine tool industry's opportunities to increase sales were lessened. Although Japan and Taiwan appear to have met their limits in several restricted markets, they have not done so in all markets. We found significantly larger overages than those determined by OAC. OAC monitors compliance by counting total exports listed in the commercial invoices and original Customs Service entry documents that make up the data used in official U.S. Census reports. (See app. II for more details on the methods and data the OAC and we used to calculate compliance.) Because OAC officials do not keep a record of all the individual errors they find in the entry documents, we could neither reconcile these differences nor determine the validity of the OAC's calculations. As shown in table 4.3, we found that Japan's exports exceeded limits in two machine tool markets in 1986 and four in 1987 and 1988. We found Taiwan's exports exceeded limits in all four of its restricted markets in 1986 and 1987 and in one for 1988. In comparison, OAC determined that Japan exceeded limits in three of its six restricted markets (only one instance in each of the 3 years), and that Taiwan exceeded its limits in all four of its restricted markets in all 3 years.

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Table 4.3: GAO's and OAC's Assessment of Japan's and Taiwan's Exports, Quotas, and Overages (1986-1988)

Japan	1986 transition period					
	GAO			OAC		
	Exports	Quota	Overage	Exports	Quota	Overage
NC ^a lathes	2,529	2,985	0	2,625	2,777	0
Non-NC lathes	340	164	176	383	155	228
Machining centers	1,340	2,215	0	1,939	1,955	0
Milling machines	1,894	246	0	110	238	0
NC punching and shearing machines	270	216	0	208	213	0
Non-NC punching and shearing machines	321	235	86	168	216	0
Total overages			262			228
Taiwan						
NC lathes	299	30	269	84	30	54
Non-NC lathes	706	427	279	892	427	465
Machining centers	158	56	102	137	56	81
Milling machines	890	576	314	884	576	308
Total overages			964			908

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1987						1988					
GAO			OAC			GAO			OAC		
Exports	Quota	Overage	Exports	Quota	Overage	Exports	Quota	Overage	Exports	Quota	Overage
3,475	3,389	86	3,250	3,389	0	3,666	3,624	42	3,588	3,572	16
164	64	100	36	64	0	248	133	115	39	204	0
2,411	1,970	441	1,970	1,970	0	2,088	1,825	263	2,003	2,065	0
190	355	0	164	355	0	219	327	0	125	340	0
166	148	18	148	148	0	115	89	26	112	106	6
207	260	0	180	345	0	169	361	0	99	382	0
645			0			446			22		
211	161	50	178	161	17	145	-b	184	169	167	2
1,122	838	284	1,141	817	324	1,077	1,309	0	1,214	1,124	90
261	126	135	275	126	149	146	155	0	201	155	46
2,106	1,867	239	2,108	1,867	241	1,971	1,995	0	2,432	2,082	350
708			731			184			488		

^aNC denotes numerically controlled.

^bGAO's 1988 quota calculation resulted in a negative figure because the reduction to this quota for our calculation of prior years' overages was greater than the quota itself.

Source: Derived from OAC and Census Bureau data.

As shown in table 4.4, we have calculated that Japan's exports in excess of quotas would have an estimated value of \$118 million and Taiwan's about \$27 million.

Table 4.4: Dollar Value of GAO's Overage Calculations (1986-1988)

Dollars in thousands				
	1986 ^a	1987	1988	3-year total
Japan	12,298	61,509	44,584	118,391
Taiwan	9,565	10,537	7,229	27,331
Total	21,863	72,046	51,813	145,722

Note: Values are based on an average dollar value for each type of imported machine tool for each country for each year.

^a1986 figures are overages for Japan's 7-month and Taiwan's 2-month transition period.

Source: Derived from Census Bureau data.

Other Restricted Countries Exceeded Requested Market Share Limits

The United States requested nine countries identified by OAC as the largest exporters (other than Japan and Taiwan) of the machine tools covered by the agreements to limit their U.S. market shares. This action was intended to help ensure that the domestic industry would have an opportunity to be the primary beneficiary of the new business created when Japan and Taiwan reduced their exports. Both the agreements assure Japan and Taiwan that the United States will guard against other countries' acquiring the market shares they vacate.

We measured these nine countries' shares of the domestic machine tool markets and found that several had increased their U.S. market shares and captured substantial portions in some of the markets where Japan and Taiwan had reduced their shares.

Although we used different import data than the OAC did, the results of both GAO and OAC analyses show that (1) at least three of the nine countries substantially exceeded their requested market share levels in certain machine tool markets, (2) several other countries not considered major machine tool suppliers in 1986 have substantially increased their U.S. market shares, and (3) as of the end of 1988, countries other than the United States have acquired most of the market shares vacated by Japan and Taiwan in four of the six restricted markets.

Table 4.5 shows that in 1987 and 1988, actual total import penetration by the nine countries increased substantially in four of the six restricted machine tool markets. For example, other countries' aggregate import

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penetration in the non-numerically controlled lathes market rose from 49 percent in 1986 to 61 percent in 1987 and to 66 percent in 1988. Those import levels substantially exceeded the 48 percent market share envisioned for each of these 2 years. During the same 2 years, the domestic share of this market was only 7 percent and 9 percent, respectively.

Table 4.5: Other Countries' Import Penetration (Excluding Japan and Taiwan)
 (Measured in Percents of Total Market Units)

	Actual			Intended ^a	
	1986	1987	1988	1987	1988
NC ^b lathes	19	11	12	19	19
Non-NC lathes	49	61	66	48	48
Machining centers	7	9	14	5	5
Milling machines	20	22	29	20	20
NC punching & shearing machines	11	17	13	12	12
Non-NC punching & shearing machines	28	23	28	28	28

^aBecause the requests to the nine countries to limit their market shares were not sent until December 1986, we used 1986 as the base year and only computed "intended" levels for 1987 and 1988.

^bNC denotes numerically controlled.

Source: Derived from Census Bureau data.

As displayed in table 4.6, imports from the nine countries that were formally requested to limit them show that all (except for Switzerland) exceeded these levels to some extent, resulting in sales estimated at about \$90 million above the limits. These overages were concentrated in three markets (machining centers, milling machines, and non-numerically controlled lathes). Table 4.6 shows that four countries—the United Kingdom, West Germany, Korea, and Italy—were responsible for about 88 percent of these sales.

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Table 4.6: Value of Imports From Other Countries in Excess of Requested Levels (1987, 1988)

Dollars in millions			
Countries	1987	1988	2-year total
United Kingdom	\$11.3	\$31.5	\$42.8
West Germany	14.0	10.7	24.7
Korea	2.8	3.5	6.3
Italy	3.4	2.2	5.6
Singapore	1.2	2.4	3.6
Sweden	2.0	0.7	2.6 ^a
Brazil	0.1	2.4	2.5
Spain	0.5	1.9	2.5 ^a
Total	\$35.3	\$55.3	\$90.6

Note: Imports from Switzerland did not exceed specified market share limits.

^aValues do not always add due to rounding.

Source: Based on Census Bureau data.

The Association for Manufacturing Technology told us that it believes an increase of 5 percentage points in domestic market share should be considered significant. Table 4.7 shows the significant market share increases by other countries in four markets. For example, in 1988, the United Kingdom exceeded its 1986 share of the milling machines market by 9 percentage points (worth about \$13 million), while the agreement countries' shares fell 6 percentage points below their 1986 level.

Table 4.7: Significant Market Share Increases by Other Countries Requested to Limit Them (Measured in Percentage Points Above Their Requested or Specified Levels)

	1987	1988
Non-NC^a lathes		
United Kingdom	12	5
Korea	5	3
Brazil	0	7
Machining centers		
United Kingdom	1	5
Milling machines		
United Kingdom	1	9
NC punching and shearing machines		
West Germany	4	7

^aNC denotes numerically controlled.

Source: Based on Census Bureau data.

Similarly, as shown in table I.3 in appendix I, in 1988, when Japan and Taiwan reduced their combined share of the non-numerically controlled lathes market 21 percentage points below their 1986 levels, Brazil,

Korea, and the United Kingdom increased their combined share by 15 percentage points, while the domestic market share only increased 4 percentage points above its 1986 levels. Tables I.2 through I.7 in appendix I show the changes in foreign and domestic shares of all the restricted machine tool markets compared to the reduction in Japan's and Taiwan's market shares in 1987 and 1988.

OAC's Reaction to Other Countries' Import Penetration

Although our analysis of other countries' import penetration showed substantial increases, OAC officials told us that these increases in other countries' import penetration were not significant and have not harmed the domestic industry.

OAC acknowledged that its evaluation of foreign imports in 1987 and 1988 showed substantial increases in the British import penetration of certain markets but did not believe these increases posed a threat to the domestic industry. OAC told us they have discussed the increased import penetration with the U.S. importer of these machine tools, but have not contacted the British government. OAC did not notify the British government because the increase in imports (of machining centers and milling machines) resulted from a strike at a U.S. plant that then imported its needs from its British subsidiary. By purchasing foreign machine tools to fill the gap created by this strike, the importer diminished the U.S. machine tool industry's potential to increase its shares in these machine tool lines.

OAC lacks written criteria to determine other responses short of the sanctions,¹ so that increases in imports will not grow to harmful proportions. While there has been no official assignment of responsibility to OAC for contacting countries that do not stay at their requested market share levels, this, in our opinion, would be consistent with OAC's responsibility to monitor these situations.

Emerging Machine Tool Exporters

When the agreements were established in 1986, only nine countries aside from Japan and Taiwan were considered major suppliers of the machine tools involved. Each of these countries had a 2 percent or greater share in at least one of these markets. We believe that there was an implicit assumption made at that time that imports from all other countries would remain at their relatively low levels.

¹The U.S. letters to these countries state that the President is prepared to take unilateral action against them if they increase their shares and threaten achievement of the revitalization program.

Generally this has been the case. These other countries' aggregate import penetration in the six restricted markets rose only 1 percentage point from 1986 to 1988. However, we found that in 1988, two countries significantly increased their shares in one or more of these domestic markets. In the non-numerically controlled lathes market, China increased its 1988 share about 7 percentage points (worth about \$2 million) and Austria about 3 percentage points (worth about \$2.5 million) above their 1986 levels. Tables I.2 through I.7 in appendix I list the countries that were not originally identified as major exporters but have since increased their shares of the domestic machine tool markets. These increases in other country shares can offset the reduction in Japan's and Taiwan's shares of these restricted markets and thus threaten the revitalization of the U.S. machine tool industry.

Conclusions

We found four machine tool markets in which the domestic industry did not obtain the increases in market shares that were intended by the agreements and U.S. requests and restraints on other exports. Several factors contributed to this situation. Although Japan and Taiwan reduced their exports, thus lowering their shares of U.S. markets, they have not reduced their exports to the limits set by the voluntary restraint agreements. Further, we believe that OAC should have found greater overages for these countries than they did. At the same time, most of the nine countries that were asked to limit their domestic market shares have not done so, and four of these countries have acquired substantial portions of the market shares vacated by Japan and Taiwan. OAC did not contact the governments of any countries that increased their import penetration of the domestic machine tool markets and does not have guidelines for contacting these governments when they do. Further, two countries that were not identified as major exporters in 1986 have since emerged as significant exporters. Thus, the trade objectives of the President's plan for revitalizing the machine tool industry have not been fully realized.

Recommendation

We recommend that the U.S. Trade Representative and the Secretary of Commerce establish criteria and guidelines for contacting the governments of countries that increase their import penetration of the domestic machine tool markets before their penetration levels can prove harmful.

Data on the Market Share Limits and Changes for Machine Tools Represented in the Agreements

The following tables show (1) the specific required and requested market share limits on exports from Japan, Taiwan, West Germany, and Switzerland,¹ and (2) the changes (1986 through 1988) in shares of the six restricted domestic machine tool markets. These tables indicate that the domestic industry has been the primary recipient of the market shares made available by reduced import penetration in four of the six markets, but has acquired little or none of these available shares in the milling machines (see table I.5) and the non-numerically controlled lathes markets (see table I.3).

Table I.1: Market Share Limits for Japanese, Taiwanese, West German, and Swiss Machine Tool Exports

1986 transition period limits				
Products	Japan (percent) ^a	Taiwan (units) ^b		
NC ^c lathes	66	55		
Non-NC lathes	5	427		
Machining centers	73	56		
Milling machines	3	576		
NC punching and shearing machines	43	NA ^d		
Non-NC punching and shearing machines	10	NA		
Annual market share limits (percent)				
Products	Japan	Taiwan	West Germany	Switzerland
NC lathes	57	3	3	NA
Non-NC lathes	5	25	3	NA
Machining centers	52	5	2	NA
Milling machines	3	19	NA	NA
NC punching and shearing machines	19	NA	3	7
Non-NC punching and shearing machines	9	NA	8	NA

^aThe market share limits have been rounded to the nearest whole number. The agreements carry the market share limits out to 100ths of a percent.

^bThe Taiwanese agreement set unit limits on Taiwan's exports during the 1986 transition period.

^cNC denotes numerically controlled.

^dNA signifies that limits are not applicable.

Source: Voluntary export restraint agreements with Japan and Taiwan; December 1986 letters sent by the U.S. Trade Representative and the Secretary of Commerce to West Germany and Switzerland.

¹The other seven countries requested not to increase their shares of the six restricted machine tool markets are not listed here because no specific market share limits were established.

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**Table I.2: Actual Percentage Point
Changes in the Numerically Controlled
Lathes' Market Shares** (Compared to 1986
Levels)

	1987	1988
Agreement countries		
Taiwan	-5	-7
Japan	2	3
Subtotal	-3	-4
Other restricted countries^a		
West Germany	-1	-1
Korea	-1	-1
United Kingdom	-5	-3
Subtotal	-7	-4^b
All restricted countries	-9 ^b	-8
All other foreign countries	-1	-3
United States	11	11

^aEight countries other than Japan and Taiwan were requested to limit their U.S. shares to specific or to 1986 shares of this domestic market. Five of these countries' market share changes were less than 0.5 percent (Sweden, Singapore, Spain, Italy, and Brazil).

^bFigures do not always add due to rounding and the omission of countries that showed market share changes of less than 0.5 percent.

Source: Derived from Census Bureau data.

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Table I.3: Actual Percentage Point Changes in the Non-Numerically Controlled Lathes' Market Shares (Compared to 1986 Levels)

	1987	1988
Agreement Countries		
Taiwan	-8	-16
Japan	-6	-5
Subtotal	-14	-21
Other restricted countries^a		
United Kingdom	12	5
Korea	5	3
Brazil	-2	7
Singapore	-1	-1
Italy	-1	-2
West Germany	-2	-3
Subtotal	10^b	9
All restricted countries	-4	-12
All other foreign countries		
China	0	7
Austria	1	3
Canada	0	1
Poland	0	1
Others	1	-3
Subtotal	2	9
United States	2	4

^aEight countries were requested to limit their U.S. shares to specific or to 1986 shares of this domestic market. Two of these countries' market share changes were less than 0.5 percent (Sweden and Spain).

^bFigures do not always add due to rounding and the omission of countries that showed market share changes of less than 0.5 percent.

Source: Derived from Census Bureau data.

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Table I.4: Actual Percentage Point
Changes in the Machining Centers'
Market Shares (Compared to 1986 Levels)¹

	1987	1988
Agreement countries		
Taiwan	-2	-6
Japan	-4	-18
Subtotal	-6	-24
Other restricted countries^a		
United Kingdom	1	5
Korea	0	1
Singapore	0	1
West Germany	0	-1
Subtotal	1	6
All restricted countries	-5	-16 ^b
All other foreign countries	1	1
United States	4	16

^aEight countries were requested to limit their U.S. shares to specific or to 1986 shares of this domestic market. Four of these countries' market share changes were less than 0.5 percent (Spain, Italy, Brazil, and Sweden).

^bFigures do not always add due to rounding and the omission of countries that showed market share changes of less than 0.5 percent.

Source: Derived from Census Bureau data.

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Table I.5: Actual Percentage Point Changes in the Milling Machines' Market Shares (Compared to 1986 Levels)

	1987	1988
Agreement countries		
Taiwan	-1	-7
Japan	0	0
Subtotal	-2^a	-8^a
Other restricted countries ^b		
United Kingdom	1	9
Singapore	1	0
Spain	-4	-2
Subtotal	-1^a	7^a
All restricted countries	-3	-1 ^a
All other foreign countries		
France	1	0
China	1	1
Greece	1	0
Others	1	0
Subtotal	4	1
United States	0	0

^aFigures do not always add due to rounding and the omission of countries that showed market share changes of less than 0.5 percent.

^bSeven countries were requested to limit their U.S. shares to specific or to 1986 shares of this domestic market. Four of these countries' market share changes were less than 0.5 percent (Italy, Korea, Brazil, and Sweden).

Source: Derived from Census Bureau data.

Table I.6: Actual Percentage Point Changes in the Numerically Controlled Punching and Shearing Machines' Market Shares (Compared to 1986 Levels)

	1987	1988
Agreement countries		
Japan	-12	-21
Other restricted countries ^a		
West Germany	4	7
Italy	2	0
Switzerland	-1	-4
Subtotal	5	3
All restricted countries	-6 ^b	-18
All other foreign countries	1	0
United States	6	19

^aNine countries were requested to limit their U.S. shares to specific or to 1986 shares of this domestic market. Six of these countries' market share changes were less than 0.5 percent (Sweden, Brazil, Korea, Singapore, Spain, and the United Kingdom).

^bFigures do not always add due to rounding and the omission of countries that showed market share changes of less than 0.5 percent.

Source: Derived from Census Bureau data.

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Table I.7: Actual Percentage Point Changes in the Non-Numerically Controlled Punching and Shearing Machines' Market Shares (Compared to 1986 Levels)

	1987	1988
Agreement countries		
Taiwan	0	1
Japan	-8	-9
Subtotal	-7^a	-8
Other restricted countries^b		
Singapore	1	1
Spain	-2	2
United Kingdom	0	2
Italy	-2	-1
West Germany	-3	-4
Subtotal	-6	0
All restricted countries	-14 ^a	-9 ^a
All other foreign countries		
Belgium/Luxembourg	1	1
Canada	1	1
Israel	1	-1
Others	-1	0
Subtotal	2	1
United States	12	8

^aFigures do not always add due to rounding and the omission of countries that showed market share changes of less than 0.5 percent.

^bEight countries were requested to limit their U.S. shares to specific or to 1986 shares of this domestic market. Three of these countries' market share changes were less than 0.5 percent (Brazil, Korea, and Sweden).

Source: Derived from Census Bureau data.

Methodology for Measuring Compliance With Voluntary Restraint Agreements and Changes in Foreign Shares of the Domestic Machine Tool Markets

To determine whether the voluntary restraint agreement goals were being met, we analyzed (1) Japan's and Taiwan's compliance with export limits, (2) the changes in other countries' shares of U.S. markets, and (3) the growth of domestic shares in the restricted markets. To perform these analyses, we used the same methods and data sources (except where more accurate data were available) that OAC used. We could not reconstruct OAC's figures for machine tool imports and quota compliance and did not always derive the same results as OAC.

Data Sources

U.S. Imports

We did not use OAC's data on U.S. imports because more accurate data were available. OAC uses the Census' IM 145 report as its source to monitor U.S. imports from all countries, adjusting these data for mistakes found in its review of Customs' entry documents.¹ The IM 145 report lists imports for each country by machine tool type. The import totals are counted by date of processing (i.e., the date that the imports were entered into Census' database, which can be several months after the actual date of entry into the country). Thus, the reports, on an annual basis, include some imports that entered the country in a prior year and were recorded in a current year, and exclude some that entered in the current year but will be recorded at some point in the future.

We used the Census' IM 115 import report, which records imports by the date of entry into the country. The IM 115 data are also recorded by date of processing and form the basis of the IM 145 report used by OAC. We adjusted the import numbers from the IM 115 data we used for 1987 and 1988 imports to reflect the changes made by OAC as the result of its reviews of entry documents and other records. The adjustments affected all types of the restricted machine tools and involved reexports (where a foreign import into the United States is subsequently sent to another country); kits (a group of spare parts that OAC determines is a complete machine tool in disassembled form); misclassifications (recording the import in the wrong category); and key punch errors (in counting, recording, or copying).

¹Customs does not transmit every entry document for each country and, in some instances, Customs failed to transmit over half of a country's entry documents. Thus, Commerce's corrections to the Census' import reports are not complete.

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Although Census provided import data (by date of entry) for the second half of 1986 and for all of 1987 and 1988, it did not have these data on machine tools imported in the first half of 1986. Therefore, to calculate total 1986 imports, we combined the Census' IM 115 report (for July through December) with other data from Census (January through June) recording the imports' date of processing, which we then corrected to reflect their date of entry using Census information on 1985 imports included in its 1986 data.

We calculated the average dollar values of imports for each machine tool type using Census import data prepared by the Association for Manufacturing Technology. These are the only data available on import values. To get the best approximation of each country's return from sales, we used a separate average value for each country, for each type of machine tool imported, and for each year reviewed.

U.S. Exports

To reconstruct the OAC's figures on U.S. exports, we obtained 1986, 1987, and 1988 data on exports from the Association for Manufacturing Technology's publication of the Census' EM 522 report. Although OAC told us that it uses the same report as the source of its data on U.S. exports, OAC's totals did not always match the totals we obtained using the same data source.

U.S. Shipments

As did OAC, we obtained 1986, 1987, and 1988 data on shipment (units and dollar values) from the "Current Industrial Reports—Metalworking Machinery," MQ 35W Series. Some shipment data are withheld to avoid disclosing figures about individual companies. We obtained figures for the unlisted shipments (in units and dollar values) from industry specialists in Commerce's Office of General Industrial Machinery, Capital Goods, and International Construction. OAC obtains the same unlisted data from this office but adjusts them based on its own knowledge of these industries.

We could not verify OAC's shipment figures using these corrections and formulas. Therefore, we estimated shipment units using the original raw data and the formulas that Commerce's industry specialists used.

Japan's and Taiwan's Exports to the United States

To verify the results of the OAC's calculations of Japan's and Taiwan's compliance with export quotas, we reviewed the OAC's source data on these countries' exports to the United States, but could not derive the figures that OAC found. To obtain total figures on these countries' exports to the United States, OAC reviews Customs' entry documents and commercial invoices on their machine tools entering the United States. OAC compares the export figures that result from this process with official Census data (the Census IM 115 report) to determine if all entry documents have been received. The IM 115 report is derived from the data recorded on the entry documents.

OAC's calculations of annual exports by Japan and Taiwan do not always match the official Census data. OAC's data differ from those on the IM 115 report because OAC adjusts these data for the number of reexports, kits, misclassifications, and key punch errors detected in its review of Customs' documents and commercial invoices.

We used the Census' IM 115 import data on imports recorded (as of the date they were exported) to determine Japan's and Taiwan's total annual exports to the United States. We adjusted these annual data for all OAC corrections, as discussed above. Although we used the Census data derived from the same data sources OAC uses and adjusted these data for all of OAC's corrections, our totals did not always match.

Apparent Consumption

The "apparent consumption" of any machine tool is the annual sum of U.S. domestic shipments added to imports minus U.S. exports. Apparent consumption figures are used to establish the "total" market size (the 100 percent of the domestic market used to determine quotas and the market shares held by any country).

Data Resources, Inc., publishes estimates of annual apparent consumption for each restricted machine tool market 5 times a year (February, May, August, October, and December). OAC uses these forecasts to set estimated quota levels before actual consumption figures are available. OAC computes the actual consumption for each machine tool market in May following each agreement year. At that time, all prior year data (annual shipments, imports, and exports) are available. It then uses these figures to determine the final actual quota numbers against which the actual exports can be measured. The difference between actual quota numbers and exports is then applied to the subsequent year's quotas, in the manner provided for in the agreements.

OAC also uses its calculations of apparent consumption and data from the Census' IM 145 import reports to calculate foreign countries' import penetration. Unlike its apparent consumption calculations for annual quota adjustments in May, OAC makes these calculations continuously during the current year as revised shipment data become available.

We calculated the annual apparent consumption for each machine tool market using OAC's data sources for U.S. shipments and exports but substituted the more accurate import data available from Census. Our calculations of apparent consumption differed from those made by OAC (as noted in prior discussions). We could neither reconstruct nor validate OAC figures.

Japan's and Taiwan's Compliance With Export Quotas

We measured Japan's and Taiwan's compliance with the quotas established by the agreements (in units). We tried to reconstruct the OAC's quota figures using the same methods and data sources that it used (except when more accurate data existed), but our results differed from theirs. The more accurate data we used did not alone cause our numbers to differ greatly from those determined by OAC; instead, the major differences were caused by the OAC's undocumented and unverifiable adjustments to the raw data available.

According to the agreements, the annual export quotas are specific percentages of the last annual consumption estimate for each machine tool market. The percentages are then converted to the appropriate number of units of each machine tool type. Beginning with the results of the transition periods, the quotas have been adjusted each year for (1) prior years' overages and (2) the effect of errors in the consumption estimates.² Although we used the same apparent consumption forecasts from Data Resources, Inc., to calculate export quota numbers, our numbers differed from OAC's because (as noted previously) our data differed for both total Japanese and Taiwanese exports and for actual apparent consumption.

Import Penetration From Other Countries

We analyzed the total and individual changes in other countries' import penetration using the Census' IM 115 data, which records imports by their entry date, and our calculations of apparent annual consumption.

²See appendix I, table I.1, for a list of the agreement limits for machine tool exports from each country.

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For Swiss and West German imports, we matched annual penetration against the specific market share limits noted in the letters the U.S. Trade Representative and the Commerce Department sent in December 1986.

For each of the seven countries that were sent similar letters at the same time, requesting them to maintain their penetration levels, we matched annual penetration against their 1986 market shares. Since the letters were sent to them in December 1986, we used these levels as the base for measuring their subsequent changes in shares of the domestic market. We also matched the penetration of all other countries against their 1986 levels, as we assumed they were expected to maintain these levels.

We analyzed import penetration for each type of machine tool, noting all increases in market share of 5 percentage points or more. We calculated the dollar value of the import penetration in excess of the requested levels to determine the value of sales each country gained when it exceeded these limits.

**Impact on the
Domestic Industry**

We determined the impact of restrictions on the domestic machine tool industry by analyzing the change in the U.S. shares in each restricted machine tool market. For each of the first 2 years of the plan, we compared the U.S. share of each market to the "ideal" that would have existed if Japan and Taiwan had reduced their exports to agreed-upon market share levels; if Switzerland and West Germany had reduced their machine tool exports to requested market share levels; and if all other countries had maintained their 1986 market shares.

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