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The World Machine Tool Industry in Transition: Growing Role of Japanese Producers

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An Intelligence Assessment

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GI 83-10017
February 1983

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An Intelligence Assessment

This assessment was prepared by 25X1
Office of Global Issues. Comments and queries are welcome and may be directed to the Chief, Industrial Analysis Branch, OGI, 25X1

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The World Machine Tool Industry in Transition: Growing Role of Japanese Producers

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Key Judgments

Information available as of 15 November 1982 was used in this report.

Advances in microelectronics have led to a new generation of highly automated, general purpose machine tools. World leadership in the development and commercial manufacture of this equipment confers substantial competitive advantages to a number of major industries as a result of the productivity gains made possible by its use. Leadership has significant national security implications as well: the ability to produce advanced weapons systems is often tied to the development of sophisticated machine tools; an expansion of arms production depends critically on a concomitant rise in machine tool production.

Japanese producers have a significant lead in the manufacture of these machine tools and are likely to achieve substantial additional gains in world machine tool trade over the foreseeable future. World leaders in the production and export of general purpose, high-technology machine tools and the computer numerical controls (CNCs) that operate them, Japanese firms have demonstrated the ability to deliver higher quality equipment more quickly and at lower cost than their foreign competitors. Japanese producers have:

- Benefited from a number of government policies. Specifically, industry cartels were formed that led to the concentration of production of key machine tools in the hands of a few select firms, giving them the opportunity to achieve the cost economies and revenue flows associated with high-volume production. This effort was supported by a number of other programs that provided research and development support and rewards for export sales.

- Adopted a highly focused strategy that seeks to dominate key segments of the general purpose machine tool sector, invested heavily in automated production of machine tools, and managed to maintain a high rate of capacity utilization.

- Had ready access, at relatively low cost, to state-of-the-art CNCs. This is due to the presence of a single firm—Fanuc—which produces over half of the CNCs sold worldwide. Foreign firms typically pay a substantially higher cost for this same equipment, at least in part as a result of the high markups charged by Fanuc's foreign distributors.

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We believe that the shift in demand to high-technology machine tools will probably lead to increasing concentration of market share in the hands of a few large firms worldwide. The substantial investments necessary for product development and requisite plant modernization will force out smaller firms with limited financial resources. The Japanese are uniquely positioned to maintain and possibly extend their lead in the production of computer-controlled machine tools:

- The Japanese machine tool industry is dominated by a group of financially solid, technologically advanced machine tool producers that have a strong advantage in price/performance over their competitors in Europe and in the United States.
- Japanese producers are aggressively moving to increase their world market share; continued rapid capacity expansion, 25X1 will enable the Japanese to supply 70 percent of 25X1 the international market for machine tools by 1985.

Although the United States has been a leader in developing the new technology, US machine tool producers—according to many market experts—are in a poor position to meet the Japanese challenge. Many US corporations have been slow to assess developments in Japan, and because of the recession they lack the financial means to react. Net new orders for the first nine months of 1982 fell 51 percent from the previous year, and the backlog of unfilled orders appears headed for the lowest point in a decade. Industry profitability—needed to finance research and development (R&D) as well as new production equipment—is further constrained by the eroding US position in the world market; imports now account for more than 25 percent of the domestic market while exports have fallen to less than 15 percent of production.

West European governments—witnessing a tripling of imports of Japanese metal-cutting machine tools in 1978-80—have attempted to stimulate the indigenous development of similar equipment. We believe it unlikely, however, that West European producers will be able to compete successfully with the Japanese in fast growing product lines. West Germany has long

been the largest West European producer and exporter of machine tools, but West German producers have fallen behind in highly automated systems, a market that we believe has the greatest growth potential. Given this environment we would expect intense pressure for some form of industry protection. We believe a reduction in Japanese Government support to its industry would have little impact on Japan's international competitiveness in machine tools because of its technological achievements, efficient production methods, and reputation for quality.

The United States retains an advantage in the most technologically intensive sectors, especially flexible manufacturing systems (FMS), which integrate groups of machining centers through the use of computerized controls. The US industry has gained considerable experience with complex machining systems from building transfer lines for the motor vehicle industry. In addition, there already are several large users of FMS in the United States, such as Caterpillar and John Deere, which provide an opportunity to develop and apply this new technology. The competition in this field, however, is sure to be intense. Other countries have already devoted considerable R&D to mastering this technology in their machine tool industries and have instituted grant and loan programs to make the technology available to their manufacturing industries.

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1980 Machine Tool Exports, Selected Countries

Million US $

	United States	West Germany	Italy	France	United Kingdom (*E*)	Japan
Boring machines	20.0		75.9	5.0	31.9	54.2
Drilling machines	22.0	53.4		14.0	31.2	28.6
Gear-cutting and finishing machines	61.0		3.5	2.4	17.5	13.9
Grinding and polishing machines	85.0		77.1	63.4	106.5	116.0
Lathes	81.0		129.6	107.0	178.4	522.1
Milling machines	19.0		82.9	84.5	94.4	75.1
Other metal-cutting machines	175.0		211.3	67.2	80.6	378.9
Punching and shearing machines	45.0		25.7	27.7	20.1	56.1
Presses, including forging	70.0		66.5	42.1	50.6	98.8
Other metal-forming machines	157.0		119.1	102.9	62.9	117.1

Source: International Statistics on Machine Tools.

Legend:

= Leading exporter. = Third-leading exporter.

= Second-leading exporter. *E* = Estimate

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The World Machine Tool Industry in Transition: Growing Role of Japanese Producers

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The Machine Tool Industry [1]

The machine tool industry is a critical ingredient in the industrialization process. Almost every manufactured product is made on machine tools or on machines that have been built by machine tools. Metalworking industries—automobiles, aircraft, shipbuilding, aerospace—are particularly dependent on the machine tool sector. Beyond this, advances in machine tool capabilities play a significant role both in the manufacture of new products and in the efficient output of existing products:

- Incorporation of new technologies—electronics, optics, and materials—into both civilian and defense-related products often hinges on a commensurate advance in machine tool development.
- Productivity gains for existing goods such as automobiles are closely tied to improvements in machine tool capabilities.

The country that first achieves advances in machine tool technology tends to strengthen its own economic base and gain a competitive edge for its user industries, both civil and defense. Without an indigenous production capability, the commercialization of new technologies may be delayed until necessary new machine tools are available from a foreign source, increasing the likelihood that commercialization in the supplier country has already occurred. In addition, if the advanced machine tools needed to boost productivity in existing industries come from abroad, user industries probably will have to take a backseat to their foreign competitors who would presumably have first call—by virtue of traditional producer-consumer links—on indigenously produced machine tools.

Every major industrialized country has a well-developed machine tool industry (see table). The technical nature of machine tool production combined with the wide range of product diversity has led to extensive specialization in these industries; the typical firm manufactures only one or two types of machine tools. Largely because of this specialization, most machine tool firms are small in terms of total employment and financial resources. The average firm employs 250 persons in West Germany, 150 in France, and less than 100 in the United States. Large firms are scarce; only 11 percent of West German firms have more than 500 employees, compared with 7 percent in the United States and 5 percent in France. Less than 2 percent of Japanese factories employ more than 300, and only one-fourth of 1 percent employ more than 1,000.

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Trade in machine tools grew rapidly in the 1970s as producers in Western Europe and Japan aggressively sought export markets to compensate for the stagnation or cyclical downturn of domestic demand. Exports as a share of production—with the notable exception of the United States—have risen across the board. In 1981 West Germany exported over 60 percent of its machine tool production, while Japanese and French exports accounted for 35 percent and 50 percent of output. US firms, in contrast, shipped less than 20 percent of production overseas in 1981. Import dependence has similarly risen to 58 percent of consumption in France, 30 percent in West Germany, and 25 percent in the United States. Significantly, Japanese import shares have declined as a result of an across-the-board improvement in domestic production capabilities.

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Market Trends

Demand for machine tools typically follows the investment cycle in major industrial countries. As a result, demand rose sharply during the second half of the 1970s, stimulated in large part by investment activity

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What Are Machine Tools?

Machine tools are described by the National Machine Tool Builders Association (NMTBA) as power-driven machines, not supported in the hands of an operator when in use, that shape or form metal by cutting, impact, pressure, electrical techniques, or a combination of these processes. The machine tool industry is comprised of those establishments whose primary products are machine tools.

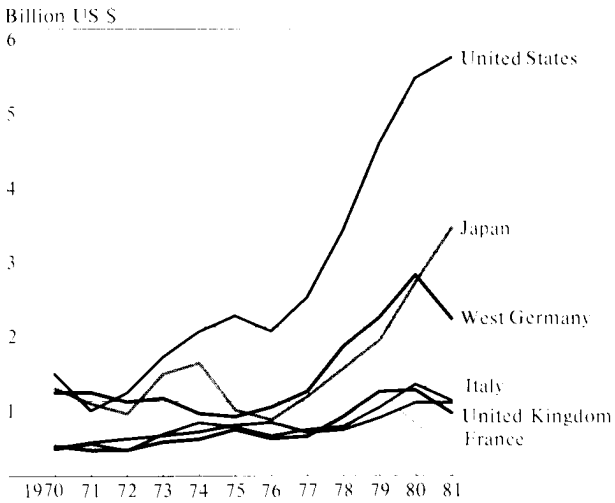
Machine tools include lathes, drill presses, machining centers, grinding machines, and forging presses. They are of two types, classified according to the Standard Industrial Classification (SIC) as Metal Cutting Machine Tools (SIC 3541) and Metal Forming Machine Tools (SIC 3542).

Machine tools may also be usefully differentiated between NC types and standard machines. NC machines are those equipped with a control system that operates the machine by means of numerically coded programs fed into the system in one of several ways, such as punched tape or by playback of prerecorded operating programs. In CNCs the control system is based on a microprocessor. Standard machines are those that are not NC equipped and are controlled by an operator.

in the US, Japanese, and West German auto industries (figures 1 and 2). Between 1976 and 1980 US demand increased rapidly because of auto retooling. The US share of machine tool consumption by non-Communist countries consequently rose from 15 percent in 1976 to 20 percent in 1980. Japanese and West German consumption also rose sharply during this period. More than one-third of the growth in Japanese production during 1976-80, however, resulted from increased exports primarily to the United States and Western Europe.

Beginning in 1981, the recession, combined with a rise in real interest rates, led to a precipitous fall in world demand for machine tools. Net new orders have fallen

Figure 1
Total Consumption of Machine Tools by Country, 1970-81



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75 percent since the first quarter of 1980 in the United States. During 1981 orders from the US auto industry were down more than 70 percent compared with the previous year. The Japan Machine Tool Builders Association forecast a 7-percent decline in orders for 1982, the first downturn in seven years. In Italy shipments were off 27 percent during the first six months of 1982 compared with year-earlier figures, while in West Germany—where demand peaked relatively early—shipments fell more than 16 percent in 1981.

The present cyclical downturn masks a strong underlying secular demand for the numerically controlled (NC) and computer numerically controlled (CNC) machine tools that have come on the market in recent years. by 1985 NC machines will account for half of

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Figure 2
World Machine Tool Production

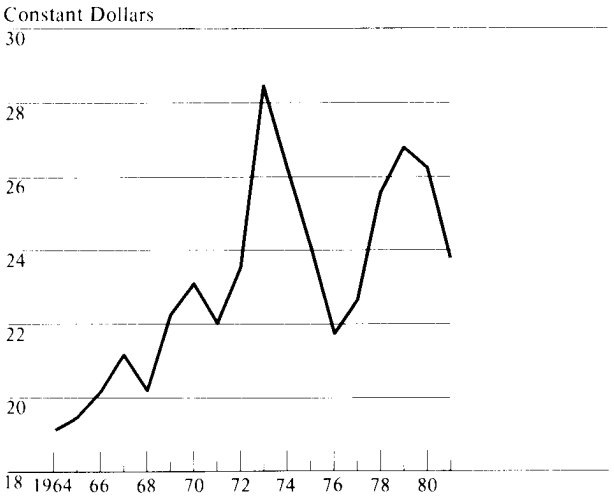

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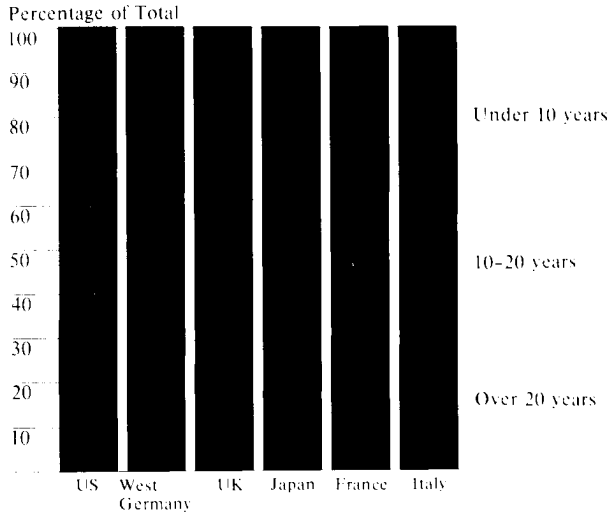
Figure 3
Machine Tools in Use in Six Industrial Nations by Age of Tool



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US machine tool sales, compared with about 30 percent in 1980. machine tool purchases will rise to 25 to 35 percent of total capital outlays, up from 20 to 25 percent in 1980. by 1990 most, if not all, equipment will be fitted with some kind of numerical control, although use of sophisticated CNCs will be considerably more limited.

The industry expects a major rebound in demand for machine tools once economic recovery begins. The demand will be driven by two main factors:

- Firms—particularly in high-wage countries—can achieve substantial productivity gains from the effective use of NC and CNC machine tools. The results can be particularly dramatic when this equipment is paired with industrial robots.

- With over half of the machine tools in use in the major developed countries more than 10 years old, the scope for retooling is considerable (figure 3). This is particularly true in the United States, which has both the oldest and the most machine tools in use—nearly 70 percent of US machine tools are more than 10 years old and 34 percent more than 20 years old.

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Japanese Dominance in Numerically Controlled Machine Tools

Japanese firms are in the best position to benefit from the shift in demand toward NC and CNC machine tools. The industry—drawing on its strong national electronics infrastructure—has concentrated on developing a decisive advantage in the production of highly

The Revolution in Machine Tool Technology

Until the 1950s, industrial automation consisted primarily of special machines constructed to perform a single operation, albeit with high speed and efficiency. This so-called hard automation is epitomized by the transfer line, a series of machines linked together in a production line along which a part, such as an automobile cylinder block, is completely and automatically processed from the raw casting.

The 1950s saw the arrival of general purpose, numerically controlled (NC) machine tools; machine tools whose functions could be programed on a punched paper tape endowing them with the speed and efficiency approaching that of special purpose machinery. The harsh environment of the shop floor, however, caused frequent breakdowns that, along with high cost, prevented their widespread use.

Over the past decade, the application of microprocessors has both reduced the cost and increased the reliability of machine control systems. An increasing number of machines are now being operated by computerized numerical controls (CNC). At the same time, the application of microelectronics technology is permitting a vast increase in the versatility of machines so equipped. A new generation of NC systems, known as direct numerical control (DNC), uses a computer to direct the motions and operations of several, even a hundred, machine tools simultaneously. 25X1

The NC machining center, with automatic tool changer, is one of the significant outgrowths of numerical control. It is a multipurpose machine programed by numerical control to do several operations, such as turning, boring, milling, drilling, and tapping. Without repositioning the part, it automatically performs a series of operations that formerly required several machines. 25X1

In an increasing number of cases, the machining center is becoming the nucleus of a complex of machines that constitute a completely integrated parts manufacturing system known as a flexible manufacturing system (FMS). These systems embrace all kinds of machining operations, assembly and in-process inspection, and the use of computers to control and report individual operations. Combined with automated warehousing, FMS brings a step closer the ultimate goal of the fully automated, unmanned factory. 25X1

automated, general purpose NC machine tools. The rapid growth in capacity, combined with the concern of Japanese producers for upgrading their own capital stock, has resulted in highly efficient production processes.

In typical Japanese fashion this advantage has been exploited by rapid penetration of world markets. By producing NC machines in large numbers as stock items and shipping them in anticipation of orders, the Japanese have undercut their competitors' prices and leadtimes. the Japanese were able to double their market share in the 1978-80 boom market in the United States by delivering competitively priced machines in four to eight months when US firms' leadtimes had jumped to 12 to 18 months.

the Japanese concentration on NC and CNC machine tools has given them a number of unique advantages. Specifically, they have been able to:

- Realize scale economies in production by concentrating on high-volume types.
- Achieve high growth rates by gaining dominance in the fastest growing market segments—NC machines.
- Generate a revenue stream to finance both further technological development and implementation of that technology in their own plants to boost productivity.

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Japanese producers have deliberately forsaken the market for large, high-powered, and high-precision NC and CNC machine tools in exchange for the cost savings attendant to high-volume production of less sophisticated machines. Japanese firms focus on the mass production, medium-duty, low-power, general purpose machines that satisfy a wide range of applications; the equipment produced typically offers the best value and quality in its class. Japanese machine tools, as a result, are often ill suited for those select customers requiring high precision or using difficult-to-machine materials. Even Japanese users have criticized Japanese-made machine tools for these shortcomings, according to a recent study by the Japan Society for the Promotion of the Machine Tool Industry, and they continue to fill their requirements for high-precision and specialized machine tools with imports from the United States and Western Europe.

Government Role. Tokyo's main role in support of the machine tool industry has been in creating a business environment designed to abet strong firms able to export. In 1956, under the first of a series of Extraordinary Measures Laws, Tokyo encouraged the formation of a machine tool cartel, which has concentrated production of each type of machine tool in the hands of the most efficient producers by ordaining that firms with a small market share discontinue production. For example, just three firms account for 52 percent of the important NC lathe sector, according to a recently released MITI (Ministry of International Trade and Industry) survey. We believe that with the domestic market essentially divided up, individual Japanese firms are focusing their attention on export markets as the principal area of company-to-company competition.

Japanese machine tool firms have benefited from a plethora of government programs directed both at them specifically and at industry in general. Programs supportive of industry generally have had their greatest impact on machine tool producers by making it easier for other firms to buy their products. The most important of these provisions has probably been Tokyo's use of an accelerated depreciation program to promote the purchase of NC machine tools. The Japanese Government has strongly encouraged exports with a variety of incentives that had the effect of rendering export earnings virtually tax exempt. One program, in effect from 1964 to 1974, allowed Japanese manufacturers to increase ordinary depreciation deductions by the percentage of the company's export income to total income. Japanese machine tool exports have thrived with this encouragement—growth of Japanese metal-cutting machine tool exports has averaged more than 30 percent annually for the past 20 years.

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Tokyo has also implemented programs specifically to support the machine tool industry. As provided by the Extraordinary Measures Laws, the Japanese Government has directly and indirectly made funds available to Japanese machine tool firms at concessionary terms. The Japan Development Bank, the Small Business Finance Corporation, the Industrial Bank of Japan, and the Long-Term Credit Bank have been the conduits for these funds. The government also has funded research and development (R&D) projects that benefit the Japanese machine tool industry; direct grants have been made by various governmental entities including the Research Development Corporation and the Agency for Industrial Science and Technology.

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Production Facilities. A major ingredient in Japan's recent success has been the extensive use of advanced production equipment in Japanese machine tool plants. Use of flexible, highly automated machine tool systems, for example, has enabled Japanese firms to upgrade substantially productivity and quality. Plant automation also gives Japanese firms quick response time on new orders. Yamazaki Machinery Works, the second-largest producer of NC lathes in Japan, has recently opened a new plant to machine parts from castings for its machine tool products that requires only 12 workers to operate on three shifts—6-6-0—rather than the roughly 200 employees required in a traditional plant of similar capacity. (The plant is presumably manned by maintenance and security personnel during the third shift.) Moreover, the parts spend an average of just three days in process instead of the usual three months required in traditional plants.

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The Houdaille Petition

Houdaille Industries, Inc., a Florida-based machine tool builder, has petitioned the President of the United States to suspend the investment tax credits now given to US firms that purchase Japanese-made NC machining centers and NC punching machines under section 103 of the Revenue Act of 1971. The petition contends that the Japanese machine tool industry, with the help of the Japanese Government, has been operating for over 25 years an international cartel that has used unfair trade practices to rapidly take control of the US market for these machines. Japan's share of the US market for machining centers grew from 3.7 percent in 1976 to more than 50 percent in 1981.

Houdaille conducted intensive investigations for more than a year, interviewing Japanese Government officials and utilizing a Japanese law firm to gather information. The petition exhaustively details the history of Tokyo's support for the machine tool industry including cabinet orders, ministerial ordinances, and published internal guidelines, which provided the framework for establishing the cartel. It also presents evidence of tax concessions, low-interest loans, research grants, and other subsidies afforded to the Japanese machine tool industry that have enhanced the industry's international competitiveness.

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While the proposed denial of the investment tax credit to purchasers of Japanese machine tools would cut profit margins on Japanese sales to the United States, it is not clear that such action would substantially slow Japanese penetration of US markets. Houdaille calculates that Japanese firms would have to reduce prices only 15 percent to offset the denial of the investment tax credit that is being sought. Japanese machine tools, however, are already priced well below comparable US models, and the huge inventory surplus of Japanese machine tools in the United States creates a strong incentive for substantial discounting; specific instances of price cuts on Japanese machine tools of nearly 20 percent have been reported by US machine tool executives. In addition, Japanese tools are rapidly developing a following based on superior design and quality that will tend to mitigate the impact of price increases.

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Role of Fanuc. Another reason for Japan's success, in our judgment, is the unique contribution of a single Japanese company, Fanuc. Fanuc is the world leader in the production of CNCs, accounting for more than half of the production of non-Communist countries. Fanuc has vigorously exploited developments in microelectronics and the capabilities of its parent company—Fujitsu—to increase the reliability and lower the cost of its numerical controls. The availability—at low cost—of these essential machine components is cited by several Japanese machine tool builders as an indispensable ingredient to their ability to produce advanced-technology machine tools at competitive prices.

Although Fanuc CNCs are available worldwide, foreign machine tool builders have not fully benefited from Fanuc's low manufacturing costs. The company's exclusive distributors have marked up prices well above those charged Japanese firms buying directly from Fanuc. West German users are complaining that Siemens, Fanuc's European distributor, has used its monopoly position to double the price of Fanuc controls over that paid by Japanese firms.

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Market Penetration. Japan's emphasis on the production of advanced machine tools has understandably made developed countries the primary markets for its exports. In 1980 Japan's three largest customers—the United States, West Germany, and the United Kingdom—accounted for 53 percent of Japanese exports compared with 32 percent just two years earlier. The Japanese garnered the largest share of market growth in the United States and Western Europe between 1977 and 1981; Japan's share of machine tools sold in the United States rose from 4 to 12 percent during this period.

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Europe Stirs Itself

With relatively small domestic markets, West European machine tool firms traditionally have depended on sales in foreign markets. Both import and export levels are typically high relative to production and consumption. Government support for the machine tool industries in Europe ranges from substantial in France, which has an array of programs rivaling Japan's in scope if not in effectiveness, to almost nonexistent in Italy. The major emphasis of European government support policies—particularly in West Germany and the United Kingdom—is research and development.

West Germany's traditional dominant position in machine tool trade is increasingly at risk in our judgment. The largest producer and exporter of machine tools in Western Europe, West Germany built its export success largely by specializing in high-quality, precision machinery. The West Germans have fallen behind, however, in highly automated systems where we believe the greatest future growth in demand lies. Bonn has recognized this weakness and has supported R&D programs to advance the state of the art of Germany's machine tool industry, but this effort has not yet manifested itself in West German production. We believe West German producers have not yet developed a strong market presence in advanced-technology machine tools in part because a large portion of their exports—34 percent—go to relatively unsophisticated LDC and East European users and because they remain successful with their existing product lines.

Italy has developed a strong machine tool industry by relying heavily on exports, which have accounted for 40 to 50 percent of production during the past decade. Italy is the fourth-largest exporter, after West Germany, Japan, and the United States. The Italian industry is capable of producing technologically advanced tools and is the world's leading exporter of NC radial drilling machines. The industry is composed of many small and medium-sized firms, which tend to be highly specialized and often have a suprisingly sophisticated export organization. The small, family-owned firms are not burdened with the same degree of labor unrest as most of Italian industry and often enjoy a labor cost advantage over their West European competitors. According to press reports, however, Italian producers believe they will increasingly have trouble holding their own against low-cost Japanese producers, which so far account for only 3 percent of Italian machine tool imports. 25X1

In *France,* the Mitterrand government has targeted the machine tool industry as crucial to French industrial competitiveness. To achieve economies of scale in development, production, and sales, Paris is forming a holding group, Machine Francaise Lourde, which will take over several financially troubled private companies in two groups—one for turning machines and one for milling machines. Government support for the industry—including orders, R&D funding, and training programs—is slated to total $335 million over a three-year period. Although France has run a trade deficit in machine tools for most of the past decade, French machine tool builders hold strong positions vis-a-vis the United States and Japan in the world market for large milling machines and precision metal forming presses, which are used in the aerospace industry. They lead in the technology for very-high-speed machining. The greatest obstacle confronting the French is in translating their technology into price competitive products, an area in which the Japanese excel. 25X1 25X1

The *United Kingdom's* machine tool industry is in trouble. The British have concentrated on categories of standard production machines and are the world's leading exporters of automatic and copying lathes. According to a spokesman for the Machine Tools Trade Association, British companies have built their reputation on small batch production and rapid readjustment to changing requirements. We expect this market to be increasingly undercut by either more sophisticated NC machines produced in Japan or the low cost of standard equipment produced in Third World countries. Unless the British industry can quickly translate the results of current government-supported R&D programs into marketable products, we believe the United Kingdom is in great danger of losing both export and domestic markets to foreign competitors. 25X1 25X1

The US Industry

The US machine tool industry is in its steepest recession in recent years. Net new orders for the first nine months of 1982 fell 51 percent from the previous year, the third straight year of decline. The backlog of unfilled orders appears headed for the lowest point in a decade. Shipments have also begun to decline since 1981, reflecting the working off of the huge order backlog built up during the boom of the late 1970s. This order backlog has shielded the US industry from the full force of the recession until now, unlike the West European industries where production declined rapidly beginning in 1981.

In machine tool trade, the US situation is even worse. Imports, which accounted for less than 5 percent of the domestic market 20 years ago, now absorb 25 percent, with Japan accounting for 12 percent. US firms are also losing their position in export markets. In 1964, the US share of world machine tool exports topped 25 percent, but by 1981 that figure had dropped to 10 percent.

US firms are caught in a vicious cycle of declining international competitiveness; increased competition first forced them out of overseas markets and is now causing them to lose ground at home. Low profitability limits US ability to upgrade production equipment necessary to stem the productivity declines relative to foreign competition and to engage aggressively in new product development. It also precludes building for inventory. US industry consequently is being forced to lay off a portion of the highly skilled work force on which it depends. These workers are often permanently lost and, with four to five years of training required, will be difficult to replace.

Looking Ahead

The anticipated shift in machine tool demand in favor of high-technology equipment is likely to lead to increasing concentration of market share in the hands of a few large firms. The investments necessary to develop these new products and to modernize production will probably force out weak firms with limited financial resources. The Japanese machine tool industry has already undergone a shakeout of this type—during the 1974-75 economic slump. Successful firms will also need to cultivate export markets both to avoid the consequences of depending on a single cyclical market and to benefit from the economies of scale made possible by advanced automation equipment. 25X1

We expect Japanese firms to dominate world markets for advanced-technology machine tools and believe it is unlikely that modification of Tokyo's more overt support measures for the Japanese machine tool industry will have any substantial impact on Japanese export performance:

- The lead they have already gained in modernizing their production equipment will be difficult for other firms to overcome, and the Japanese strength in providing cost-effective solutions to industry's automation needs will be difficult to match. 25X1

- Users' sensitivity to prices confers a second considerable advantage. Not only are the Japanese low-cost producers of machine tools, but they are likely to engage in discounting over the short run in an effort to reduce their large unsold inventories. 25X1 25X1 25X1 25X1

- The reputation for high-quality, reliable machine tools that the Japanese have built up in recent years will further guarantee them continued access to the markets where they have already established a presence. 25X1

For their part, Japanese machine tool manufacturers appear 25X1 determined to capture an overwhelming share of the market for advanced-technology machine tools. We expect the Japanese to branch out into more kinds of machine tools as the result of pressure to utilize fully their capacity. 25X1 at the current rate of capacity expansion the Japanese by 1985 will be able to supply 70 percent of machine tool demand of non-Communist countries. 25X1 25X1 25X1

The Japanese clearly remain sensitive to the possibility of import controls; we believe they would respond to such a threat with increased direct investment in target markets. Makino Machine Company has already acquired LeBlond, a US maker of lathes, and Yamazaki has equipped its US subsidiary, Mazak, with what may be the most advanced manufacturing facility in the United States at its Florence, Kentucky, plant. 25X1

We anticipate increasing levels of competitive pressure as the recession continues to shrink markets and as technological advances shift the composition of demand. Specifically, US producers can expect to face increased competition from West European producers in high-precision and specialized machine tool markets. We believe they will target US markets for machine types in which they have traditionally been strong as they lose ground to Japanese exports of NC lathes and machining centers in their home markets. For example, the Italian Machine Tool Builders Association has recently opened a US office whose purpose, according to press reports, is to foster US sales of Italian machine tools. 25X1

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the United States has the best prospects for market leadership in the most technologically intensive sectors, especially flexible manufacturing systems. The US industry has gained considerable experience with complex machining systems from building transfer lines for the motor vehicle industry. Further, there are already several large users of FMS in the United States, such as Caterpillar and John Deere, which provide an opportunity to develop and apply this new technology. The competition in this field, however, is sure to be intense. Other countries have already recognized the importance of mastering this technology to manufacturing productivity in general; they have implemented research and development programs aimed at providing this technology to their machine tool industries and have instituted grant and loan programs to make the technology available to their manufacturing industries. 25X1

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Appendix

Figure A1
The Japanese Machine Tool Industry, 1970-81

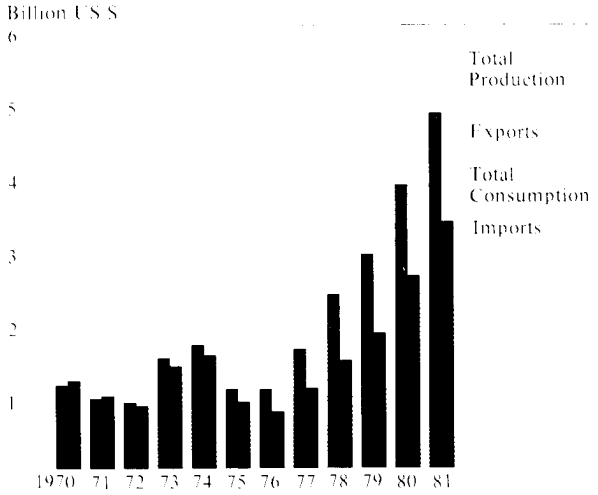

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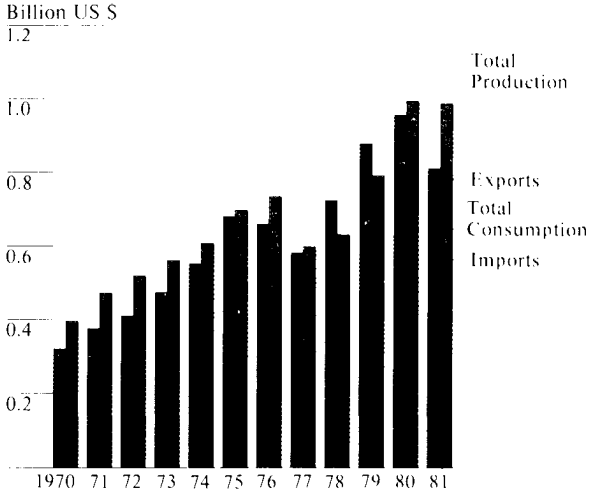
Figure A2
The French Machine Tool Industry, 1970-81



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25X1

25X1

Figure A3
The West German Machine Tool Industry, 1970–81

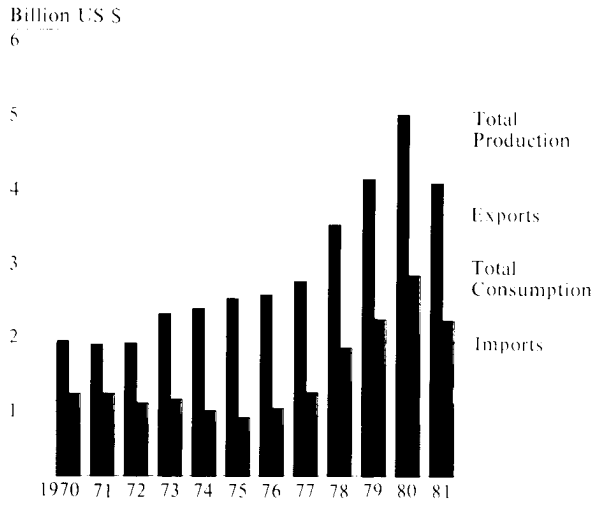

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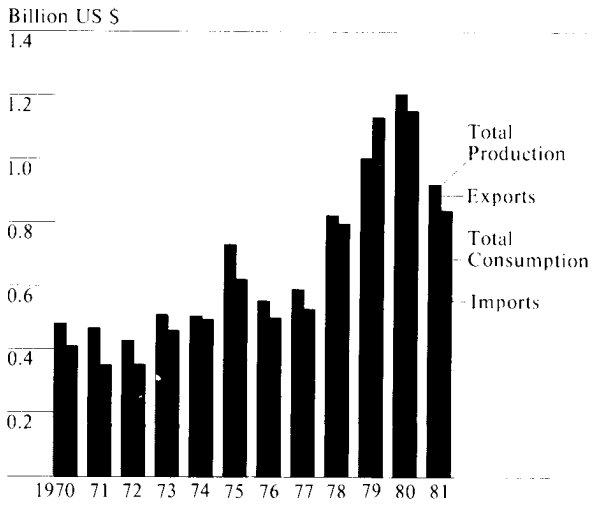
Figure A4
The British Machine Tool Industry, 1970–81



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25X1

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Figure A5
The Italian Machine Tool Industry, 1970–81

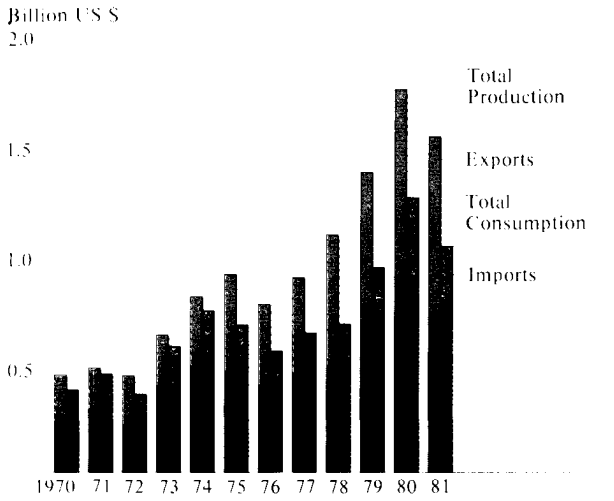

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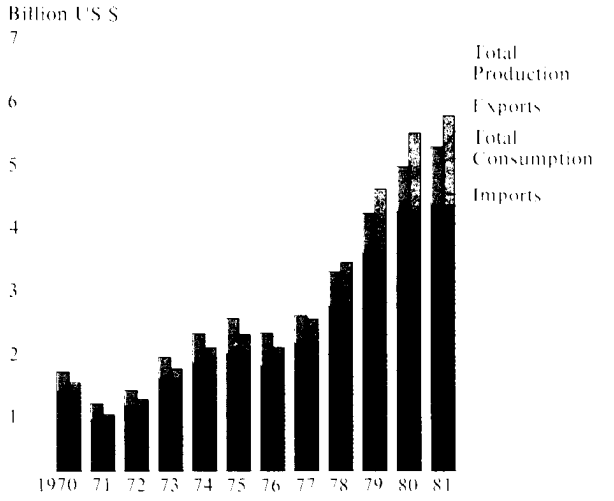
Figure A6
The US Machine Tool Industry, 1970–81



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25X1

25X1

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