Multinationals and the U.S. Technology Base

September 1994

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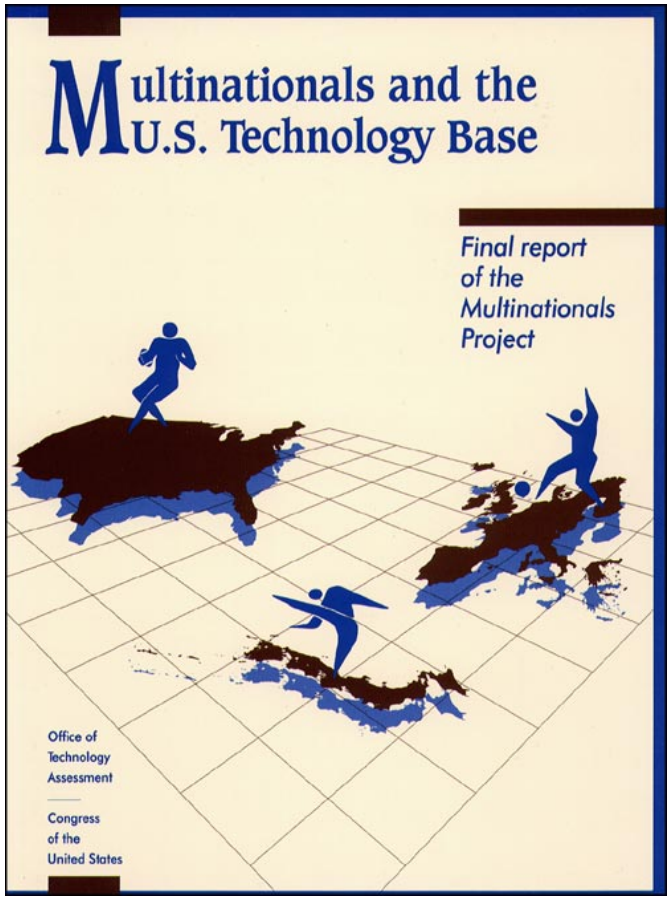

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Foreword

Multinational firms are critical to ensuring the health of the U.S. technology base. The most technologically sophisticated and economically significant sectors of the U.S. economy are now characterized by high levels of international production, foreign direct investment, trade among affiliated companies, and complex forms of international financial and technological collaboration.

While it is not wrong to speak of the global research and technology base of multinational firms, it can be misleading. Extensive data suggest that technology is deeply rooted in national (or in the case of Europe, regional) concentrations or bases, with partial and company-specific interconnections. The implication of this finding for public policy is that the U.S. national technology base must be well-maintained on a continuous basis. Moreover, in order for the United States to retain its technology leadership in a broad range of industries, it must address the increasingly important role of multinational enterprises in innovation and in the development of the nation's science and technology base.

Governments understand that the health of the national technology base is related not just to R&D spending, but also to the strategic investment behavior of companies, especially multinationals. Such investment increasingly crosses national borders. Between 1980 and 1992, global foreign direct investment grew by over a factor of four to reach $2.0 trillion (in nominal dollars). This surge of investment transformed the world economy. Rather than substituting locally produced goods and services for imports, however, investment has augmented and created trade, often through international transfers of merchandise within networks of affiliated firms.

Despite a dramatic increase in international business activities of all kinds, most multinationals remain firmly rooted in the national technical, financial, and corporate cultures of their home countries, World economic integration is occurring at uneven rates, both in relation to the core technology operations of companies and with respect to overall trade and investment relations among nations.

For the foreseeable future, it is unlikely that differences in national patterns of technology development, direct investment, long-term finance, and corporate governance will converge. These differences may be the source of increasing friction in the more complex economic relationships evolving among the United States and its major trading and investing partners.

This is the second and final report of OTA's assessment of Multinational Firms and the U.S. Technology Base. The first report, *Multinationals and the National Interest: Playing by Different Rules,* was published in September 1993. This assessment was requested by the Senate Committee on Commerce, Science, and Transportation and the Senate Committee on Banking, Housing, and Urban Affairs. Over the course of this assessment, OTA worked closely with many MNEs based in the United States, Europe, and Japan. The information they provided was invaluable to the conduct of this study. OTA also appreciates the assistance provided by its contractors and the advisory panel, as well as by the many reviewers whose comments helped to ensure the accuracy of this report.

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* *Mr. Marx recently retired from Ford and has taken a position as President and CEO of Electro-Wire Products.

Note: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not. however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and [he accuracy of its contents.

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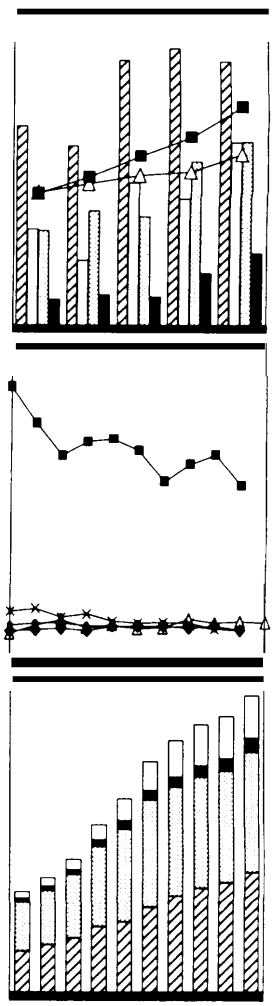


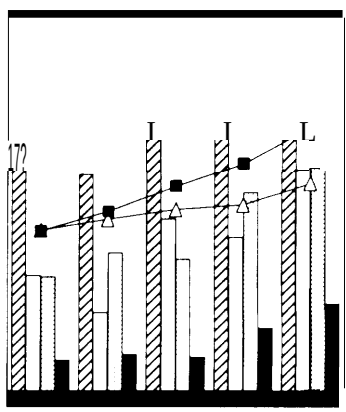
Part I: Summary, Findings, and Policy Options

EXECUTIVE SUMMARY

Multinational enterprises (MNEs) are business organizations that underpin much of the U.S. economy and the international system of trade and investment. They are increasingly global in their origins, sourcing, communications, production, and outlook. The foreign affiliates of MNEs control a substantial portion of the world economy, perhaps as much as one-quarter of all economic activity in their host countries. Intrafirm trade (IFT) may account for as much as 40 percent of all U.S. merchandise trade. [1]

Even though MNEs exert an increasingly profound influence on technology development in the United States, the U.S. government currently does not have the institutions or the capability to monitor and analyze foreign direct investment (FDI) on a global basis, or to evaluate fully the investments by foreign-based companies in the United States. Clearly, a comprehensive understanding of the operations of MNEs is necessary to facilitate their benefits to the U.S. technology base, as well as to inform future U.S. economic policies, both foreign and domestic.

At the level of the firm, successful companies know that product design must follow consumer preference, and both vary from market to market around the world. These firms recognize that local markets require a local presence, which has led to wider distribution of the assets of many MNEs. But local presence, even manufacturing, does not often translate into local technology de-



[1] I IT is defined as international trade among affiliated companies—that is, cross-border trade between firms within the same MNE group of companies. See glossary (appendix A) for terms and acronyms used in this report.

velopment, which has remained—with a few important exceptions—stubbornly resistant to the globalization phenomenon.

Finding 1: Multinationals Develop Core Technology at Home

- Unlike other principal activities of MNEs, research and technology development tends to be concentrated in the country of national origin. U.S.-based MNEs, for example, conduct less than 13 percent of their manufacturing R&D abroad (see figure 1-1 in chapter 1). Although no comparable data exists for European and Japanese MNEs, the available evidence suggests that they conduct similar if not smaller percentages of their R&D overseas than do U.S. firms. R&D conducted by foreign affiliates continues to increase, especially in such sectors as chemicals, pharmaceuticals, and electronics; however, it tends to be focused on product design and customization.
- **Foreign affiliates account for a small but rapidly rising share of all business R&D spending in the United States.** That share increased from 9.4 percent ($4.5 billion) in 1982 to 16.4 percent ($10.7 billion) in 1992.[2] Much of this growth, however, resulted from unusually heavy foreign acquisitions of U.S. firms in the late 1980s. Among our major trading partners, Japanese affiliates in the United States exhibit by far the lowest level of R&D intensity, which is the ratio of R&D spending to sales (see figure 1-4).
- In sharp contrast to other advanced industrial nations, **the United States typically exports five times more technology than it imports.** Most of this trade is conducted within MNEs (see figures 1-2 and 1-3). **Japanese firms, however, acquire considerably more technology from unaffiliated U.S. firms than do their European counterparts.** In 1992, for example, 43 percent of all U.S. technology sales to Japan were conducted between unaffiliated firms, compared to 11 percent for Europe.[3]
- **Japanese firms spend more on technology development as a percentage of GDP than do their U.S. or European counterparts.** Between 1981 and 1993 industry-financed R&D expenditures in Japan grew at an average rate of 8.0 percent. The average growth rate for U.S. firms was 3.9 percent. That number for the United Kingdom, Germany, and France was 1.6, 3.9, and 4.6 percent respectively.

Finding 2: Trade Follows Investment in the 1990s

- Affiliates of foreign-based MNEs account for a substantial portion of U.S. merchandise trade and the greatest share of the U.S. merchandise trade deficit. **In 1991, for example, the trade deficit of foreign affiliates in the United States was larger than the total U.S. trade deficit (see** figure 1-5). Across the United States, Europe, and Japan, affiliates of foreign-based MNEs have a greater propensity to import than do domestic firms. In the absence of foreign affiliates, however, it is possible that the U.S. trade deficit would be even greater than it is.
- Over the past decade, **the U.S.-European direct investment relationship has been relatively symmetrical in scale and composition.** Japanese investment in the United States, however, exceeds U.S. investment in Japan by a factor of three to one (see figures 1-8 through 1 -11). Moreover, it is far more concentrated in wholesale operations (and less concentrated in manufacturing) than is European or American

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[2] Unless otherwise specified, all figures in this report are expressed in 1987 constant dollars. For additional information on data used in this report, see appendix D.

[3] This report uses "Europe" to refer to the European Union, its associate members, and the European Free Trade Association. Consistent with most international trade and investment data, the term does not include the countries of Eastern Europe. The report uses "European Union" or "EU" when the data or analysis pertains only to the countries of the European Union.

FDI. **As global FDI expanded dramatically in the 1980s and 1990s, U.S. direct investment in Japan failed to keep pace with the overall trend (see** figure 1 **-6).**

- International trade among affiliated firms tends to reflect the balance of investment between the United States and its respective trading partners. **Between 1983 and 1992, intrafirm trade (IFT) between the United States and Europe was roughly equivalent,** accounting for 43 percent of all U.S.-European merchandise trade. Of that IFT, 43 percent was conducted by U.S.-based MNEs and 57 percent by European-based MNEs (see figure 1-7).
- **Intrafirm trade between the United States and Japan is far less balanced than U.S.-European IFT.** Over the past decade, IFT accounted for 71 percent of all U.S.-Japan merchandise trade. Of that, fully 92 percent was conducted by Japanese MNEs and only 8 percent by U.S.-based MNEs (see figure 1-1 2). **These figures indicate that the majority of U.S. trade with Japan takes place within and is dominated by affiliated networks of Japanese firms.**

Finding 3: Corporate Governance and Finance Diverge Across the Triad

- Despite the current blurring of national economic boundaries, **the competitive strength of individual MNEs continues to be shaped by circumstances prevailing in their home countries.** Critically important distinctions persist in the ways corporations govern themselves and raise long-term capital across the United States, Germany, and Japan.
- **American capital markets are the largest, most decentralized, open, and transparent in the world.** Japanese and German capital markets are changing somewhat, but they are likely to remain relatively concentrated and opaque.
- The ability to raise capital at competitive terms and to deploy it effectively is crucial to both the long-term success of particular MNEs and to the development of critical technologies for individual nations. **Long-term capital remains more patient in Germany and Japan than in the United States.** Foreign firms enjoy full access to U.S. capital markets; however, firms based outside Japan and Germany are less able to benefit from the strengths inherent in those capital markets.
- **Distinctive cross-shareholding and corporate banking relationships shape the business strategies and development trajectories of Japanese and many European MNEs. These** institutional arrangements can provide stable foundations for the commercial adaptation, incremental improvement, and optimal diffusion of new technologies.
- For the foreseeable future, it is likely that **differences in national systems of corporate governance and corporate financing will be a source of increasing friction** in the complex economic relationships evolving among the United States and several of its major trading and investing partners.

Policy Issues

Taken together, the findings presented above suggest that the United States has a clear interest in the success of U.S.-based firms, both at home and abroad, in proportion to the commitment that such firms make to the U.S. technology base. To the extent that foreign-based companies also contribute to U.S. technology development, the United States has a direct interest in their success as well. More technology innovation and development in the United States can lead to more jobs for Americans. Furthermore, the higher-skill, higher-wage jobs of the future are likely to reside in technology-intensive industries.

U.S. policy might pursue three basic strategic responses to the international asymmetries in global trade, investment, and finance identified by this assessment. It could:

1. Seek to expand existing multilateral trade agreements to encompass obstacles to foreign direct investment, restrictive business practices, and other barriers to comparable market access.

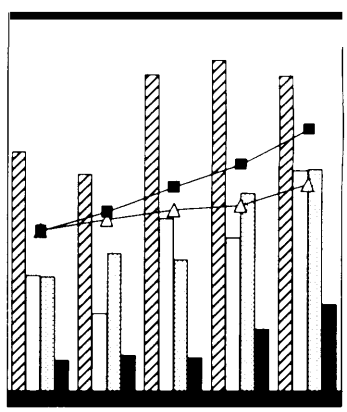
2. Create a two-tiered policy regime, one that grants national treatment when comparable market access exists, and another that places conditions on national treatment in response to enduring formal or informal market barriers.
3. Augment a broad multilateral strategy with domestic measures designed to (a) improve U.S. technological capabilities and (b) reform U.S. trade and investment policies to meet the demands of increasingly global commerce.

The specific policy options identified by this assessment are divided into three broad areas: technology development, foreign direct investment, and the ways in which MNEs govern and finance their operations. They range, for example, from creating a uniform national benefits test for participation in U.S. technology programs to harmonizing diverse national financial regimes. Policy issues and options are discussed in detail in chapter 2 of this report.

Globalization in Perspective 1

Many analysts and business executives talk about the globalization of commerce and technology as if it were an accomplished fact. And from the perspective of some companies, it may indeed appear to be so. Many multinational enterprises (MNEs) now deploy multiregional or even global marketing strategies. Some sell more abroad than they do at home. More and more MNEs source a significant share of their parts through international channels, and many have located major production facilities in foreign countries. A growing number of firms from different nations enter into strategic alliances to pool financial and technological resources, and to gain access to foreign markets. Foreign affiliates loom ever larger in host country economies, and are important to international trade as well.

Successful companies know that product design must follow consumer preference, and both vary from market to market around the world. These firms recognize that local markets require a local presence, which has led to wider distribution of the assets of many MNEs. But local presence, even manufacturing, does not often translate into local technology development, which has remained—with a few important exceptions—stubbornly resistant to the globalization phenomenon. Clearly, the realities of doing business at the level of the firm tell only part of the globalization story.



Multinational firms have developed their foreign operations at very different rates and in varying degrees. This is evident in both historical and functional terms. After WWII U.S. firms were the first to venture abroad in large numbers, followed a decade later by their European counterparts. Japanese and other East Asian companies are, by comparison, relative newcomers to multinational commerce.

BOX 1-1: Types of Multinational Enterprises (MNEs)

For purposes of this assessment, OTA has identified and analyzed six principal types of MNEs. They are not to intended be rigid or mutually exclusive, but instead to capture the major differences relevant to the development of public policy. The six types of MNEs listed below are described in greater detail in chapter 2 of the first report of this assessment.

Resource-based MNEs organize around the extraction of natural resources, or agricultural products, and their processing for sale in the industrialized countries.

Export-oriented MNEs maintain the preponderance of their production and R&D base in their domestic market. They export high value-added products to other national markets, often through intrafirm trade. Typically, they establish final assembly, service, support, sales, and marketing operations abroad.

Regional MNEs optimize their activities, including production, around a regional market but have not yet achieved significant sales and operations outside their region of origin.

Transnational MNEs have begun to locate production facilities globally, but still depend heavily on their domestic market and operations for their competitive position, economies of scale and scope, key production operations, and R&D.

Global MNEs replicate much of the full value-added chain, including substantial product development and research operations, in more than one national or regional market.

Distributed MNEs optimize the location of their sourcing, production, and R&D on a global basis.

SOURCE: Office of Technology Assessment, 1993.

In addition, multinational firms can take many different forms and are highly flexible business organizations. In the first report of this assessment, OTA identified six principal types of MNEs (see box 1-1).[1] Because of these characteristics, multinationals are sensitive both to market factors and government influence.

Throughout this report, the term MNE is used in a generic sense, that is, the word "enterprise" does not imply that companies have grown beyond the formal and legal structures of the national jurisdictions in which they are incorporated. In addition, this report does not deal directly with labor and wage questions related to the investments or disinvestments of multinationals from one country to another. OTA has addressed these issues in its report on U.S. trade with Mexico.*

FINDING 1: MULTINATIONALS DEVELOP CORE TECHNOLOGY AT HOME[3]

World economic integration is occurring at uneven rates, both in relation to the core technology operations of MNEs and with respect to overall investment and trade relations among nations. Unlike other principal activities of multinational firms, research and technology development tends to stay at home; it remains largely centralized, even in the most internationalized industries. One implication of this finding is that the United

[1] U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest: Playing by Different* Rules, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993). The report is summarized in appendix B.

[2] U.S. Congress, Office of Technology Assessment, U. S.- *Mexico Trade: Pulling Together or Pulling Apart?,* OTA-ITE-545 (Washington, DC: U.S. Government Printing Office, October 1992), passim.

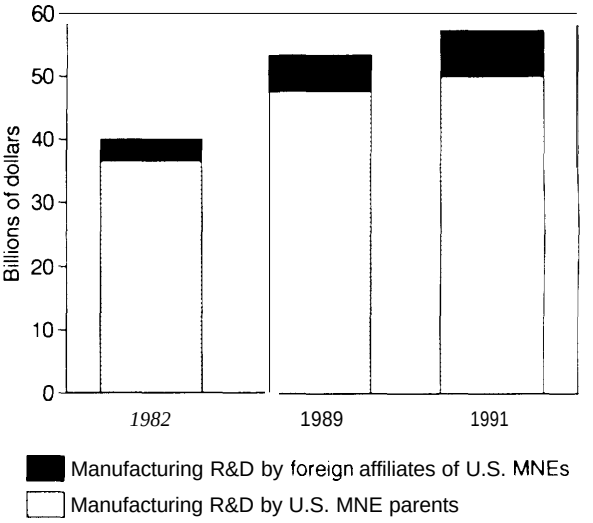
[3] This tinding is based on the analysis in Part II.

States has a clear interest in the success of U. S.-based firms, both at home and abroad, in proportion to the commitment that these firms make to the U.S. technology base. More technology innovation and development in the United States can translate into jobs for Americans, and it is in the technology-intensive industrial sectors where the higher-skill, higher-wage jobs of the future are likely to reside. To the extent that foreign-based companies contribute to U.S. technology development, the United States has a direct interest in their success as well.

Overseas research and technology development by foreign affiliates has increased significantly in the past decade, and in some sectors, such as chemicals, pharmaceuticals, and electronics, contributes substantially to the local technology base. It is, however, still concentrated in product design and customization, and pales in comparison to the home-base R&D activities of MNEs. As chapter 3 of this report shows, even though U.S.-based firms trade more technology with their foreign affiliates than do Japanese or European companies, R&D conducted by foreign affiliates of U.S.-based firms is still quite limited compared to technology development at home.

In the critical area of manufacturing technology,[4] for example, U.S.-based MNEs have consistently conducted most of their research and technology development in the United States. As figure 1-1 shows, in the decade 1982-91, total manufacturing R&D of U.S.-based MNEs increased by 43.2 percent. In 1991, the last year for which these figures are available, R&D conducted by majority-owned foreign affiliates of U.S. MNEs reached only 12.7 percent of the total, up from 8.7 percent in 1982.5 In addition, the

FIGURE 1-1: Manufacturing R&D of U.S.-Based MNEs (constant 1987 dollars)



SOURCE: OTA based on data in U S Department of Commerce Bureau of Economic Analysis Survey of *Current Business* 73(7) 44, table 5, July 1993 (hereafter cited as BEA SCB)

manufacturing R&D intensity of U.S.-based parent groups—that is, R&D expenditures as a percentage of total sales—is substantially higher than that of their foreign subsidiaries. In 1991, for example, it was 2.1 percent for U.S. parents, compared to 0.8 percent for their majority-owned foreign affiliates.[6]

R&D spending in the United States by affiliates of foreign-based MNEs has accounted for a small but rapidly rising share of all U.S. R&D. Between 1982 and 1992, total business R&D spending in the United States grew by 38 percent in real terms, from $48.6 to $67.0 bill ion.[7] During the same pe-

[4] For a comprehensive assessment of U.S. manufacturing technology, see U.S. Congress, Office of Technology Assessment, *Making Things Better: Competing in Manufacturing*, OTA-ITE-443 (Washington, DC: U.S. Government Printing Office, February 1990).

[5] A majority-owned foreign affiliate is a subsidiary company of which the foreign parent company owns more than 50 percent.

[6] U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business* (Washington DC: July1993), table 5, p. 44 and table 7, p. 46.

[7] In constant 1987 dollars. National Science Board, *Science and Engineering Indicators—1993*, (Washington, DC: U.S. Government Printing office, 1993), NSB 93-1, appendix table 4-4, p. 333.

riod, R&D expenditures by foreign affiliates in the United States grew by 138 percent, from $4.5 to $10.7 billion.[8] Much of this $6.2 billion increase, however, resulted from unusually heavy foreign acquisitions of U.S. firms in the late 1980s, as opposed to higher spending levels by existing foreign-owned companies in the United States.[9] Because much of the surge of FDI in the late 1980s was concentrated in high-technology industries, the manufacturing R&D intensity of foreign affiliates in the United States approaches that of the national average, 2.5 and 2.8, respectively. 10

Multinationals account for a large share of all U.S. technology trade: on average, 79 percent of exports and 67 percent of imports between 1986 and 1992. Moreover, 97 percent of all technology exported by MNEs flows from U.S. parents to their affiliates overseas, and 91 percent of all technology imported by MNEs flows from overseas parents to their U.S. subsidiaries (see figures 1-2 and 1-3[11]). These figures indicate that, in the U.S. case, the majority of international technology trade is contained within multinational networks of affiliated companies. Foreign affiliates may contribute to the technology base of host nations in selected sectors, but across the Triad they are still a small part of it. [12] This finding was confirmed in numerous interviews conducted by OTA in Europe, Japan, and the United States.

In addition, distinct patterns of technology investment are associated with firms of different nations. Since 1989, Japanese spending on business R&D has exceeded that of the United States and Europe as a percentage of gross domestic product. Over the past decade, Japanese firms increased their R&D spending by an average of 8.0 percent each year, as compared to 3.9 percent for the United States and 1.6,3.9, and 4.6 percent respectively for the United Kingdom, Germany, and France. Firms across the Triad decreased their R&D spending in response to the recession of the early 1990s. [13]

These patterns, however, do not hold for the affiliates of foreign-based firms in the United States. European affiliates tend to spend more on R&D in the United States and exhibit higher levels of R&D spending as a percentage of their sales than do their Japanese counterparts. As figure 1-4 shows, R&D intensity for German affiliates is very high, probably reflecting the concentration of German investments in R&D-intensive industries such as chemicals and pharmaceuticals. At the other end of the spectrum, the very low R&D in-

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* In constant 1987 dollars. Data from U.S. Department of Commerce, BEA, *Survey of Current Business* (Washington, DC: May 1993), table 1, p. 89; and U.S. Department of Commerce, BEA, *Foreign Direct Investment in the United States: Preliminary 1992 Estimates* (Washington, DC: forthcoming, 1994); table H-3A.

9 U.S. Department of Commerce, BEA, *Foreign Direct Investment in the United States: An Update* (Washington, DC: U.S. Dept. of Commerce, June 1993), p. 70.

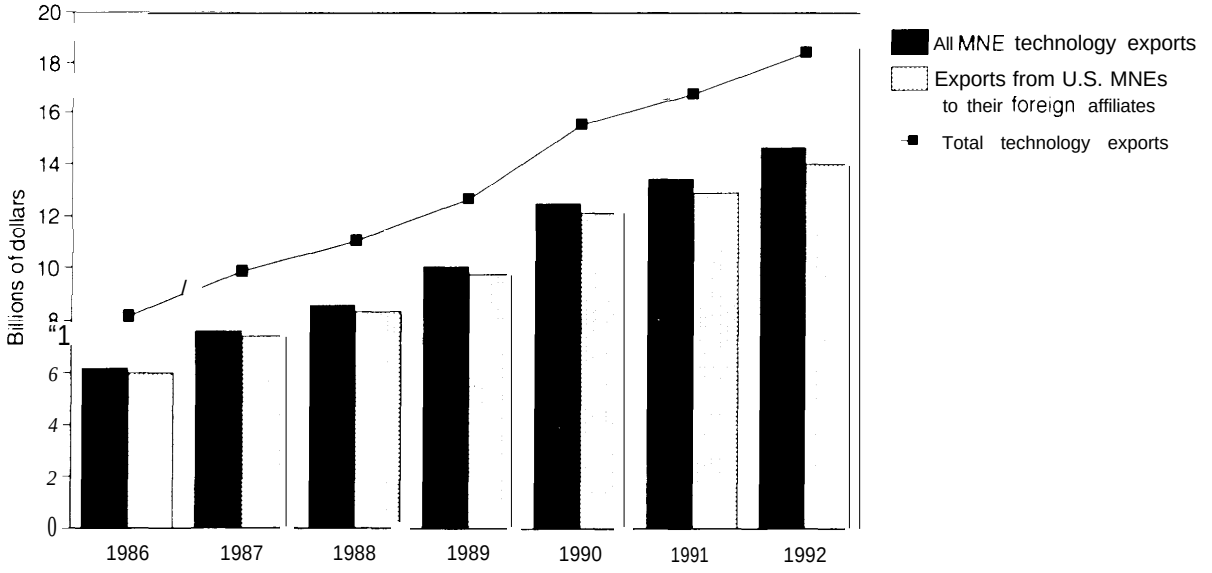
10 Ibid., p. 72. Across the advanced industrial nations, the R&D intensity of foreign affiliates tends to be much lower than the average for all manufacturing industries in the host country. One of the few exceptions is the United States, where the average R&D intensity of foreign manufacturing affiliates is driven up by the concentration of foreign investment in industries with high R&D intensity, such as pharmaceuticals, chemicals, and mechanical engineering. For a comparison of tbe R&D intensity of foreign affiliates in all sectors, see fig. 1-4. For an expanded discussion of R&D conducted by foreign affiliates in the United States, see ch. 4.

11 These figures are based on the $tech_{nol}O_{gy}$ balance of payments indicator, which measures international transactions in royalties and license fees. This indicator only approximates technology transfer for three reasons. First, the available U.S. data for royalties and license fees combines transactions of all forms of intellectual property, including industrial process technology, copyrights, trademarks, franchises, and rights to broadcast live events. Second, it is difficult to measure intellectual property traded between affiliated firms, since the value of affiliated transactions is not always determined on the open market. Tb ird, technology also can be transferred through a variety of channels that are not captured by this or any other reliable measure.

12 Throughout this report, the term "Triad" is used to denote the United States, Japan and the advanced industrial economies of Europe.

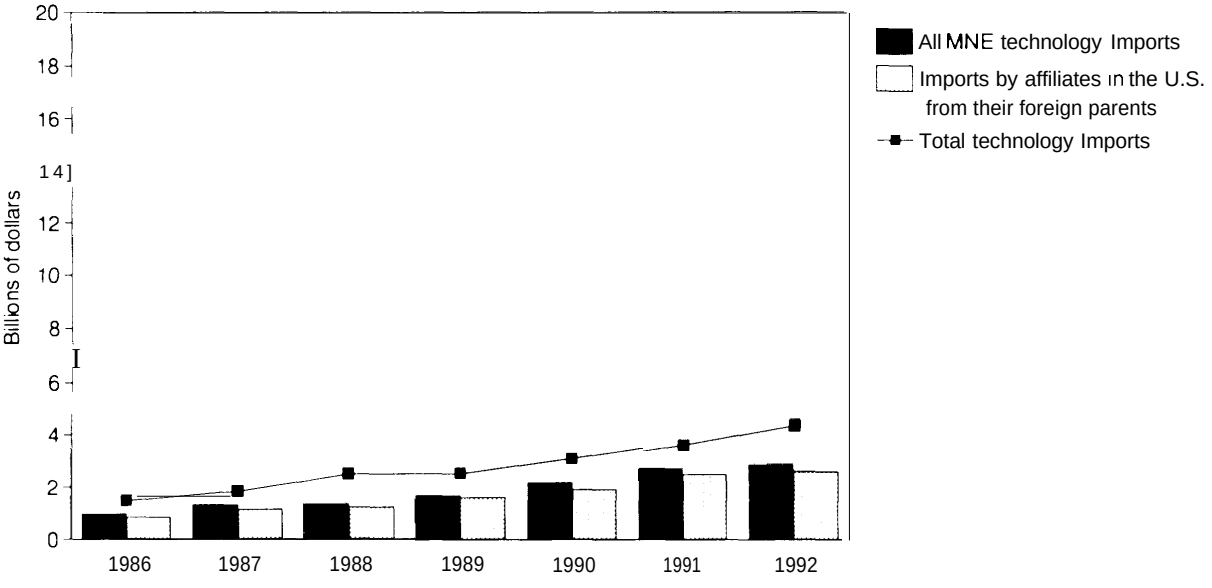
13 See figure 3-13 and accompany ing text in ch. 3.

FIGURE 1-2: MNEs and U.S. Technology Exports, 1986-1992 (constant 1987 dollars)



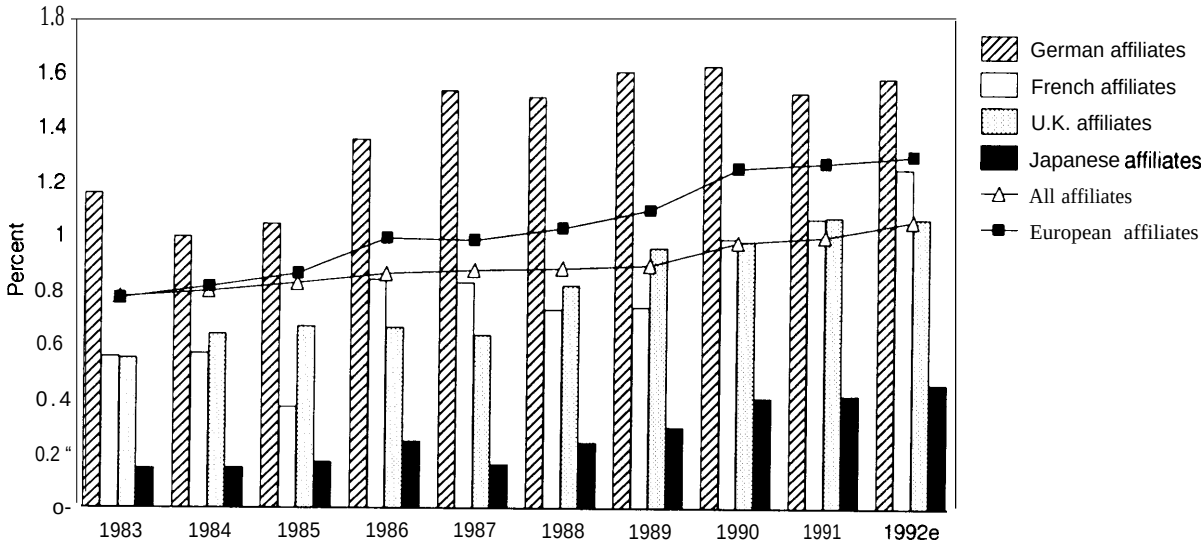
SOURCE OTA based on data in BEA *SCB* 73(9) 122 table 7, September 1993

FIGURE 1-3: MNEs and U.S. Technology Imports, 1986-1992 (constant 1987 dollars)



SOURCE OTA based on data in BEA *SCB* 73(9) 122, table 7 September 1993

FIGURE 1-4: R&D Intensity of Foreign Affiliates in the U.S. by Nationality of Ownership, 1983-1992



NOTES: R&D intensity measures total affiliate R&D expenditures as a percent of total sales, 1992 data are preliminary

SOURCE: OTA, based on data in U.S. Department of Commerce, Bureau of Economic Analysis, Foreign Direct investment in the United States Operations of U.S. Affiliates of Foreign Companies revised 1983-1991 estimates and preliminary 1992 estimates, (Washington, DC U S Government Printing Office, 1986-1994), tables E-4 and H-3B from 1992, tables A-6 and H-2 from 1987-1991, and tables 8 and H-6 from 1980-1986 (hereafter cited as BEA, *FDIUS)*

tensity of Japanese affiliates may reflect their propensity to invest less in manufacturing and more in wholesale trade (compare figures 1-8 and 1 -10).[14]

Multinational firms are critical to ensuring the health of the U.S. technology base. The most technologically sophisticated and economically significant sectors of the U.S. economy are now characterized by high degrees of international production, foreign direct investment, trade among affiliated companies, and complex forms of international financial and technological collaboration. Many of these sectors, such as semiconductors, electronics, chemicals, pharmaceuticals, aerospace, telecommunications, and autos, are also marked by increasingly high R&D costs. The location and character of innovative activity by MNEs significantly shapes the basic structure of competition and competitive advantage in these and related sectors.

While it is not wrong to speak of the global research and technology base of MNEs, it is certainly misleading. The data presented above and in Part II of this report suggest that technology is deeply rooted in national (or in the case of Europe, regional) concentrations or bases, with partial and company-specific interconnections. Although many fundamental technological innovations are pursued in several countries at the same time, or may be licensed from one region to another, it is not uncommon for a nation or even a firm to hold a leadership position or even control an important technology. Moreover, the cost of retrieving innovation leadership may be prohibitive once it is lost. The implication for public policy is that the national technology base must be well-main-

14 See the section on R&D by foreign affiliates in the United States in part II, ch. 4.

tained on a continuous basis. In this view, U.S. technology programs, such as the Partnership for a New Generation of Vehicles (PNGV) and the Advanced Technology Program (ATP), may be necessary to ensure that critical capabilities continue to reside in the U.S. technology base.

Some analysts take a different view. They argue that programs like the ATP and PNGV are subsidies to U.S.-based firms, subsidies that put government managers in position to pick winners and losers. They are further concerned that, if successful, such programs might cause foreign governments to increase their support of R&D, leading to a cycle of increasing government involvement in technology innovation, a process that they believe will ultimately make American firms less competitive than they might otherwise have been.

Advocates of this perspective assert that some technology programs discriminate against the U.S. affiliates of foreign-based MNEs, and that they might undermine U.S. negotiators who seek to convince other countries to open their markets to U.S. exports and direct investment (see box 1-2). On the other hand, there is no reason that U.S. technology programs cannot be conducted so that they are consistent with the principle of national treatment and the GAIT Treaty of December 1993.[15] (This issue is discussed in the section on Policy Issues and Options in chapter 2.)

While it is possible to conceive of a more cohesive and global technology base in the future, its development would require far more international economic integration and more extensive political cooperation. At a minimum, substantial reduction in or removal of the asymmetries in national patterns of direct investment, trade, finance, and corporate governance would be a prerequisite. [16] In the absence of rapid convergence in these areas, it is likely that nations will continue working to enhance the national technology assets on which industrial competitiveness rests. In the United States, such steps include the proliferation of government-industry cooperative technology development programs such as the ATP, the PNGV, the Technology Reinvestment Project, the Department of Energy cooperative R&D agreements (CRADAS), and the Manufacturing Extension Partnerships, among others. (These developments are discussed in chapter 2 in the section on Policy Issues and Options.)

U.S. government support for technology development has favored participation by U.S.-based companies over the affiliates of foreign-based firms. Some U.S. technology programs exclude foreign companies, such as the PNGV, which is a partnership between Ford, Chrysler, General Motors, and the U.S. government. [17] More often, the principle of conditional national treatment (CNT) has been applied in legislative language that permits participation by U.S. affiliates of foreign firms only on the condition that their countries of origin extend reciprocal access for U.S. MNEs. [18] In Europe, CNT has taken the form of requiring firms to establish local R&D operations. This has, in effect, largely limited participation in EU programs to European-based companies and a few foreign firms with R&D operations in Europe.

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15 Under the new terns established by the GATT Agreement on Subsidies and Countervailing Measures negotiated during the Uruguay Round, government research subsidies are permitted for up to 75 percent of the costs of industrial research (defined as new knowledge for developing new or substantially improved products, processes, or services), and up to 50 percent of the costs of precompetitive development activity (defined as applied research up the point of a first, noncommercial prototype).

16 These differences are described in detail in the first report of this assessment, *Multinationals and the National Interest*, op.cit., footnote 1.

17 The White House, Office of the Press Secretary, "A New Partnership for Cars of the Future, Ensuring L'. S. Leadership, Expanding Economic Opportunity, Preserving Jobs, Protecting the Environment," Sept. 29, 1993, p. 1.

18 Such provisions are included in the U.S. Federal Technology Transfer Act of] 986, Omnibus Trade and Competitiveness Act of 1988, Technology Preeminence Act of 1991 (Advanced Technology Program), and others.

BOX 1-2: The Technology Policy Debate

Although technology policy encompasses a number of relatively noncontroversial missions, such as federal support for basic science research, the Clinton Administration's effort to focus federal technology policy on commercial technology development has sparked considerable debate.

Critics of the new technology policy argue that market forces—not governments—should determine the location and rate of innovation in the economy. This position is based on mainstream economic theory, which holds that market mechanisms assure the most efficient allocation of resources throughout the economy. Deviations from the market—such as R&D subsidies—distort investment and consumption incentives, and consequently allocate resources to less productive sectors of the economy. In addition, government intervention introduces interest group pressures and other political factors that can obscure market signals and redirect national resources along the lines of political influence.

Critics maintain that R&D subsidies tend to violate the spirit of U.S. economic policy, which has long sought to extend the principle of national treatment throughout the international economy. According to this view, governments typically use subsidies to favor domestic over foreign firms, which creates unfair terms of competition. If the United States makes technology policy an important component of national economic strategy, other nations might follow suit, which could introduce an alternative channel for industrial policy and perhaps even ignite an international R&D subsidies war.

Advocates of the new technology policy argue that markets sometimes fail to allocate resources optimally, and in particular that market failures in innovation can lead to underinvestment in critical technologies. In addition, other governments frequently intervene in markets, which has led to the development of serious foreign competition in industries where the United States formerly held a dominant position, such as commercial aircraft, communications satellites, computers, semiconductors, and automobiles.

Those who favor a commercial technology strategy assert that government policy can and should be used to correct market failures that affect national technology development. From this perspective, markets typically do not account for technological spillovers from new and/or technology-intensive industries. Innovators often lose part of the returns from their investments in new technology, because some of the benefits accrue to imitators and/or society at large. Under these circumstances, selective government subsidies can be used to offset the appropriation problem and provide a stronger incentive to innovate, which is most desirable when the technological spillovers constitute a distinct public good. Moreover, advocates suggest that firms, not governments, can take the lead role in steering the innovation process, especially in projects where industry puts up at least 50 percent of the funds.

These competing positions are well illustrated by the recent debate over the Clinton Administration's Partnership for a New Generation of Vehicles (PNGV), sometimes called the Clean Car Initiative. Critics maintain that the government cannot predict the future course of automotive technology, and that the program merely subsidizes the Big Three automotive producers at the expense of other potential innovators. Moreover, because it excludes foreign automotive producers, the PNGV violates the principle of national treatment and encourages other nations to do the same.

Proponents of the PNGV maintain that the program uses taxpayer revenues to generate a public good that would not be provided by the market alone. They argue that, because the market does not adequately value or price the public's interest in clean air and reduced dependence on fossil fuels, innovators will not have sufficient incentive to make the enormous investments associated with clean automotive technologies. Consequently they contend that the government must push the market and provide additional incentives for firms to invest in these technologies.

(CNT is discussed at the end of the first policy section in chapter 2.)

FINDING 2: TRADE FOLLOWS INVESTMENT IN THE 1990s[19]

Governments understand that the health of the national technology base is related not just to R&D spending, but also to the strategic investment behavior of companies, especially MNEs. Such investment increasingly crosses national borders. Since 1980, the world stock of foreign direct investment (FDI) has grown by over a factor of four, accelerating dramatically after the Plaza Accord in 1985.20 By 1992, the global stock of foreign direct investment reached approximately $2.0 trillion.[21] This surge of investment transformed the world economy and assisted exports in many sectors. Rather than substituting locally produced goods and services for imports, investment augmented and created trade, often through international transfers of merchandise within networks of foreign affiliates and their parent groups, i.e., intrafirm trade (IFT). The flow of FDI to the United States decreased significantly in the 1990s, but the existing stock of foreign investment continues to grow.

U.S. affiliates of foreign-based companies account for a substantial portion of U.S. merchandise trade and the greatest share of the U.S. merchandise trade deficit (see figure 1-5).22 In 1982, the total merchandise trade deficit was $30.2 billion; of that, U.S.-based firms accounted for $6.1 billion, compared to $24.1 billion for U.S. affiliates of foreign-based MNEs. In 1986, both U.S.-based firms and foreign affiliates in the United States ran substantial deficits, $73.0 and $83.2 billion respectively. Since that time, the trade balance of U.S.-based firms improved steadily to reach a surplus of $11.9 billion in 1991 and a deficit of $6.1 billion in 1992. The trade deficit of foreign affiliates in the United States, however, remained substantial, at $72.1 and $70.7 billion in 1991 and 1992 respectively.[23]

This pattern does not mean that foreign affiliates are themselves responsible for the U.S. merchandise trade deficit. That deficit is affected by a range of factors, including exchange rates, variations in national growth and productivity rates, and different rates of domestic savings and investment. Moreover, a portion of what foreign affiliates import is used for the production of goods that might otherwise have been produced entirely

19 This finding is based on the analysis in Part 111.

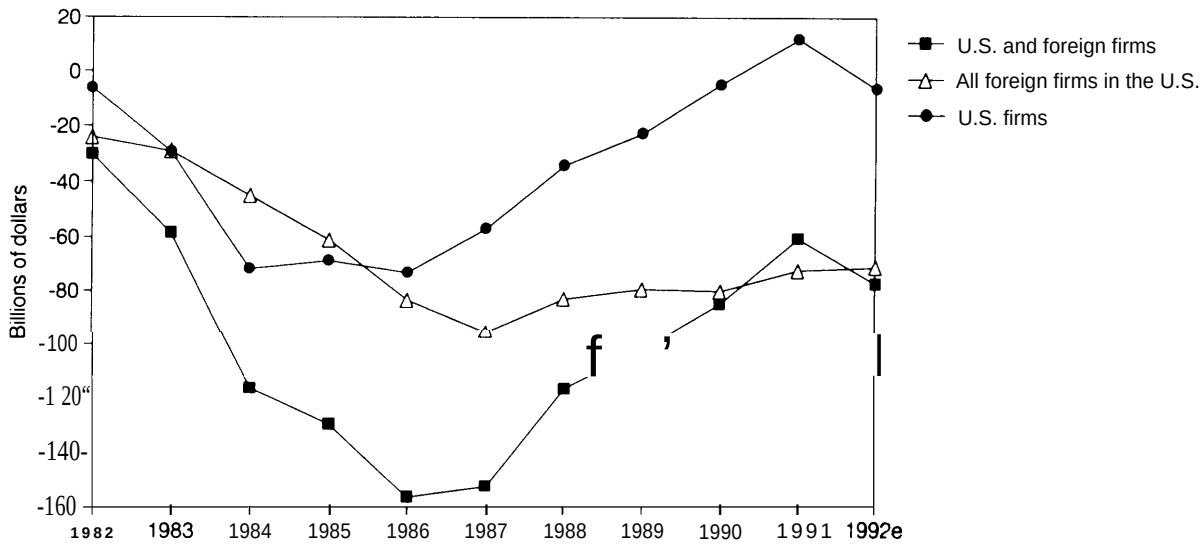
20 The Plaza Accord refers to an agreement reached at the Plaza Hotel in New York in 1985, in which the finance ministers of the major industrial nations agreed to corrdinate a devaluation of the dollar against other major currencies.

21 United Nations, *World Investment Report 1993: Translational Corporations and Integrated International Production (NY:* United Nations, 1993), p.1.

22 Part of the discussion and several of the figures in this chapter concentrate on merchandise trade as a relevant measure of multinational activity. Merchandise tradecovers manufacturedgoods, wholesale trade, agricultural products, and raw materials. It does not include services, a fast-growing sector of international trade where the United States ran a trade surplus of $61 billion in 1992. OTA is currently conducting a separate assessment of the service sector in the U.S. economy. See also U.S. Congress, Office of Technology Assessment, *Trade in Services: Exports and ForeignRevenues*, OTA-ITE-316 (Washington, DC: U.S. Government Printing Office, September 1986), and U.S. Congress, Office of Technology Assessment, *International Competition in Services: Banking, Building, Software, Know-How*, OTA-ITE-328 (Washington, DC: U.S. Government Printing Office, July 1987). Other measures, such as the current account and the capital account, provide a more comprehensive picture of international flows of goods, services, and capital, but they are less directly tied to the health of the U.S. technology base and MNE activity, the principal subjects of this assessment.

23 These trade data are expressed in constant 1987 dollars, based on data provided in Department of Commerce, BEA, *Survey of Current Business*, (Washington, DC: October 1993), p. 53, table 1.

FIGURE 1-5: U.S. Merchandise Trade Balance, 1982-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary

SOURCE: Adapted from BEA, SCB 73(10) 54, table 1, October 1993, BEA, SCB 73(3) 90-91, table 2, March 1993, BEA, SC/3 74(3) 68-69, table 2, March 1994, BEA *FD/US,* table G-3 (1982-1986), and table G-1 (1987-1992)

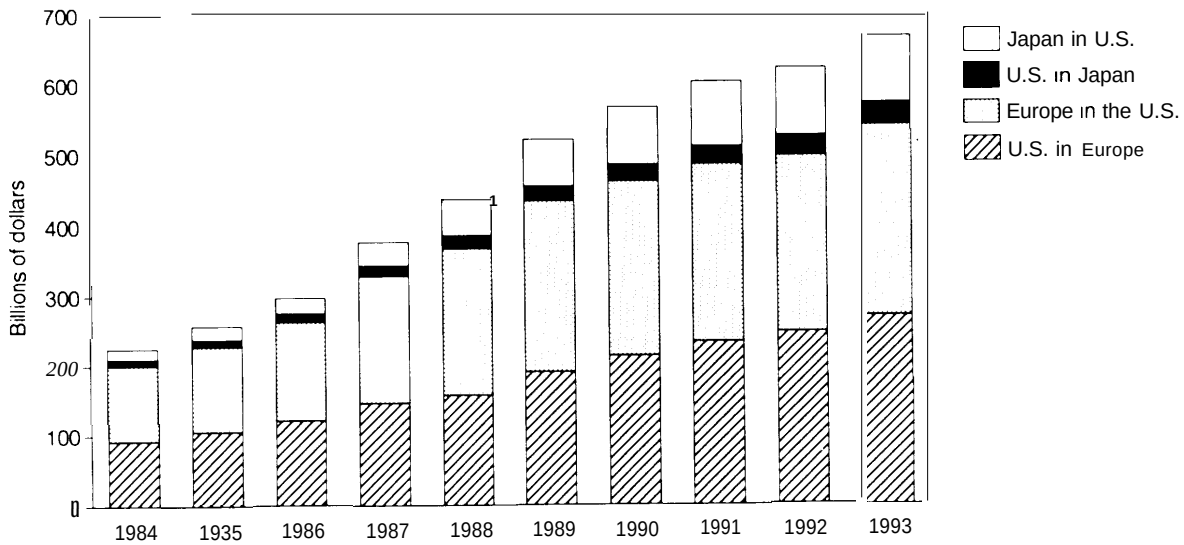
abroad. Nevertheless, the data indicate that foreign affiliates have afar stronger propensity to import than do U.S. businesses.[24] Further analysis indicates that much of the trade by affiliates is conducted as intrafirm trade within their own MNE networks, and that most intrafirm trade flows from parent groups to their overseas affiliates.

As international trade and investment expanded throughout the 1970s and 1980s, intrafirm trade increased in tandem, but it did not do so evenly across the Triad. International trade among affiliated firms has tended to reflect the balance of investment between the United States and its respective trading partners (see figure 1-6). Where investment is relatively well-balanced, as in the U.S.-Europe case, IFT has tended to follow suit. U.S.-based MNEs have transferred roughly the same amount of merchandise to their European affiliates as European-based MNEs have to their affiliates in the United States. Similarly, although the volume is much smaller, affiliates in Europe and in the United States transfer about the same amount of merchandise to their foreign-based parents (see figure 1 -7). U.S.-European intrafirm trade has been relatively symmetrical over the past decade, even as it has grown as a percentage of all trade. Between 1983 and 1992, IFT accounted for an average of 43 percent of U.S.-Europe merchandise trade.[25] Of that IFT, 43 percent was con-

[24] Since 1988, the ratio of imports to exports for foreign affiliates in the United States has been about double that of U.S. businesses. In 1991, affiliates' imports exceeded their exports by *80* percent. See Ibid., p. 54.

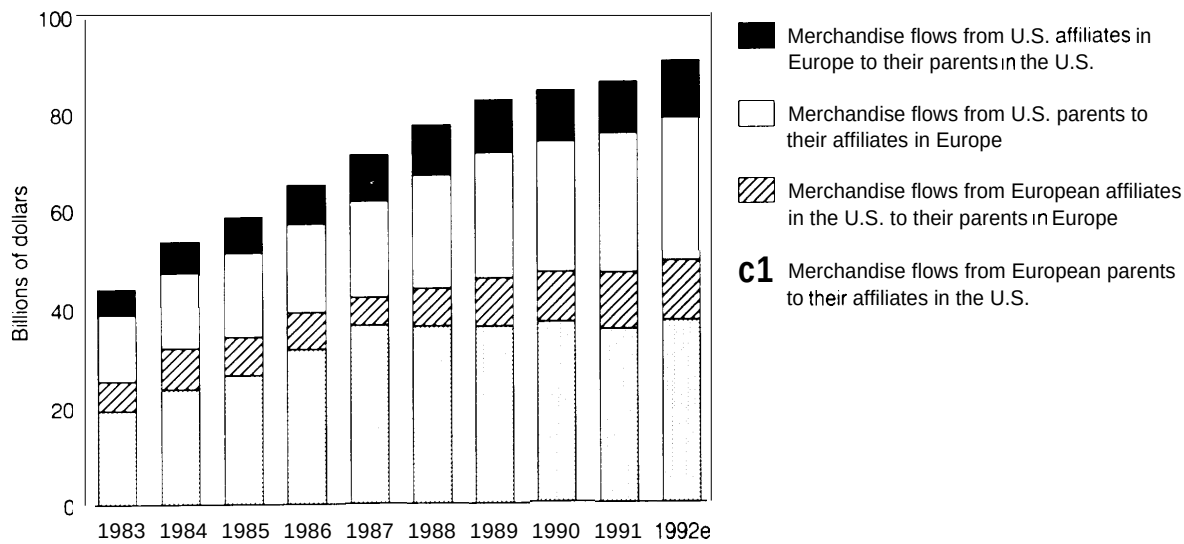
[25] Department of Commerce, BEA, *U.S. Direct Investment Abroad* (Washington, DC: 1983-1991 issues); Department of Commerce, BEA, *Foreign Direct Investment in the United States* (Washington, DC: 1983-1991 issues); Department of Commerce, BEA, *Survey of Current Business*, (Washington, DC: June 1993), table 2, p. 78.

FIGURE 1-6: Total Direct Investment Positions: U.S.-Europe and U.S.-Japan, 1984-1993 (historical cost)



SOURCE OTA. based on data in BEA, *SCB* 73(7) 65-6797-100, July 1993, 71 (8) 51-54,86-88, August 1991 69(8) 52-53,67-69 August 1989 and 77(8) 63-65 90, August 1987 and U S Department of Commerce News, " press release, June 28, 1994, tables 2 and 3 (hereafter cited as USDOC press release)

FIGURE 1-7: Volume and Direction of U.S.-European Intrafirm Trade, 1983-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary

SOURCE: OTA based on data in BEA *FDIUS* table G-4(1983-1986) and table G-2 (1987-1992), U S Department of Commerce, Bureau of Economic Analysis *U.S. Direct Investment Abroad Operations of U S Parent Companies and their Foreign Affiliates* revised 1983-1991 estimates (Washington DC U S Government Printing Office 1986-1994) tables 50 in 1983-1988 and Ill H 1 m 1989-1991 (hereafter cited as BEA *USDIA)* BEA, SCB 73(6): 78 table 2 June 1993

ducted by U.S.-based MNEs and 57 percent by European-based MNEs

In the 1980s, the U.S.-European investment relationship was also relatively well balanced in scale and composition, and in recent years has stabilized at nearly equal levels for total investment. As figures 1-8 and 1-9 indicate, the largest share of investment has been in manufacturing, both for Europe in the United States and for the United States in Europe. Moreover, in both cases, manufacturing and wholesale trade together account for about half of all direct investment.

With respect to the U.S.-Japan relationship, however, broad differences persist in the scale and composition of Japanese investment in the United States as compared to U.S. direct investment in Japan. Japanese investment in the United States exceeds U.S. investment in Japan by a factor of 3.1 to 1 and it is far more concentrated in wholesale operations (and less concentrated in manufacturing) than is direct investment between the United States and Europe (see figures 1-8 through 1-1 1). As U.S. FDI grew in the 1980s, U.S. direct investment in Japan remained disproportionately small (see figure 1-6).

Compared to Europe, U.S. intrafirm trade with Japan displays anomalies. First, it comprises a much larger part, 71 percent on average between 1983-1992, of all U.S.-Japan merchandise trade.[26] Second, over the same period Japanese MNEs and their affiliates conducted an average of 92 percent of all U.S.-Japan intrafirm trade (compare figures 1-12 and 1-7). This asymmetry is even more pronounced than that associated with the bilateral U.S.-Japan imbalances in direct investment and merchandise trade, Taken together, these two statistics indicate that most U.S. trade with Japan takes place within and is dominated by affiliated networks of Japanese MNEs.

In this context, the U.S. trade deficit with Japan is linked with the bilateral imbalance in direct investment. As figure 1-13 shows, on average the U.S. intrafirm trade balance with Japan closely tracks the total MNE trade balance and, in most years, the overall merchandise trade balance. In part, the large-scale U.S. trade deficit with Japan in the 1980s can be explained by the high dollar-yen exchange rate, a decline in the growth rate of U.S. productivity, and higher Japanese rates of savings and investment. But its persistence into the 1990s, especially in light of the Plaza Accord and the prominent role of U.S.-Japan IFT, suggests that the relatively low level of direct investment in Japan is important. It is unlikely that the U.S. merchandise trade deficit with Japan will be corrected in the absence of substantial investment by U.S.-based firms in Japan.

Some analysts argue that Japanese investment in the United States looks very different from European investment because Japanese affiliates are relative newcomers to the American business community. They believe that, over time, the volume of Japanese intrafirm trade will diminish, reflecting an increase in the local sourcing of Japanese affiliates, as predicted by the FDI life cycle theory.[27] The data on this point are mixed. For example, Japanese auto transplants—which produce cars in the United States—report that their percentage of locally sourced parts has increased significantly in recent years (see figure 6-13 in chapter 6). On the other hand, a U.S. Customs Service audit of the Honda Corp. in 1990 concluded that the domestic content was considerably less than the company reported.[28] A further complicating factor is that 43 percent of all U.S. suppliers to the three largest automobile transplant producers (Toyota, Honda, and Nissan) are

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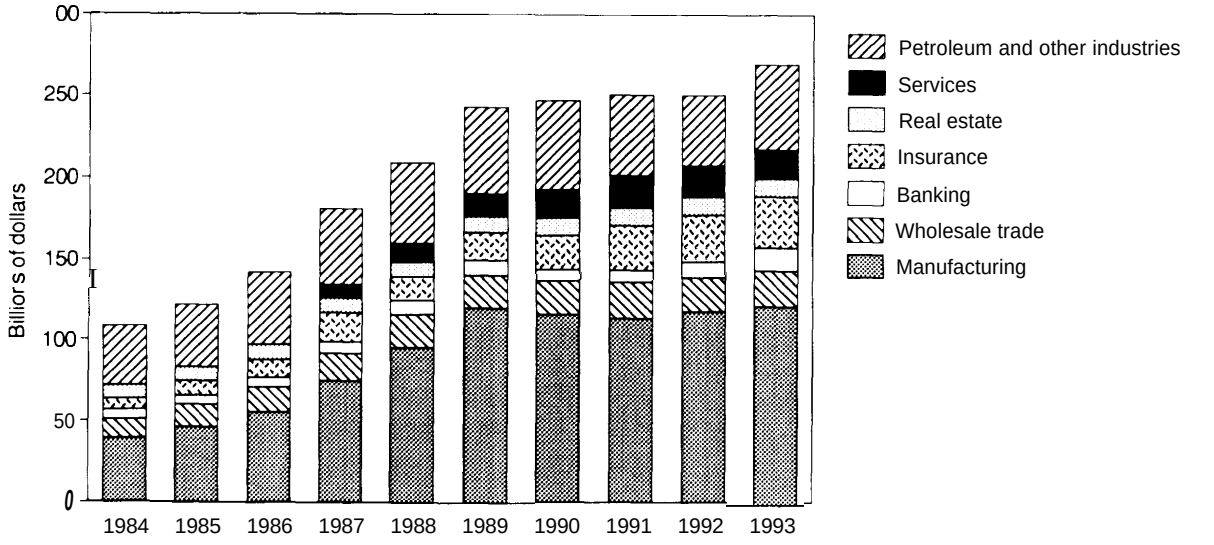
[26] Ibid.

[27] The life cycle theory of FDI is discussed in ch.6.

[28] U.S. Congress, OTA, *Multinational and the National Interest*, op. cit., footnote 1, pp. 96-97.

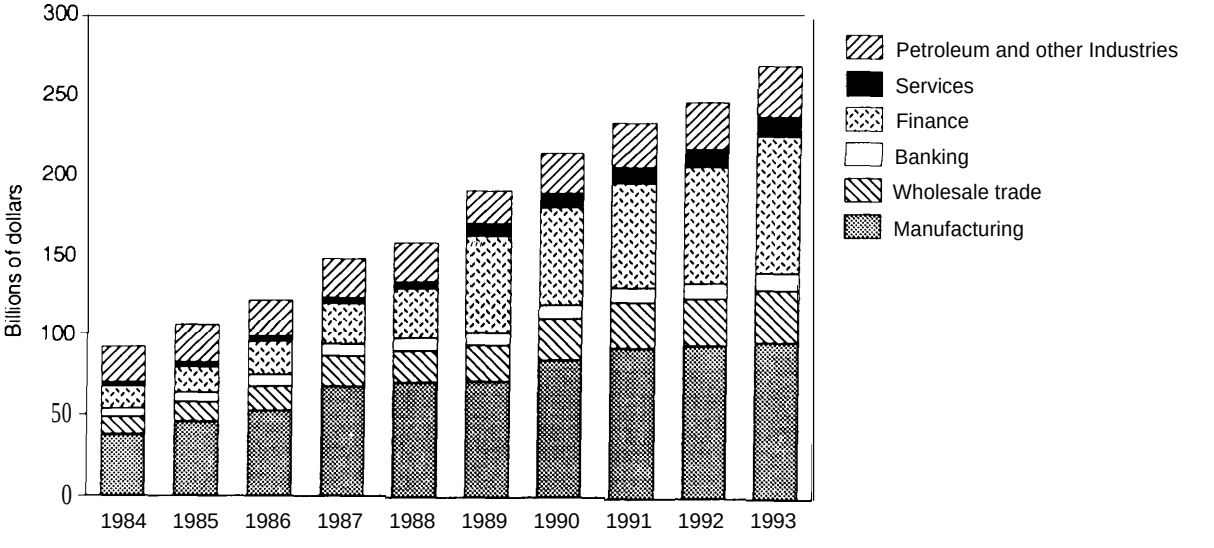
FIGURE 1-8: Europe's Direct Investment Position in the United States by Sector, 1984-1993 (historical cost)



NOTE BEA statistics on FDI Include data on services only since 1987

SOURCE OTA, based on data InBEASCf373(7) 65-67, July 1993, 71 (8) 51-54, August 1991, 69(8) 52-53, August 1989, and 77(8) 90, August 1987, USDOC press release, June 28, 1994, table 3

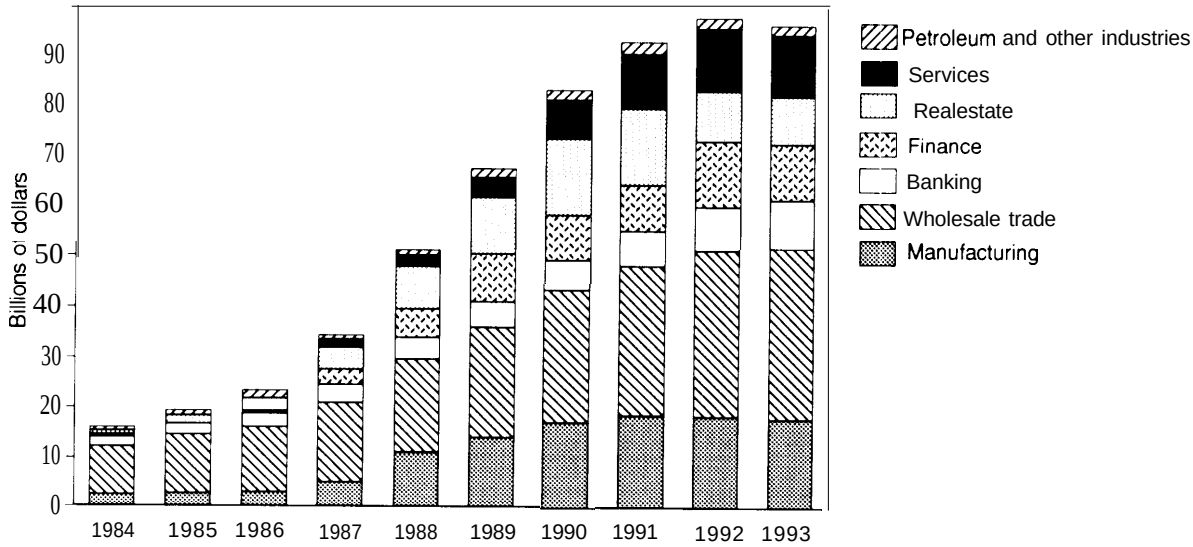
FIGURE 1-9: U.S. Direct Investment Position in Europe by Sector, 1984-1993 (historical cost)



NOTE BEA statistics on FDIposition include figures for services only since 1987

SOURCE OTA, based on data inBEA, *SCB* 73(7) 97-100, July 1993, 71 (8) 86-88, August 1991, 69(8) 67-69, August 1989, and 77(8) 63-65, August 1987, USDOC press release, June 28, 1994, table 2

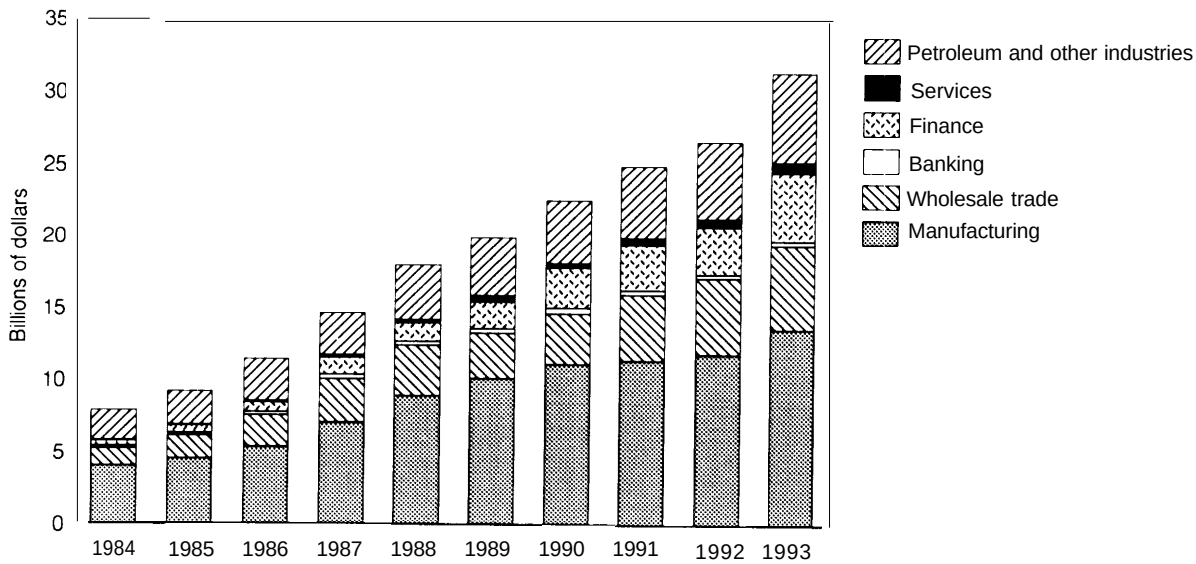
FIGURE 1-10: Japan's Direct Investment Position in the United States by Sector, 1984-1993 (historical cost)



NOTE BEA statistics on FDI include data on services only since 1987

SOURCE OTA based on data wBEA,SCf373(7) 65-67 July 1993,71 (8) 51-54, August 1991, 69(8) 52-53, August 1989, and 77(8) 90, August 1987, USDOC press release, June 28, 1994, table 3

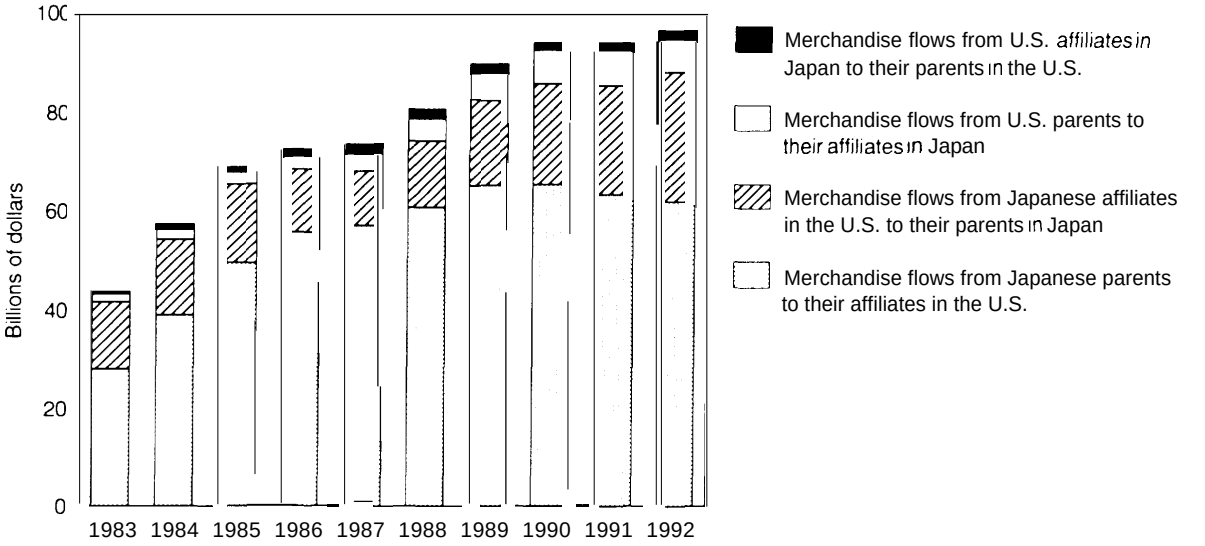
FIGURE 1-11: U.S. Direct Investment Position in Japan by Sector, 1984-1993 (historical cost)



NOTE BEA statistics on FDI position include figures for services only since 1987

SOURCE OTA, based on data in BEA *SCB* 73(7) 97-100 July 1993, 71 (8) 86-88, August 1991, 69(8) 67-69 August 1989, and 77(8) 63-65, August 1987 USDOC press release June 28, 1994 table 2

FIGURE 1-12: Volume and Direction of U.S.-Japanese Intrafirm Trade, 1983-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary

SOURCE: OTA based on data in BEA, *FDIUS,* tables G-4 (1983-1986), and G-2 (1987-1992), BEA *USDIA* tables 50 (1983-1988) and III H 1 (1989-1992) BEA, SCB 73(6) 78, table 2 June 1993

themselves affiliates of Japanese-based MNEs (see figure 1-14).

FINDING 3: CORPORATE GOVERNANCE AND FINANCE DIVERGE ACROSS THE TRIAD[29]

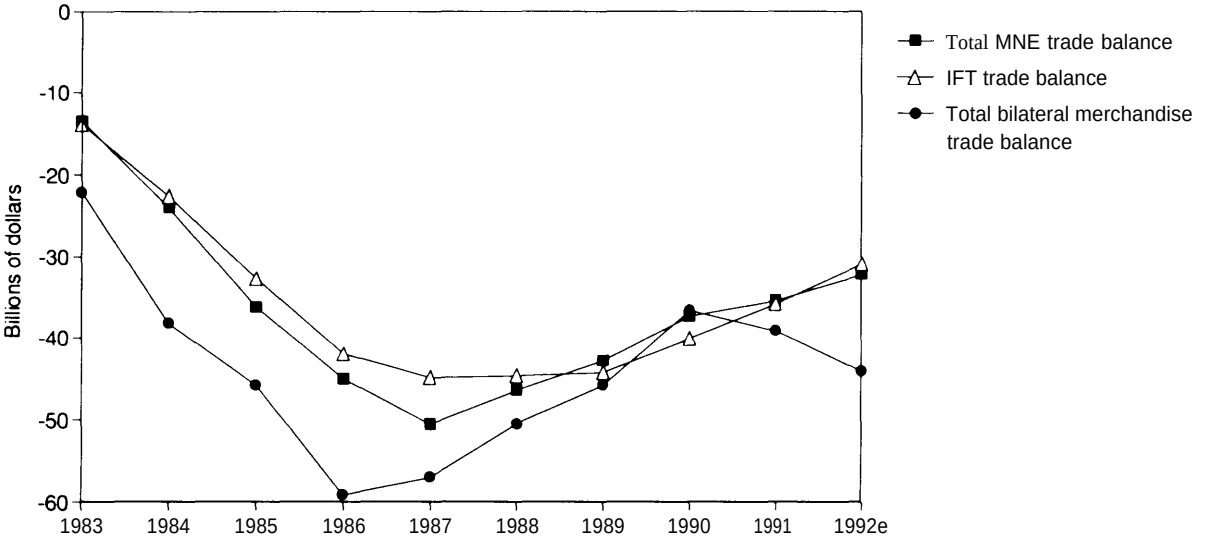
The strategic behavior of individual MNEs continues to be shaped by systems of corporate governance and long-term corporate financing that prevail in their home countries. Sometimes these systems provide firms with distinct advantages. Such advantages influence the investment decisions of MNEs, especially in long-term investments in plant, equipment, research, and technology development. Such decisions, in turn, are often the wellsprings of future technological innovation.

Both Japan and Germany, for example, employ systems of corporate governance and corporate finance that can create advantages for their firms in ways not entirely consistent with the principle of comparable market access. In both countries, nontransparent systems of corporate governance permit business behavior that would be questionable in the United States. Cartel-1ike arrangements legitimated by such systems, for example, are not uncommon. Such arrangements can undercut equality of competitive opportunity, especially for foreign firms.

In both Germany and Japan, cross-shareholding arrangements among companies and banks are more extensive than in the United States, and are particularly pronounced in Japan's major industrial groups (see table 1- 1). This can discourage direct investment by foreign-based firms and influence their market access, although it should be noted that Germany is far more receptive to foreign investment than is Japan. Such arrange-

[29] This finding is based on the analysis in Part IV

FIGURE 1-13: U.S. Merchandise Trade Balance with Japan, 1983-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary

SOURCE: OTA, based on data in BEA, *FDIUS,* tables G-4 (1983-1986) and G-2 (1987-1992), BEA, *USDIA,* tables 50 (1983-1988) and Ill H 1 (1989-1992), BEA, *SCB* 72(6) 88-90 table 2, June 1992, BEA, SCB 73(3) 90-91, table 2, March 1993, BEA, SCB 74(3) 68-69, table 2, March 1994

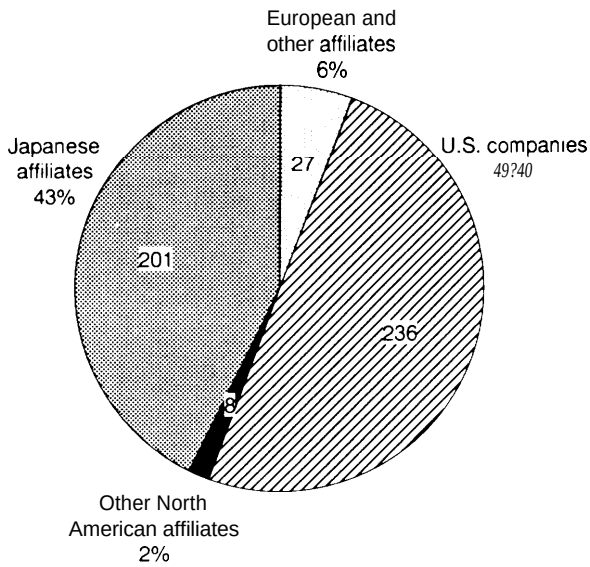
ments, together with the underdevelopment of markets for takeovers, have often discouraged foreign MNEs from entering Japan (and to a lesser extent, Germany) by way of acquisition.

In both countries, systems that provide long-term financing for home-based MNEs, which often include a prominent role for banks, enable those firms to take a broad view of their markets. This ability can put them in a better position than their U.S.-based competitors to concentrate on building market share and developing new technologies, rather than on short-term profitability. Especially with regard to Japan, such factors appear to be implicated in enduring competitiveness problems in parts of the U.S. technology base. They help to explain, for example, the collapse of domestic production by U.S.-based MNEs in the consumer electronics industry.

Even though U.S. capital markets are the largest, most decentralized, open, and transparent in the world, long-term capital is relatively more patient in Germany and Japan. Although the financial markets of the United States support novel technology ventures, in recent years they have often been less supportive of long-term investments in state-of-the-art manufacturing facilities required to sustain competitive advantage. Since the development and exploitation of next-generation technologies often depends on the existence of such facilities, this kind of shortsightedness can have enduring consequences for the national technology base.

Major Japanese and German MNEs remain firmly rooted in their home markets, despite recent, often painful restructuring. For many years, the stability of those roots bolstered their competitive position internationally. This was especially evident in such industrial sectors as consumer electronics, machine tools, advanced transportation systems, and parts of the chemicals industry. Today, Japan appears to be paying a price for the financial bubble and inflated real estate prices of the 1980s, while the costs of reunification are registering heavily on the German economy. In both

FIGURE 1-14: Suppliers to Japanese Automobile Transplants, by National Affiliation



NOTE: Number of firms given in brackets, total number = 472

SOURCE: OTA, based on data in The *ELM Guide to U.S. Automotive Sourcing* (East Lansing, MI ELM International Inc., 1992), and *The ELM Guide to Japanese Affiliated Suppliers in North America,* 4th ed. (East Lansing MI ELM International Inc., 1993)

cases, however, the singular national structures of corporate governance and finance that propelled the growth of their corporations in critical technology sectors are now helping those corporations adjust to new competitive realities. Those structures are themselves adjusting, but they are not being abandoned.

Key distinctions are likely to persist in the ways corporations govern themselves and raise long-term capital across the United States, Germany, and Japan. Expectations concerning their ultimate convergence should be kept modest. National patterns are embedded in deep social and political traditions, and they are being reinforced more than they are being eroded by turbulence in the global economy. For the foreseeable future, it is not unlikely that differences in national structures of corporate governance and long-term corporate financing will be the source of increasing friction in the more complex economic relationships evolving between the United States and its major trading and investing partners.

TABLE 1-1: Cross-Shareholding in Four Major Japanese Business Groups for Fiscal Year 1992 (in percent)

	Financial Institutions	Trading, Manufacturing, or Other
Mitsui	231	208
Mitsubishi	19.8	334
Sumitomo	242	306
Fuyo	23.6	172

NOTE: Data represents average percentage of stock held by group members or affiliated companiees Data IS for fiscal year 1992 ended March 31, 1993, and IS drawn from a survey conducted by Toyo Keizai of 2,131 firms listed on Japanese stock exchanges

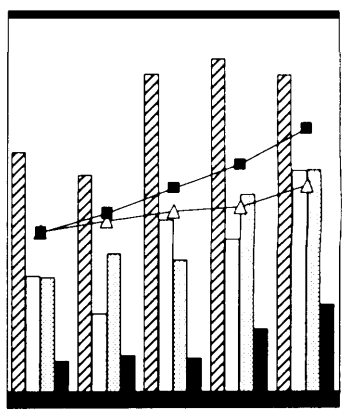
SOURCE: Kigyo *Keiretsu Soran* (Tokyo Toyo Keizai Shinposha, 1994) pp. 44-50.

U.S. Technology Policy in International Economic Perspective 2

The first report of this assessment, *Mulitnationals and the National Interest: Playing by Different Rules,* identified broad asymmetries in the policy regimes of the major trading nations+ specially market access, foreign direct investment, financial, and industrial policies related to the activities of multinationals. [1]These asymmetries, it suggested, might have adverse consequences for the health of the U.S. technology base. The report discussed a range of informal barriers to international trade and investment, particularly in Japan but also in Europe, that have inhibited the full realization of an open, comprehensive multilateral trade regime that is transparent and mutually advantageous to trading partners. OTA thus raised the concern that widely divergent policy systems and business practices among states in the Triad might disrupt trade and investment relations among the major economic powers.

THE POLICY CONTEXT

In the past year, significant progress was made at multilateral, regional, and bilateral levels in negotiating formal trade agreements. In December 1993, the Uruguay Round of multilateral trade negotiations was concluded under the General Agreement on Tariffs and Trade (GATT). The new GATT agreement establishes a World Trade Organization (WTO), which, if ratified by all member states, would greatly strengthen multilateral provisions



[1] U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest: Playing by Different* Rules, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993). The report is summarized in appendix B.

for dispute resolution.[2] In an effort to expand regional trade, supplemental agreements on labor and the environment were negotiated for the North American Free Trade Agreement (NAFTA), and Congress ratified implementing legislation for NAFTA, which entered into force on January 1, 1994. Progress toward expanded trade and investment in the Pacific Region was also achieved in the context of the Asian Pacific Economic Cooperation (APEC), where high-level meetings were held and a Committee on Trade and Investment was established.

In addition, considerable progress was made in a variety of bilateral market access agreements, including the eliminat ion of duties affecting approximately $1 billion in U.S. trade with Canada, dramatic reduction in tariffs on a variety of goods with China, and elimination of discrimination by European Union (EU) member states against foreign heavy electrical equipment. The United States and the European Union were, however, unable to resolve disputes over the sale of telecommunications network equipment in Europe and, accordingly, the United States imposed sanctions against the European Union in this areas Nevertheless, as the data presented in chapter 1 and in Part 111 indicate, the United States and Europe have achieved in the aggregate a relatively balanced relationship with regard to investment and trade—including intrafirm trade conducted by [J. S.- and European-based multinational enterprises (MNEs).

U.S.-Japan Economic Relations

In contrast to these successes, the U.S.-Japan economic relationship continued to deteriorate during the past year. The U.S. merchandise trade deficit with Japan expanded despite a steady devaluation of the dollar against the yen, partly in response to the rapid U.S. recovery from the recession of the early 1990s and sustained recession in Japan, which reduced import demand. U.S.-based MNEs made limited headway in investing in Japan, despite partial correction of overvalued land prices in Tokyo. The U.S. direct investment deficit with Japan remained substantial, albeit somewhat reduced from the previous year. Moreover, the Framework for a New Economic Relationship talks between the United States and Japan collapsed in February 1994, confirming a long-standing pattern of disappointing bilateral trade negotiations.[4] Several weeks later, the President reinstated the Super 301 provisions of the 1988 Omnibus Trade and Competitiveness Act by Executive Order.[5] Although the Framework negotiations resumed in May, it was still unclear whether a common understanding of the objectives of the talks was achieved.

Japan poses a special problem not only for the United States, but also for other nations with chronic bilateral trade deficits with Japan,[6] and whose MNEs still face stiff resistance to entering the Japanese market through direct investment. But beyond these bilateral imbalances and the ris-

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[2] There is, however, considerable debate as to whether the WTO will lead to increased international trade and a reduction of informal trade barriers. For example, see the debate between C. Barfield and K. van Wolferen in "Will the New World Trade Organization Work?", *The Washington Post*, p. C3, June 26, 1994.

[3] Office of th, United States Trade Representative, *1994 Trade Policy Agenda and 1993 Annual Report of the President of the United States on the Trade Agreements Program* (Wash ington, DC: U.S. Government Printing Office, 1994), pp. 14-15 and passim.

[4] In particular, the Marlwt-oriented Sector-Specific (MOSS) talks of the middle 1980s and the Structural Impediments Initiative (S11) of 1989 and 1990 largely failed to produce the Intended results. See ibid., p. 61.

[5] W.J. Cl inton, President, United States, "Executive Order 12891—Identification of Trade Expansion Priorities," Weekly *('on) ipilation of Presidential Documents* 30(9)422-423, March 3, 1994.

[6] According to the Japanese Ministry of Finance, Japan's trade surplus in 1993 was higher with other Asian countries than it was with the United States. "Japan's surplus with Asia on a customs-cleared hasis in fiscal 1993 through March 31 jumped 25.1 percent from the previous year to S55.948 billion The surplus with the United States grew 1 I.8 percent to $51. 14 billion. . . . With the European Union, the surplus fell to $24.24 billion, down 21.8 percent from fiscal 1 992." *The Nikkei Weekly*, p. 1 April 25, 1994.

ing trade frictions associated with them, Japan presents a significant challenge to the post-WWII system of international trade and investment. The challenge is to integrate all nations, including Japan, more fully into the world system—which means convincing them to open their economies both to imports and to foreign direct investment, in a way that is comparable to the openness of the United States and the European Union. Failure to do so will almost certainly generate economic dislocation and severe pressure on the maintenance of a global economic order based on the principles of free and open markets, national treatment, and multilateralism.[7]

Although underlying macroeconomic factors drive aggregatc trade and investment balances, their composition and character can have microeconomic roots. Chronic bilateral trade and investment deficits between advanced industrial nations matter. In part, deficits reflect competitive disadvantages of firms based in deficit countries; but they can also reinforce those disadvantages. Where comparable market access is effectively blocked, many U.S. business leaders. for example, reluctantly conclude the odds are rigged against them and lower their expectations accordingly. In such circumstances, some settle for a minority equity position in a joint venture company. others feel compelled to license their technology, even when experience teaches it may ultimately be used to compete against them in their own or third-country markets. Foreign-based MNEs face few comparable restraints to investment and trade in the United States. In the case of Japanese MN Es, this has often translated into head-to-head competition with U.S. companies in America from a sanctuary base at home.

Building on the analysis of the first report of this assessment, in the chapters that follow, OTA present a comprehensive array of macroeconomic data, detailed trade and investment statistics, and information based on extensive staff interviews in Japan, the European Union and the United States. These data confirm that globalization has proceeded at different rates, both in terms of the kinds of MNEs that have emerged (see table 1 -1), and in terms of sectors of the international economy. In addition, industries of different nations have globalized at different times and in different ways. Taken together, the data presented in this report characterize trade and investment relations in the Triad, and also indicate the extent to which Japan has become an outlier in the global economic system.

Comparable Market Access

In addition, this analysis moves beyond identifying asymmetries among the policy regimes of the United States, the European Union, and Japan. It describes the nexus between trade and investment--demonstrating the importance of intrafirm trade among affiliated companies, which is circumscribed when direct investment is limited. *The central issue is comparable market access,* that is, the expectation that U.S.-based MNEs will be afforded the same access to foreign markets that foreign MNEs enjoy in the United States. Here it is critical to distinguish between *formal* national treatment and *effective* national treatment. When foreign companies meet sustained resistance to their imports and investment, even where legal and regulatory restraints have been removed, equality of competitive opportunity has not been achieved. The test is whether actual market access is comparable, both for trade and investment. especially in industries based on critically important technologies. "

Several members of the advisory panel associated with this study suggested that market

[7] The increase in trade friction in the Triad is now chronicled in yearly editions of government publications such as Office of the United States Trade Representative, *1994 National Trade Estimate Report on Foreign Trade Barriers* (Washington, DC: 1994); Services of the European Commission, *Report on United States Barriers to Trade and Investment*, Doc No. I/194/94 (Brussels, Belgium: Services of the European Commission, 1994); and Ministry of International Trade and Industry, *1994 Report on Unfair Trade Policies by Major Trading Partners* (Tokyo: Ministry of International Trade and Industry, 1994).

access problems are not limited to Japan, but may also extend to a number of newly industrialized and advanced developing countries in Asia, most notably China, Indonesia, Malaysia, the Republic of Korea, and Taiwan, all of which run trade surpluses with the United States and have placed conditions on investments by U.S.-based firms.[8] Similar views were expressed to OTA in industry interviews. These observations imply that there may be fundamental differences in the organization of capital and the conduct of business from one region to another, compounding the difficulty of finding multilateral solutions to a widening array of disputes associated with international trade and investment.[9]

OTA conducted very limited research on this point, primarily because the activities of MNEs in these countries are still very small when compared to the advanced industrial nations. U.S. direct investment in most East Asian economies is an order of magnitude smaller than it is in Japan: in 1993, for example, it was $3.0 billion for the Republic of Korea, $3.1 billion for Taiwan, and $0.9 billion for China. In addition, U.S. direct investment in these countries exceeds their investment in the United States by approximately 3 to 1.'O Finally, in interviews conducted by OTA, U. S.-based MNEs reported they are generally less concerned about restrictions on their ability to invest in other Asian countries than in Japan.

Multilateralism Beyond Trade

Large-scale trade and investment imbalances across the advanced industrial nations must be addressed. The Japanese economy, for example, has become too powerful to be ignored without detriment to U.S.-based MNEs and, ultimately, to the U.S. technology base. Moreover, for Japanese MNEs to continue to benefit from relatively open trade and investment regimes in the United States and Europe without Japan reciprocating constitutes a threat to the long-term viability of the multilateral system itself. To the extent that other nations are unable or unwilling to extend reciprocal market access to foreign-based firms, the problem is that much more critical. The United States has pursued a post-WWII policy wedded to the principle of national treatment, which has been applied in the areas of trade, investment, taxation, and (with important exceptions) to technology promotion funding.[11] For this reason, many analysts argue that exceptions to the principle of national treatment should be made only with great circumspection, if at all.

From this perspective, the answer to Japanese exceptionalism is to create the normative and legal conditions for a convergence of differing national trade *and* investment practices toward a global standard, exemplified by the relative openness of the U.S. economy. There is a considerable body of opinion that identifies institutions like the WTO as the long-term solution to broad asymmetries in market access policies and diverging business practices among nations in the Triad. In this view, what the Uruguay Round of GAIT negotiations has done for trade, the next round could do for investment, i.e., establish a minimum code of conduct that would prohibit policies that discourage foreign direct investment. As the analysis in Part III of this report indicates, trade and investment are so interdependent in the 1990s, it is unlikely that a solution to unfair trade conditions can

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[8] The OTA Advisory Panel on Multinationals and the U.S. Technology Base is listed in the front of this report.

[9] For a discussion of how different historical patterns and institutional structures have resulted in different kinds Of capitalism and different rates of economic development, see J. Zysman, "How Institutions Create Historically Rooted Trajectories of Growth," in *Industrial and Corporate Change* 3(1): forthcoming, 1994.

[10] In 1993, direct investment in the United States was $0.8 billion for the Republic of Korea, $1.3 billion for Taiwan, and for China it was negligible. U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *United States Department of Commerce News* (Washington, DC: June 28, 1994), tables 2 and 3. All figures are on a historical cost basis at year end.

[11] The question of eligibility for foreign-based MNEs in U.S. technology programs is discussed in the next section.

be crafted without also addressing imbalances in FDI among major trading nations. But as Part IV suggests, convergence toward international norms may be less important than recognizing the differences between the U. S., European, and Asian economic systems, and learning how to live with them.

For these reasons, some observers now advocate a two-tiered foreign economic policy: one policy for countries that practice effective national treatment and extend a high degree of market access to foreign merchandise, services, and investment; and another policy for countries that do not. (Presumably, developing nations could be held to a different standard, in view of their need to develop indigenous industrial bases.) Atone tier, policy would be geared to recognize, promote, and expand the benefits of the post-WWII open system of international economic relations to additional countries. At the other, it would recognize the challenge posed to that system by nations that do not offer comparable market access, and take steps to limit potential damage to U.S.-based MNEs and, more broadly, the U.S. technology base. This approach would place conditions on national treatment, and meet infractions of international trade and investment treaties with specific measures designed to counter them. (Conditional national treatment is discussed in the next section.)

Other voices suggest a middle ground, that is, a U.S. approach that continues its commitment to multilateralism and national treatment but, at the same time, crafts specific bilateral and domestic policies to offset persistent imbalances in trade and investment with some of our trading partners. This might entail compensation at the national level to make sure, for example, that technological resources and competencies are retained within the United States at levels sufficient to ensure the long-term viability of the U.S. economy and the technology base on which it depends. Such a policy would require, for example, highly effective coordination and implementation of a range of U.S. technology promotion programs. (U.S. government support for technology development is discussed in the section on policy issues and options below.)

Still others contend that a special policy for Japan is unnecessary and ill-advised. They point out that Japan has removed most tariffs and other formal and legal barriers that had hitherto blocked access to the Japanese economy. The increase in the U.S. trade deficit with Japan over the past year, they suggest, resulted largely because the United States economy recovered from the 1991-92 recession more quickly, thus increasing the U.S. appetite for foreign-made goods and services. They also argue that exchange rate changes have made it more difficult for U.S. MNEs to invest in Japan, just at a time when land prices have been adjusted downward and the Japanese Government has instituted reforms to promote foreign investment in Japan.

Conditional National Treatment

As Parts III and IV of this report demonstrate, there is, at best, only limited convergence toward global norms regarding foreign direct investment, corporate governance, and the long-term financing of MNEs. Globalization of production and information systems has not led to harmonization of rules across nations, with the possible exception of international trade. Countries deviate from national treatment and comparable market access when national interests are believed to be at risk, such as national security and areas of strategic significance for economic development and competitiveness. [12]

12 "Areas in which foreign-owned companies are often treated differently include ownership of domestic firms, participation in national R&D and technology programmed and public procurement contracts. In addition, liberalising measures may be accompanied by reciprocity conditions under which foreign-owned companies are treated as domestic ones, only if other countries do the same. Such conditions are justified on grounds of increasing the openness of countries to foreign investment and creating a 'level playing field'. " R. Brainard, "Globalisation and Corporate Nationality," S7/ *Review (13):* 179, December 1993.

Proponents of conditional national treatment (CNT) contend that unilateral application of national treatment will not ensure the long-term vitality of the U.S. technology base and the industrial sectors that depend on it. When many global industries are characterized by increasing price competition, consolidation, and short-lived technological leadership, it is difficult to sustain competitive advantage in the face of large-scale asymmetries in market access, both for trade and investment. As one prominent analyst has suggested, foreign firms "may actually displace or deter the entry or expansion of American companies that might normally be expected to locate more of their production in the United States, thereby generating better jobs, more R&D, closer linkages with local suppliers, and more technical spill-overs." If a foreign firm "knocks out one or more domestic competitors . . . the final result may be a more oligopolized industry, where the remaining firms exercise significant market power."] [3]

Another aspect of CNT focuses on the principle of specific reciprocity. It stresses that MNEs must have the capacity to compete equitably across national borders. In this approach, U.S. government policies would condition the treatment of foreign companies in the United States on whether U.S. MNEs are treated comparably in the relevant countries with regard to imports and inward direct investment. Proponents of CNT point out that while the Trade Related Investment Measures under the new GAIT treaty, as well as the guidelines on investment issued by the Organisation for Economic Co-Operation and Development (OECD), are first steps toward an international investment regime, they are limited. Moreover, there are no multilateral agreements respecting other important areas such as corporate governance, finance, and competition policy.

In practice, this means that if foreign investors are to have the right to invest in the U.S. economy, then U.S.-based MNEs should also have the right to comparable access abroad. Reforms throughout Europe suggest that access for foreign investors to EU markets and research projects has improved significantly in recent years, although counter-examples still exist. The evidence, however, does not point to the same conclusion for Japan.[14]

Advocates of the CNT approach believe that if the United States continues to provide unfettered access to foreign-based MNEs despite foreign restrictions on U.S. firms, then U.S. policy favors foreign investors over domestic ones. In this view, asymmetric FDI can create an uneven playing field: foreign-based MNEs enjoy access to financing, technology, and markets that is denied to many U.S.-based MNEs. They argue that CNT is a highly flexible policy approach that can deploy a large number of instruments, such as performance requirements for investment, domestic content and export requirements, and program requirements for participation in publicly funded technology projects.

Congress has written the principle of CNT into a variety of laws over the past several years, and a large number of legislative proposals in the 103rd Congress contained similar provisions (see box 2-1). The CNT approach can be applied broadly as, for example, in the American Technology Preeminence Act, which permits participation in the Advanced Technology Program (ATP) only when the Secretary of Commerce finds "that the company's participation in the program would be in the economic interest of the United States, as evidenced by investments in the United States in research, development. . . ." It further provides either that:

> (i) the company is a United States-owned company: or (ii) the Secretary finds that the company is incorporated in the United States and has a parent company which is incorporated in a country which affords to United States-owned companies opportunities, comparable to those afforded to any other company, to participate in

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[13] L. D. Tyson, 'Why They Are Not US. Why American Ownership Still Matters," *The American Prospect* (4):37-49, winter 1991.

[14] For details see U.S. Congress, OTA, *Multinationals and the National Interest: Playing By Different Rules*, *op. cit.*, footnote 1.

BOX 2-1: Laws and Legislation Based on a Conditional National Treatment Framework

Conditional National Treatment Laws

1 "American Technology Preeminence Act," P.L. 102-245, including the "Technology Administration Authorization Act of 1991." H.R. 1989/S. 1034; 42 U.S.C., § 13525.
2 Defense Authorization Legislation, P.L. 102-484. H.R. 5006/S. 3114; 10 U.S.C., § 2491.
3 Defense Authorization Legislation, P.L. 102-190, comprised of the "National Critical Technologies Act of 1991" (S. 1327) and the "Advanced Manufacturing Technology Act of 1991" (S. 1328). 10 U.S.C., § 2491.
4 "National Cooperative Production Amendments of 1993," P.L. 103-42. H.R. 1313/S. 574; 15 U.S.C., § 4306.
5 "Stevenson-Wydler Technology Innovation Act of 1980," as amended (15 U.S.C., § 3710a).
6 "Bayh-Dole Act of 1980"; 35 U.S.C. Chapter 18, § 204.
7 "Energy Policy Act of 1992"; 42 U.S.C., § 13525.
8 Defense Appropriations, P.L. 103-139. H.R. 3116.

Conditional National Treatment Legislation being considered in the 103d Congress

1 "Aeronautical Technology Consortium Act of 1993," S. 419/H.R. 1675.
2 "National Environmental Technology Act of 1993," S. 978.
3 "National Competitiveness Act of 1993," H.R. 820.
4 "Defense Authorization Legislation;" H.R. 2401/S. 1298.
5 "Hydrogen Future Act of 1993," H.R. 1479.
6 "National Aeronautics and Space Administration Authorization Act;" H.R. 2200.
7 "Omnibus Space Commercialization Act of 1993;" H.R. 2731.
8. H.R. 249.
9. "Fair Trade in Financial Services Act of 1993;" S. 1527.
10. Authorizations for the "Earthquake Hazards Reduction Act of 1977;" H.R. 3485.

> any joint venture similar to those authorized under this Act; affords to United States-owned companies local investment opportunities comparable to those afforded to any other company; and affords adequate and effective protection for the intellectual property rights of United States-owned companies.

Consistent with this language, H.R. 1675, section (b), of the "Aeronautical Technology Consortium Act of 1993" defines an eligible firm as one that "conducts a significant level of its research, development, engineering, design, and manufacturing activities in the United States."[16]

Another bill, H.R. 820, goes beyond these requirements. It would amend the Stevenson-Wydler Technology Innovation Act of 1980 to define an eligible company as one that maintains substantial employment in the United States, agrees to manufacture resulting products here, and agrees to procure parts and materials from U.S. suppliers. In addition, it contains specific reciprocity provisions, requiring that the home country must afford U.S.-based MNEs comparable treatment to that found in the United States on a variety of terms. These include access to participation in publicly

15 American Technology Preeminence Act of 1991 (Public Law 102-245).

16 See U.S. Congress, House of Representatives, H.R. 1675, and Senate, S.419, *Aeronautical Technology Consortium Act of 1993* (Washington, DC: U.S. Government Printing office, 1993).

funded technology programs and to other national resources, the employment of transparent standards of regulation, provision of local investment opportunities, and the protection of intellectual property rights—all to same degree as found in the United States. [17]

Similarly, U.S. defense authorization legislation requires a participating foreign-based company to conduct a "significant level of its research, development, engineering and manufacturing activities in the United States" and have a foreign government that encourages the participation of U.S. companies in government-funded R&D consortia. [18] These kinds of policies emphasize performance standards, measures of reciprocity based on multilateral rules and, potentially, domestic content requirements for manufacturing. Those who favor a CNT approach would, accordingly, look critically at the R&D activities of foreign investors seeking to participate in publicly funded projects, rather than assuming positive spillover effects from their activities.

Some opponents of CNT legislation point out that this approach risks unintended consequences for American firms abroad. To the extent that U.S.-based firms are not currently constrained by comparable foreign regulation, CNT provisions in U.S. law increase the risk of retaliation. As an alternative, they suggest that ambitious new multilateral codes---covering, for example, investment, market access in key sectors, and acceptable business practice—be negotiated by countries willing to accept greater and measurable liberalization obligations. The codes themselves could then be opened to other countries, who would accept those obligations, and receive attendant reciprocal benefits, when they are ready to do so. (CNT is discussed further under the subheading, "Eligibility Requirements" below.)

POLICY ISSUES AND OPTIONS

The discussion of policy options that follows is the product both of the policy context addressed in the previous section and the major findings presented in chapter 1. It proceeds from a record of solid but limited progress in both bilateral and multilateral trade relations, interpreted against a backdrop of enduring asymmetries in market access, direct investment, and the way in which MNEs of different nations are financed and governed across the Triad. Chapter 1 describes three principal findings of this OTA assessment, which can be summarized as follows:

- MNEs develop core technology at home.
- Trade follows investment in the 1990s.
- Corporate governance and long-term financing diverge across the Triad.

Taken together, these findings suggest that the United States has a direct interest in the global success of U.S.-based MNEs, to the extent that such prosperity translates into more innovation and technology development in the United States. In this respect, all Americans stand to gain or to lose from the achievements of U.S.-based firms, particularly in the high-technology sectors that promise the greatest returns and the best jobs of the future. As suggested earlier, however, the definition of an American firm would not necessarily have to be based on a firm's country of origin or ownership. The nature of the contribution that the firm makes to the U.S. technology base and, ultimately, to the U.S. economy and standard of living, might turn out to be of greater importance.

Additional data and analysis on which these findings are based are presented in Parts II, III, and IV. Each of the findings suggests policy issues and options that Congress may wish to consider. These are presented below in separate sections.

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17 See U.S. Congress, House of Representatives, H.R. 820, *National Competitiveness Act of 1993* (Washington, DC: U.S. Government Printing Office, 1993), sec. 206, subsection 20, parts A, B, C, and D.

18 Department of Defense Authorization" Act (Public Law 102-484); National Defense Authorization Act for Fiscal Year 1992 and 1993 (Public Law 102- 190); and National Defense Authorization Act for Fiscal Year 1993 (Public Law 102-484).

MNEs Develop Core Technology at Home (Policy Implications)

Part II of this report analyzes the national innovation systems of the United States, Japan, and the European Union (chapter 3). It then assesses the contribution that MNEs make to those systems, focusing on where technology is developed and the extent to which it is diffused across national borders by MNEs (chapter 4). A key finding is that the technology innovation activities of MNEs remain highly centralized compared with their international production networks.

Government Promotion of Indigenous Technology

OTA's findings are consistent with efforts by the Congress over the past several years to support and maintain the U.S. technology base. U.S. policymakers have recently reemphasized what other countries have long recognized: to a very large extent, the health of the economy and its competitiveness rests on the strength of the national technology base. While this view is not new in the United States, it seemed less important during the quarter century following WWII, when U.S. technology led the world and U.S. military technology was in a class by itself.

The debate on the need for government support of the U.S. technology base stemmed largely from congressional concerns in the late 1980s about the relative decline of U.S. technology leadership, and the apparent inability of the executive branch to coordinate technology development funding in an efficient and effective manner. Beginning in the military field, in 1989 and 1990, Congress mandated that the Department of Defense produce a "Critical Technologies Plan" to identify and foster the development of key technologies that underpin U.S. national security and economic prosperity, and specifically to ensure the long-term superiority of U.S. weapon systems.] [9] At that time, the U.S. military budget associated with research and technology development amounted to approximately $10 billion.[20]

Although the initial emphasis focused on coordination of Department of Defense technology base programs, this approach was soon applied to broader economic concerns as reflected in another congressionally mandated review, this time a Department of Commerce study of ● 'Emerging Technologies" in 1990. Z In 1992, Congress created a National Critical Technologies Panel associated with the Office of Science and Technol - ogy Policy (OSTP). It was charged with identifying areas of technological development essential for the long-term economic prosperity and national security of the United States. Later that year, Congress established a National Critical Technologies Institute to support the Panel de] iterations and to coordinate its recommended actions.

In this way, a level of agreement was achieved not only on the need for technology promotion and coordination of U.S. government technology funding, but also on the technology areas in need of support.[22] By late 1993, the critical technologies perspective had worked its way into the White House and was endorsed by the President.[23] Further, the OSTP issued a plan to begin

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[19] Department of Defense, *Critical Technologies Plan for the Committees on Armed Services United States Congress* (Washington, DC: Department of Defense, March 15, 1990).

[20] This figure includes Department of Defense budget categories 6.1 through 6.3A. U.S. Congress, Office of Technology Assessment, *The Defense Technology Base: Introduction and Overview—A Special Report*, OTA-ISC-374 (Washington, DC: U.S. Government Printing Office, March 1988), p. 34.

[21] U.S. Department of Commerce, Technology Administration, *Emerging Technologies: A Survey of Technical and Economic Opportunities*, Spring 1990.

[22] National Critical Technologies Panel, *Report of the National Critical Technologies Panel* (Washington, DC: U.S. Government Printing Office, 1991). The National Critical Technologies Panel was appointed by the Director of the Office of Science and Technology Policy, Executive Office of the President.

[23] The White House, *Technology for Economic Growth: President's Progress Report* (Washington, DC: November 1993).

coordination of a large number of government-funded technology programs, including the Technology Reinvestment Project, the Advanced Technology Program, the Partnership for a New Generation of Vehicles (PNGV), the National Flat Panel Display Initiative, SEMATECH, Energy Department cooperative R&D agreements (CRADAs), and the Manufacturing Extension Partnerships, among others.[24]

Technology Funding and Foreign Economic Policy

Programs to promote the development of new technologies could constitute a strategic domestic response to long-term trade and investment deficits with some U.S. trading partners. But to do so, the range and focus of present programs would have to be changed in two ways. First, it would be important to ensure that they contributed to the national interest, while still extending national treatment to foreign-based MNEs; and second, they would have to be coordinated a good deal more efficiently than they are at present. These issues are, of course, intertwined, and each is addressed below.

With regard to the public interest, it is appropriate to ensure that technology benefits arising from participation in programs funded in part by government ultimately accrue to the U.S. taxpayer, who will be asked to foot part of the bill. The connection may not be easily measured, but it should be cast in terms of a contribution to the indigenous American technology base. In most cases, the recipients of public technology promotion funds will be corporations that match public funds on a 50-50 basis, bring extensive technology assets to the table, and help define the research to be undertaken. They have a right to benefit as well. However, the question of eligibility of U.S. affiliates of foreign-owned MNEs arises. Foreign affiliates argue that they provide jobs for hundreds of thousands of Americans and so should be eligible for participation. Conversely, a displaced auto worker from Michigan, whose job may not be restored, might not agree that his or her taxes should support foreign auto companies, for example, even if those companies employ thousands of Americans in other locations.

Eligibility Requirements

In recent years, Congress and the Administration have experimented with a variety of approaches to the question of eligibility. In the PNGV, participation is restricted to the Big Three U.S. auto makers, without the possibility of Japanese or European participation. In the ATP, Congress legislated a broad array of conditions, including reciprocal access for U.S. companies to similar programs abroad. In other programs the requirements are far less restrictive, and the question of foreign ownership is less prominent. In short, different programs take different approaches. As a result, an ad hoc and inconsistent body of law, executive orders, and administrative practices has built up over time, with little consensus among policy makers about who should be eligible for U.S. government technology funding.

In the interests of fairness and administrative consistency, Congress may wish to enunciate a single set of eligibility requirements that would apply to all U.S. technology promotion programs, with some few exceptions, perhaps requiring a presidential finding when national security interests are at stake. This could involve a national benefits test, with several constituent elements. Perhaps the most important element would be a requirement that companies receiving U.S. technology funds demonstrate a clear prior commitment to the U.S. technology base. Companies that could not point to existing R&D facilities and technology infrastructure in the United States, sufficient at a minimum to support the project in question, would not be eligible. It would be unnecessary to make national ownership a criterion for inclusion or exclusion for funding. Some foreign-based MNEs might be persuaded to develop

24 Ibid.

more technology in the United States if they thought they could benefit from participation in U.S. technology promotion programs.

As OTA suggested in the first report of this assessment, the answer to the policy question of what should constitute an American company is tied not so much to the ownership or home base of particular MNEs, but rather to how a firm affects the economy and standard of living where it operates. The purpose of a benefits test would be to ensure that firms receiving public funds contributed to the national interest. In this view, MNEs should be considered American, and therefore eligible, if and when they contribute in a meaningful way to technology innovation in the United States. Even though this approach stems from unilateral or national concerns, eligibility requirements could be written to be both consistent with the principle of national treatment, and legal under the terms of the new GATT Treaty and other international agreements.

The following criteria could form the basis of a test to determine the eligibility of both foreign-based *and* U.S.-based firms for all publicly funded R&D programs. No distinction based on national ownership would be necessary or appropriate, but each funding authority might employ the following conditions :[25]

1. A measure of R&D presence in the United States, perhaps as a percentage of U.S. sales, of global sales, or of the company's overall technology development budget;
2. A set of specific technological and financial contributions the company would make to the project;
3. An agreement on the part of the company to conduct all of the R&D funded under the project (or a negotiated percentage) in the United States;
4. A requirement that the country of origin of the MNE applying for funds afford reciprocal access to U.S.-based firms;
5. An agreement on the part of the company to manufacture a negotiated percentage of the final product(s) in the United States; and
6. In retum for proprietary rights, an agreement by the company not to license the technology abroad, but to pursue export of products resulting from the technology in lieu of licensing.

Should Congress decide to incorporate some or all of these points into legislation applicable to U.S. technology promotion programs, it would be important to do so in a way that did not discriminate unfairly against any firm, foreign or domestic. The test is whether the United States would be willing to see identical conditions applied to affiliates of U.S.-based companies by foreign governments. In addition, Congress might wish to grant limited waiver authority with respect to point number 1 (above) in cases where a company with insufficient R&D presence in the United States nevertheless proposed the development of a technology with extraordinary or unique potential. In that case, participation by the company could be made contingent on its agreement to develop the new technology jointly with at least one eligible U.S. partner.

Some analysts oppose reciprocity provisions (point 4 above), which typically require reciprocal access for U.S. firms to technology programs in the country of origin of the foreign-based applicant in question. While this approach is already contained in H.R. 820 and the authorizing legislation for the ATP, among others, it may present problems. First, technology innovation systems of the major trading nations in the Triad are configured very differently (see chapter 3), so much so that requiring equivalent reciprocal access may

[25] These criteria are ranked in ascending order of probable difficulty of implementation. Some analysts believe that item 5 would he inconsistent with U.S. treaty obligations under the NAFTA and GATT agreements. In addition, item 6 might expose some U.S. patents to compulsory licensing abroad.

not be feasible in practice, or might not achieve the intended result. In Japan, for example, comparatively little technology development is funded directly through government programs.

Second, if the approach was extended beyond eligibility for technology programs to include reciprocal opportunity for trade or investment abroad, some analysts believe there would be unintended consequences that outweigh any possible benefits. This might take the form of increased tensions in international economic relations, leading to a variety of retaliatory actions on the part of our trading partners. Congress nevertheless may wish to consider making participation by foreign-based MNEs contingent on comparable access by U.S.-based MNEs to foreign technology promotion programs. This would be only one of a range of policy instruments that could be deployed to rectify persistent trade and investment imbalances that built up during the 1980s and show little sign of receding in the 1990s. (These and other options are discussed below in the section on trade and investment.)

Coordination of Federal Technology Programs

If technology programs are to function, in part, to offset some of the trade and investment asymmetries that characterize economic relations in the Triad, they will have to be strategically coordinated. This fundamental insight lies at the heart of now long-standing congressional concerns referred to above as the critical technologies approach. But even after years of congressional prodding, the Department of Defense, for example, was unable to come up with a credible long-term plan to maximize the effectiveness of its technology base programs.[26] In 1991, when Congress mandated a review of critical technologies within the Executive Office of the President and created the Critical Technologies Institute, it sought to enhance the capability to coordinate technology promotion programs into a single strategic approach.

As OTA reported in early 1994, with respect to the $1.8 billion in federal energy and environmental technology programs, only a small portion is directed at commercial applications. In addition, although several agencies have mission-oriented programs, there has been little strategic direction, and funding agencies have seldom worked closely together to identify critical environmental problems or common technology priorities .27 With the exception of agriculture, federal expenditures on both military and civilian research and technology development have devoted scant attention to the commercialization of new technologies.[28]

Over the past 18 months, there has been an intense effort to coordinate federal R&D programs, emanating largely from a new National Science and Technology Council (NSTC). The Council was created by executive order to function as a government-wide coordinating body, to create visibility for technology policy, and to establish a single set of goals, priorities, and criteria to shape federal R&D programs. If successful, the NSTC would encourage greater centralization of the R&D funding process, and could help focus the

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[26] "The [Senate Armed Services] committee is deeply disappointed in the Defense Department's inability to provide a comprehensive plan addressing the development of technologies critical to the national defense. . . The continued inability of the Administration to rationalize the national science and technology investment program, and to prioritize technology base activities, detracts both from national security and, in a broader sense, from global economic competitiveness." United States Senate, Committee on Armed Services, "National Defense Authorization Act for Fiscal Year 1991 ," report 101-884 (Washington, DC: U.S. Government Printing Office, 1990), p. 179.

[27] United States Congress, Office of Technology Assessment, *Industry, Technology, and the Environment: Competitive Challenges and Business Opportunities*, OTA-ITE-586 (Washington, DC: U.S. Government Printing Office, January 1994), p. 291.

[28] See D.C. Mowery, '-The Challenges of international Trade to U.S. Technology Policy," in M.C. Hams and G.E. Moore (eds.), *Linking Trade and Technology Policies* (Washington, DC: National Academy Press, 1992), p. 124.

heretofore disparate funding priorities of a large number of agencies on a small number of nationally oriented policies and goals.[29] If, however, the budget priorities of the Council are significantly different from those of the historically separate funding authorities, then the Council is likely to encounter resistance that cannot be overcome within the Council alone.

Moreover, this effort alone does not constitute an effective national technology strategy. Rather, it is an important initial step to achieve greater cooperation among the various agencies of the U.S. Government that undertake R&D programs. As a creation of the executive branch, the Council lacks a clear legislative mandate. For that reason, any successes—whether in organization or in the implementation of an actual R&D strategy—achieved by this Administration could be easily abandoned by the next. Nevertheless, Congress may wish to pay close attention to the progress of the NSTC, chronicling its strengths and weaknesses. If it brings a greater degree of internal coherence and purpose to U.S. technology promotion programs, Congress may wish to consider legislation to give it greater institutional staying power. If, on the other hand, it does not yield results, there is much that can be learned in terms of the kinds of efforts to undertake next.

Many analysts argue that the most successful government-sponsored R&D occurs when the goals are clear, such as in the Apollo projector in the decades-long effort to design ever more sophisticated and powerful nuclear weapons at the national laboratories. Both programs achieved their stated objectives. These lessons suggest that efforts by government programs to increase U.S. competitiveness or push up national productivity will succeed to the extent they can be tied to clearly articulated national missions. They also would have to be embedded in a stable institutional structure, insulated from patronage and partisan forces.

This is not the first time that OTA has assessed the need for a strategic technology policy and the institutions required to sustain it. In 1990, OTA analyzed options to coordinate strategic technology policy and to set up a Civilian Technology Agency. Legislation was proposed to that end in both the 100th and 101st Congresses.[30] If Congress wishes to make technology promotion programs an instrument of economic strategy, it will have to provide both leadership and legislative impetus. Otherwise, the history of critical technologies suggests that individual government agencies are likely to direct their portion of technology funding in ways that make sense at the level of departmental priorities, but which do not cumulate into a national technology strategy.

Trade Follows Investment in the 1990s (Policy Implications)

As Part III of this report indicates, international trade and direct investment have become highly interdependent over the past decade, so much so that trade among affiliated companies now accounts for at least one-third of all U.S. merchandise trade. In our most important bilateral trade relationships, the balance of trade is highly correlated with the balance of investment. That is, where U.S. MNEs have been able to invest freely abroad, there is a rough balance in both IFT and merchandise trade; where the balance of investment has been highly skewed, there are large trade deficits. At a minimum, these findings suggest that U.S. foreign economic policy is too focused on trade and should give greater weight to issues associated with foreign direct investment. For example, steady devaluation of the dollar against

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[29] J.H. Gibbons and L.E. Panetta, Executive Office of the President, Memorandum for the Heads of Executive Departments and Agencies, "FY 19% Research and Development (R&D) priorities," May 6, 1994.

[30] For a comprehensive evaluation of these options, see U.S. Congress, Office of Technology Assessment, *Making Things Better: Competing in Manufacturing*, OTA-ITE-443 (Washington, DC: U.S. Government Printing Office, February 1990), pp. 32-35 and 71-89.

major foreign currencies should increase exports of U.S. merchandise goods. But it also reduces the ability of U.S.-based MNEs to make investments abroad, investments that may prove indispensable to opening foreign markets and selling U.S. products.

U.S. *Policy on Foreign Direct Investment*

As currently constituted, U.S. government policy does not recognize the strategic linkage between trade and investment. Minimal government attention and resources are devoted to foreign direct investment. The Committee on Foreign Investment in the United States (CFIUS) is the major government organization responsible for FDI. It is an interdepartmental committee that reviews prospective investments on military security grounds alone. There is no formal U.S. government review of the effect of FDI on U.S. trade, the U.S. technology base, U.S. industry, or other economic concerns. Accordingly, U.S. policy has not moved to increase the benefits of foreign investment for the U.S. technology base, either in terms of inducements to encourage FDIUS in research and technology development, or in terms of measures to discourage less desirable forms of direct investment.

Not all forms of investment by foreign-based MNEs are equally beneficial to the U.S. economy and technology base. OTA research suggests a hierarchy:

1. very beneficial investment in high-technology industries with substantial R&D and manufacturing operations in the United States;
2. intermediate investment in assembly operations using some U.S.-made parts and components;
3. **less** beneficial FDI in pure assembly or screwdriver operations, with less domestic value--added; and
4. least beneficial FDI in wholesale distributors for foreign-made components and finished products.

OTA interviews with managers of MNEs and analysis of macro-level economic data suggest that much of the surge in FDIUS in the late 1980s was concentrated in the last two categories. Given the increasing magnitude and importance of FDI, Congress may wish to reconsider U.S. policy. Several options follow.

Sustaining Unrestricted FDIUS

The analysis contained in Part 111 of this report (and in chapter 3 of the first report of this assessment) indicates that FDIUS offers indisputable benefits to the U.S. economy, both in terms of augmenting investment capital, and to a lesser extent by providing technology and jobs.[31] Those who favor this approach argue that the benefits are so great as to outweigh any costs. In the absence of foreign direct investment, they suggest, the same products would be imported to meet consumer demand, with the difference that the foreign capital and associated jobs would remain abroad. They are also concerned that any restrictions on FDIUS might risk adverse consequences, such as reciprocal restrictions on U.S. investment abroad or, in the extreme, disinvestment by foreign affiliates in the United States.

For these reasons, they advocate that the principles of national treatment and unrestricted FDIUS be sustained, even in the absence of comparable access for U.S. direct investment abroad. They point to ongoing efforts by foreign governments, notably Japan, to provide investment capital and temporary office space to U.S. companies seeking to establish a local presence. And they note that governments across Europe have made substantial progress in liberalizing their investment regimes in recent years. In this view, it

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[31] On the capital aspect, see E.M. Graham, "Foreign Direct Investment in the United States and U.S. Interests," *Science* 254(39): 1740-1745, Dec. 20, 1991.

would be counterproductive for the United States to send any signal regarding FDIUS that might reverse recent progress abroad. Instead, these analysts would minimize the application of the Exon-Florio provision, reducing executive discretion that they suspect may exert a chilling effect on potential foreign investors.[32] With respect to Japan, moreover, they advocate taking no action on the assumption that Japan is already slowly opening to investment, and market forces, particularly exchange rate fluctuations, will eventually redress the imbalance.

Multilateral Approaches

In the long term, it may be possible to seek comparable market access for investment through regional or multilateral investment codes. The recent conclusion of the GATT Uruguay Round included agreements on Trade Related Investment Measures (TRIMs). But FDI was not treated in a comprehensive manner, and multilateral rules respecting the conduct of FDI have not been established. Similarly, the NAFTA agreement involved extensive discussion about trade issues, but largely ignored investment. The same is true of the 1992 European economic integration initiative, where national governments retain competency over investment matters. The United States could seek first a North American regional agreement for investment, then mutual harmonization with other regional organizations such as the European Union.

Many observers conclude, however, that reaching multilateral agreements governing foreign direct investment will be a formidable task, particularly if extended to developing countries. However, at the beginning of the Uruguay Round of GAIT talks in 1986, agreement on trade-related aspects of intellectual property (TRIPs) was thought to be a distant possibility at best. And yet the TRIPs agreements were included in the GATT treaty signed in December 1993.

Addressing the Trade/Investment Deficit

A third policy approach focuses on the linkage between the U.S. trade deficit and the lack of equality of investment opportunity abroad. In a world where more than one-third of all trade is conducted among affiliated companies, exports and direct investment are intrinsically related. Advocates of this position point to the logical necessity of setting up a foreign subsidiary before conducting intrafirm trade (IFT) with it. The implication: in order to increase exports, and the high-quality jobs associated with them, U.S.-based MNEs will also have to increase investments abroad. In this view, the U.S. government should press Japan to improve investment opportunities for U.S. companies, and to that end, support the value of the dollar against the yen.

As the Japanese economy has demonstrated, Japanese FDI in the United States and East Asia has increased exports from Japan of high-quality parts, components, and finished goods. This has expanded employment, both in export-oriented Japanese firms and in their overseas affiliates. Some observers distinguish between low and high value-added jobs. The former, they contend, will inevitably shift to lower-wage areas due to the downward pressure on prices associated with overcapacity and global competition in a range of industries. It is therefore critical that U.S. policy reflect the strategic importance of keeping high value-added jobs at home, even if it becomes more difficult to retain those with low value-added.[33]

If the policy goal is to increase U.S. investment abroad in order to support U.S. exports and jobs, Congress and the executive branch might consider

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[32] Exon-Florio, a provision of the U.S. Omnibus Trade and Competitiveness Act of 1988, amended Title VII of the Defense Production Act of 1950 to provide the President with the authority to investigate and determine the national security impact of proposed or pending mergers, acquisitions, and takeovers by or with foreign persons.

[33] For a summary article on the effect of this problem on the German economy see F. Protzman, "Rewriting the Contract for Germany's Vaunted Workers," in *New York Times*, p. F5, Feb. 13, 1994.

measures to achieve comparable investment opportunities for U.S.-based MNEs. Such an objective at first requires a designation of countries in which barriers to investment exist, and then a plan for the most appropriate remedy. There are several distinct approaches among those who seek greater market openness for U.S. direct investment abroad, including monitoring developments in FDIUS and using policy instruments based on specific reciprocity (see below). Others believe that the requisite instruments are already available, such as Section 301 and Sections 1106 of the Omnibus Trade and Competitiveness Act.[34] Proponents advocate continued executive discretion to apply such instruments in a flexible and prudent manner; they oppose automatic or more assertive legislative measures. They are concerned that U.S. bilateral investment treaties with developing nations will be more difficult to negotiate if the United States imposes any form of investment strictures, even if directed only at advanced industrial nations within the OECD.

Monitoring Developments in FDIUS

Making informed policy choices and conducting successful negotiations in the complex fields of trade and investment require extensive data and analytic capabilities. However, U.S. government units broadly responsible for international trade and investment policy lack sufficient data and analytical capability to evaluate fully the contemporary trade and investment patterns of MNEs. Several of the executive offices with front-line responsibilities in this area told OTA they are unable to analyze interrelated flows of trade and investment around the world and, accordingly, cannot use that analysis to further U.S. interests. The Office of the United States Trade Representative (USTR), for example, employs only one full-time economist in these critical areas.

In addition, no executive agency performs a comprehensive analysis of FDIUS, except for purposes of military security, and none is charged with formulating a strategy to maximize the value of FDI to the United States. The United States does not collect systematic data on global FDI or global technology transfer. U.S. embassies abroad undertake only limited activities in this area. The Department of Commerce, Bureau of Economic Analysis (BEA), does conduct extensive surveys of foreign direct investment in the United States and U.S. direct investment abroad. These were indispensable in conducting the analysis for this report. But these surveys are not designed to assess a range of important trends in trade, investment, and technology transfer, or to analyze the implications of foreign direct investment in the United States.

In recent years, funding for BEA and other economic data resources within the U.S. government has not reflected the increasingly global character of the economy and the corresponding surge in international trade and direct investment. This has diminished the ability of the United States to conduct analysis to support sound foreign economic policy. If Congress wishes to put U.S. negotiators on a more equal footing with their European and Japanese counterparts, it could increase funding for economic analysis and data collection, specifically related to assessing trends in global trade, direct investment, and the transfer of technology.

Congress may also wish to consider reorienting the data collection priorities of the BEA and related offices. It would, however, be unwise to diminish or to increase significantly the funding of existing U.S. government data resources without first examining their mandates for relevancy to the more global economy of the 1990s. For this reason, Congress may wish to mandate a study of U.S. government offices that collect trade and investment-related data; it would assess their missions, methodologies, cross-agency coherence, and the adequacy of their funding to support U.S. negotiations and policy makers.

As trade among MNEs comes to dominate the international economy, understanding the patterns and purposes behind global FDI becomes

34 Omnibus Trade and competitiveness Act of 1988 (Public Law 100-418).

more important. As noted earlier, since 1980, world stock of FDI has increased by over a factor of four to reach $2.0 trillion (in nominal dollars) in 1990. This has transformed economic relations among the advanced industrial nations and has profound implications for the developing world as well.

Because the phenomenon of FDI is here to stay, and will continue to influence our economic well-being, Congress may wish to consider creating an Office of Foreign Direct Investment, perhaps reporting to the National Economic Council or within the Department of Commerce. Such an office could assess trends in FDI on a global basis and recommend U.S. policy based on trends and forecasts. It might also recommend policies to induce favorable forms of FDI in the United States.

As an interim step, Congress might consider commissioning a study to make recommendations concerning the scope and powers of such an Office. This study could specifically address the following issues: whether the Office of Foreign Direct Investment would combine existing resources for data collection and analysis with new ones; whether it would conduct systematic monitoring of FDIUS; the extent to which it would also monitor U.S. direct investment abroad and investment by foreign-based MNEs in third countries (i.e., not the United States and not the country of origin); and whether it should be charged to adjudicate FDIUS cases, based on their contribution to or adverse impact on the U.S. technology base and economy.

Specific Reciprocity

Yet another approach appeals to the principle of obtaining compliance with the terms of bilateral or multilateral agreements though the implicit threat of reciprocal action. Proponents believe such a policy could be used to condition continued national treatment on the ability of U.S.-based MNEs to obtain comparable access abroad for trade, investment, and/or participation in government-funded technology promotion programs. A number of bills containing elements of specific reciprocity have been passed or proposed in recent Congresses. (For examples, see box 2-1 above in the section on conditional national treatment.) If Congress wished to take an even more aggressive stance in this area, legislation could be written to:

1. Make foreign MNEs eligible to participate in U.S. technology promotion programs only on the condition that U.S.-based MNEs receive reciprocal treatment abroad, on a country-by-country basis;
2. Require that U.S. companies be afforded adequate and effective protection in the area of intellectual property rights abroad, and apply sanctions in cases where they are not;
3. Require access to equity markets and trade associations for U.S.-based MNEs abroad, comparable to those available to foreign affiliates in the United States.

If bilateral and sectoral imbalances persist despite these and related policy measures, Congress may wish to consider other options. For instance, Congress could mandate screening of FDIUS from an economic security perspective, or it could condition new investments by foreign companies in the United States on reciprocal and comparable investment opportunities (or levels of U.S. investment) abroad for U.S.-based MNEs. However, many analysts believe that these options would lead to unforeseen and probably undesirable political and economic consequences.

In its strongest form, legislation could be designed to empower U.S. firms to bring claims against nonconforming nations (or firms) before the International Trade Commission or another designated adjudicatory body, similar to the process now employed with antidumping suits against foreign imports. Failure to cooperate or implement settlements could, in the extreme case, lead to a variety of retaliatory measures, such as applying a tax or other sanctions to foreign affiliates already operating in the United States, until U.S. firms achieved comparable investment access in the country in question. Few analysts endorse this approach because of its highly coercive and unilateral elements.

I Corporate Governance and Finance Diverge Across the Triad (Policy Implications)

As chapters 7 and 8 suggest, structural differences in corporate governance and corporate finance are likely to persist across the Triad. Structural convergence—the unspoken assumption behind the traditional American approach to trade and investment frictions—is a long-run prospect at best. Japanese and German forms of corporate governance in their purest forms are probably not suitable for the United States, even if current policy impediments were not present. In addition, even a cursory review of American corporate history indicates that American business is unlikely to conform to the Japanese model and adopt a broadly shared sense of the national interest.[35] Nor is American business culture likely to adapt to a German-style system that depends upon a mutual sense of intimacy and trust among key stakeholders, including employees. To a considerable extent, the success of such systems depends upon social mores that sometimes render acceptable the subordination of consumer interests, executive salaries, and immediate shareholder returns. Similarly, the prospects for Germany or Japan moving toward the American model are limited.

American Corporate Governance in a Global Business Environment

The system of American corporate governance developed mainly in reaction to the need for stable contracting arrangements in uniquely decentralized markets, as well as in response to actual or perceived abuses of power by corporate managers, bankers, and shareholders.[36] The consequences are reflected not only in our system of corporate governance, but in such policy areas as antitrust, which differs in both overt and subtle ways from its analog in Japan or from what Europeans call competition policy (see appendix C).

In a world where core technological competencies often remain close to the headquarters of leading MNEs, systems of corporate governance that encourage long-term thinking and enable the pursuit of strategies that subordinate immediate returns to long-term market position can have vitally important national implications. In fields where American corporations have ceded markets to competitors based in other nations, for example in parts of the electronics sector, the task of building the critical mass required to regain a place at the frontier of innovation will be daunting.

Such observations are part of the background now, as national debates continue over the organization of American business, the time-horizons and salaries of American executives, and the international competitiveness of the U.S. technology base. Many of the inadequacies identified and agreed upon may imply domestic adjustments.[37] Given historical patterns, however, it would be surprising if internal changes in the American system happened quickly or predictably.

Responding to Different Systems of Corporate Governance

Our basic system of corporate governance must itself be competitive. But to the extent that enduring differences in corporate governance systems and competition policy effectively subsidize foreign MNEs or protect them from competition in their home markets, American trade and investment policies may need to be reconfigured to enable compensatory responses. Because objective judgments are required in this regard, and because uni -

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35 On the Japanese case see R.J. Samuels, *"Rich Nation, Strong Army": National Security and the Technological Transformation of Japan* (Ithaca, NY: Cornell University Press, 1994).

36 See M. Roe, "A Political Theory Of American Corporate Finance," *Columbia Law Journal 91 (I): 10-67,* Jan. 1991. Also see O.E. Williamson, *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting (New* York, NY: Free Press, 1985); and W. Adams, *The Structure of American Industry* (London, UK: Macmillan, 1982).

37 The Competitiveness Policy Council, created by Congress in 1988, has commissioned a task force to examine particular aspects of the American system of capital allocation. A report is expected by early 1995.

lateral responses would risk disproportionate retaliation, many analysts believe that a multilateral approach to such policy reconfiguration would be preferable. To prepare the groundwork for multilateral negotiations on corporate governance or competition policy arrangements that impede comparable market access across the Triad, Congress may wish to consider mandating the Office of the United States Trade Representative or the Commerce Department to examine the issue in more depth. Such an examination could concentrate on critical technology industries. It might look, for example, at the effects of stable cross-shareholding arrangements and other aspects of corporate governance or competition policy that create sanctuary markets and effective cartels in specific industries.

Competitive advantages that may result more from enduring national traditions than from artificial governmental manipulation may have the effect of subsidizing overly aggressive corporate strategies. This might occur when the world market share of firms based in one country increases rapidly in a competitive, technologically intensive sector. To reverse such a development, companies must be able to compete in the home markets of such firms. To the extent this is precluded by unique systems of corporate governance that make it problematic to investor acquire critical mass in those markets, those systems could be defined as implicit trade barriers or implicit subsidies. A reasoned estimate of the value of such practices might provide the basis for negotiating offsetting trade and investment rules. If, for example, corporate governance structures in Japan make it too costly for foreign-based MNEs to invest in production and distribution facilities in Japan, but their Japanese competitors can readily establish or acquire their own facilities abroad, and if trade and technological innovation now follow investment, those structures themselves become legitimate issues for multilateral negotiation. The analytical foundations for such negotiation require much more work.

Improving Transparency

Congress may wish to consider measures to increase the transparency of the underlying governance structures of foreign corporations operating in the United States. The Internal Revenue Service (IRS) tries to understand the financial effects of governance structures when foreign firms begin to generate income in the United States. Likewise, the Securities and Exchange Commission requires that foreign firms listing their stocks on American exchanges meet disclosure requirements that approximate those for public companies in the United States. The right of publicly held foreign firms to conduct operations in the United States, for example, might be made conditional on meeting standards of financial disclosure comparable to those of publicly held U.S. firms.

Harmonizing Divergent Accounting Rules

Accounting standards could work in a similar fashion. Mindful of the impact on competitiveness of the interaction between traditions of corporate governance and national accounting rules, governments and professional bodies around the world have pursued the complex challenge of accounting rule harmonization. Aside from the substantive issues involved and the plausible arguments used to justify specific national rules, the harmonization agenda is complicated by the fact that government agencies do not always establish accounting standards.

In the United States, the Financial Accounting Standards Board established in 1973 by the American Institute of Certified Public Accountants, sets the standards. The SEC, IRS, and other agencies of the government certainly have critical impact on the work of the Board, but it is most often indirect. In Germany and Japan, government offices play the key role in standard setting. Consequently, international work on accounting harmonization has been pursued in a number of public and private arenas, the most important being the United Nations, the OECD, the European Com-

munity, and the (private) International Accounting Standards Committee. The SEC has been active for many years in promoting international harmonization.

The comparative analysis presented in Chapter 7, however, suggests that institutional differences are not the only impediment to true harmonization. Accounting differences are rooted in idiosyncratic systems of corporate governance, which themselves reflect diverse social and cultural priorities. OTA research in Germany and Japan bears out the view that hidden reserves, the lack of balance sheet transparency, the treatment of R&D expenditures, and other practices that can create competitive advantages for firms, continue to be perceived as quite functional and even necessary-especially during periods of recession or slow growth. Once again, such issues will come under scrutiny as multilateral rules governing trade and investment are reshaped in the years ahead.

In considering the public policy environment within which MNEs compete, a key issue centers on our inadequate knowledge of the competitive consequences of national accounting systems. Both inside and outside government, policy-relevant research is still at an early stage. Congress may want to accelerate that research by providing the SEC with a mandate to assess the competitive consequences of such differences. In addition, because accounting principles and corporate tax issues are closely related, Congress may wish to link such research to ongoing work by the IRS on the taxation of foreign and U.S.-based MNEs.

Harmonizing Financial Rules

As in the field of corporate governance, differences in underlying national financial structures become more important when MNEs compete directly in one another's home market. To the extent that competitive problems occur in particular industrial sectors, Congress may again want to reconsider efforts to promote convergence in those structures.

With convergence in mind, one option may be to revisit the issue of expanding the powers of American financial institutions to match the powers held by leading competitors abroad. When Congress next reviews the Glass-Steagall provisions of the Banking Act of 1933, for example, it might reconsider the barriers between commercial and investment banking in the United States. Those barriers have been allowed to erode somewhat in recent years, but they continue to have an important impact on the structure of American financial markets. It is timely to complement traditional and enduring concerns about the safety and soundness of those markets with consideration of the impact of that structure on the international competitiveness of critical technology industries. Universal banking, whereby individual banks combine commercial and investment banking capabilities, may not fill the financing gaps often noted in the development and commercialization of new technologies in the United States. Nevertheless, since many of' our major trading partners either have universal banking systems in place (Germany, Switzerland, Austria) or are now moving in the direction of universal-type systems (Canada, Britain, France, Japan, Italy), structural differences between American financial markets and others are likely to become more pronounced in the years ahead. We need abetter understanding of the effects of such differences on the international competitiveness of promising industries.

In a similar vein, Congress may wish to reconsider the issue of ownership linkages between banks and commercial enterprises. Like the Banking Act of 1933, the Bank Holding Company Act of 1956 might be reviewed in a global context. Since the 1930s, concerns about the safety and soundness of the banking system have limited the scope for American banks, and later bank holding companies, to take significant equity positions in nonfinancial corporations. Constraints having a similar effect do not exist in either Japan or Germany. This policy asymmetry matters now when some German and Japanese MNEs are world leaders in important technology-intensive sectors. To the extent that stable bank shareholders give them an advantage over American-based rivals, a case may be made for relaxing traditional legal

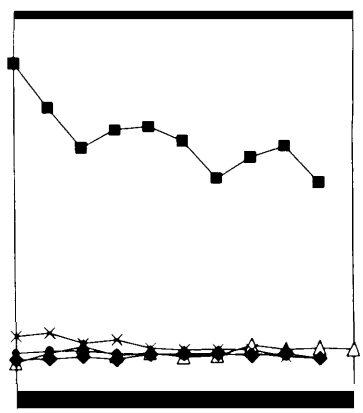
constraints. The issue requires further analysis on a sectoral basis. (See chapter 8 of this report for additional background.)

If adequate convergence across national financial systems in the near term is not feasible, Congress may want to develop new multilateral approaches to competitive problems at the level of the firm. Once again, this may depend upon bringing investment issues to the fore in trade negotiations. Enduring financial structures that either provide long-run advantages for particular firms or constrain fair competition do so primarily through their effect on inward investment. New rules aimed at comparable market access across the Triad may be needed to counter such effects. For example, accession to future multilateral investment and market access agreements could be conditioned upon conformity to common standards of financial disclosure and other business practices. Congress may wish to ensure that the negotiation of such rules is a key objective on the nation's trade policy agenda.

Part II: National Technology Innovation and Multinational Firms

Multinational enterprises (MNEs) are critical to the U.S. technology base. The most technologically sophisticated and economically significant sectors of the U.S. economy are marked by high degrees of foreign direct investment (FDI), global production, intrafirm trade (IFT), and complex forms of international financial and technological collaboration.[1] These sectors, including but not limited to semiconductors, electronics, chemicals, pharmaceuticals, telecommunications, and autos, are also marked by increasingly high research and development (R&D) requirements. The location and character of technology development by MNEs shapes the basic structure of competition and competitive advantage in these and related sectors.[2]

The analysis in Part 11 centers on a basic tension facing policymakers concerned with the U.S. technology base. Large firms are an important source of national innovative capacity. However, they are increasing y multinational, deploying strategies based on global economic and technological calculations. MNEs can and do move manufacturing plants, financial resources, technological assets, and even R&D activities on a global basis in response to international business opportunities. While policy makers are



[1] For an overview of the principal activities of MNEs, see: OTA, *Multinationals and the National Interest: Playing by Different Rules*, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993).

[2] In a number of sectors and important technologies, innovation by small and medlun~-sized enterprises is very robust and extremely important to the U.S. technology base. In the aggregate, however, large firms conduct the bulk of R&D activities in private enterprise. This assessment focuses exclusively on the activities of MNEs and the unique policy considerations they engender.

concerned primarily with the long-term health and regenerative capacity of the national technology base, MNEs are concerned primarily with the more immediate international competitiveness of the enterprise. The central challenge facing U.S. policy makers is to deploy national technology policy in a way that encourages the innovative activities of MNEs and, at the same time, directs the benefits of those activities to the U.S. economy and technology base.

In the aggregate, the innovative activities of MNEs remain highly centralized. Despite the globalization of production and the international availability of technologically intensive products, the means to innovate and generate new technology remain relatively localized in the home markets of MNEs in the advanced industrial states. In many respects, however, the globalization of production and commerce has expanded the international scope of technology. MNEs are conducting more research abroad and are transferring increasing amounts of technology across national borders. In addition, reduced transportation and communication barriers have promoted the rapid diffusion of new technologies in the form of technologically intensive goods and services.

Nevertheless, core technology development remains rooted in the parent operations of MNEs, which are themselves embedded in national and often subnational innovation systems. Consequently, assessing the technology development activities of MNEs and their significance for national competitiveness and technology policy requires understanding the structure and performance of the national innovation systems in which they base their global operations. To address these complex relationships, the analysis in Part II is conducted in two stages. Chapter 3 compares the distinctive structural features of national innovation systems across the advanced industrial nations. It also analyzes the most recent aggregate R&D and patenting data in order to compare the basic performance of each system, and to understand the critical role of business enterprises in those systems. Chapter 4 analyzes the technology development activities of MNEs. It focuses on where firms develop new technology and the extent to which they diffuse technology globally, as measured by overseas R&D activities, international technology trade, and trends in international technical alliances.

The evidence considered in Chapters 3 and 4 supports the following principal findings.

FINDINGS

1. Trends in both R&D spending by MNEs and technology trade indicate that technology development generally remains rooted in distinct national technology bases. At the same time, MNEs are a principal mechanism behind the globalization of technology. Higher rates of external patenting, more rapid diffusion of technology across borders, increasing rates of overseas R&D activity, and the growing prevalence of international technical alliances all point in this direction. However, close analysis of these trends indicates that the degree of internationalization is still relatively low.
2. Overseas R&D by affiliates remains quite limited when compared to both the R&D activities of the parent group and the more extensive internationalization of production and sourcing (see figure 4-9 in chapter 4). MNEs typically centralize basic research and product development in the home market. Research oriented toward customization and production process technology moves offshore slowly, as overseas production units become more deeply integrated into local markets. Only rarely do companies transfer or acquire basic research functions abroad.
3. Similarly, U.S. royalties and license fee data indicate that the majority of international technology trade takes place within MNE networks, and that technology flows principally from MNE parents to their overseas affiliates (see figures 4-12 and 4-13).
4. National innovation systems vary significantly across the Triad. The institutional structure of the Japanese and German innovation systems favors commercially relevant innovation within industry, while the structure of the U. K., French, and especially U.S. innovation sys-

terns gives more emphasis to defense and dual-use technologies, with weaker support for commercial technology development.

5. Across the advanced industrial states, industry conducts the largest percentage of national R&D, ranging from 59.2 percent in France to 71.4 percent in Germany (see figure 3-1 in chapter 3). However, recent trends show substantial variations across nations in the level of R&D investment by private enterprise. Although there have been large annual variances, between 1981 and 1992 business-financed R&D expenditures in Japan grew at an average rate of 8 percent. The average growth rate for U.S. firms was 3.9 percent, while industry-financed R&D in the France, Germany, and the United Kingdom, grew at average rates of 4.6, 3.9, and 1.6 percent, respectively (see figure 3- 13). In the context of comparatively short investment time horizons, U.S. firms are less likely to maintain long-term R&D investments than are many of their counterparts in Japan and Europe.
6. The nature and degree of overseas technology development and diffusion associated with MNEs varies by national origin as well as by industry sector. Aggregate patterns indicate that the magnitude and intensity of overseas R&D is the highest both for U.S. affiliates in Germa n y and the United Kingdom and for German and U.K. affiliates in the United States.[3] The magnitude and intensity of overseas R&D is the lowest both for U.S. affiliates in France and Japan and for French and Japanese affiliates in the United States (compare figure 4-2 with 4-7, and figure 4-5 with 4-8).
7. Approximately half of all R&D and 81 percent of the manufacturing R&D conducted by foreign affiliates in the United States is concentrated in three sectors-chemicals, pharmaceuticals, and electrical and nonelectrical machinery. German affiliates in the United States consistently have had the highest R&D intensity, which reflects the concentration of German affiliates in chemicals and pharmaceuticals (typically sectors with high ratios of R&D to sales). The comparatively low R&D intensity of Japanese affiliates in the U.S. reflects the relatively low percentage of Japanese foreign direct investment in the United States (FDIUS) directed to manufacturing. In 1992, 19 percent of Japan's FDIUS was in manufacturing industries and 34 percent in wholesale trade, compared with 47 percent and 8 percent, respectively, for European FDIUS.
8. Japanese firms acquire U.S. technology through different channels than European MNEs. Japanese firms buy an unusually large percentage of U.S. technology from unaffiliated firms. Since arms-length transactions impart a higher degree of control to the purchaser, Japanese firms in the aggregate retain a proportionately higher degree of control over the technology they purchase from the United States than do European firms. In addition, Japan accounts for over half of the U.S. trade surplus in industrial process technology (see figure 4-15). These patterns are consistent with the oft-noted tendency of Japanese firms to acquire overseas technology by buying it directly rather than by initiating R&D activities in foreign markets.

[3] R&D intensity is the ratio of R&D expenditures to sales, It is a standard measure for comparing the relative technological intensity of firms.

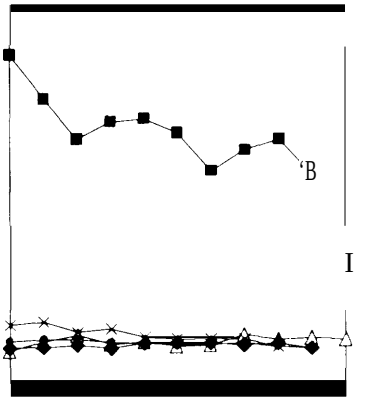
The U.S. Technology Base in Comparative Perspective

3

Despite recent trends in the internationalization of technology, most core innovative activities of MNEs remain centralized in distinct national innovation systems. ' This chapter compares the structure and performance of the U.S. innovation system with those of other advanced industrial nations.

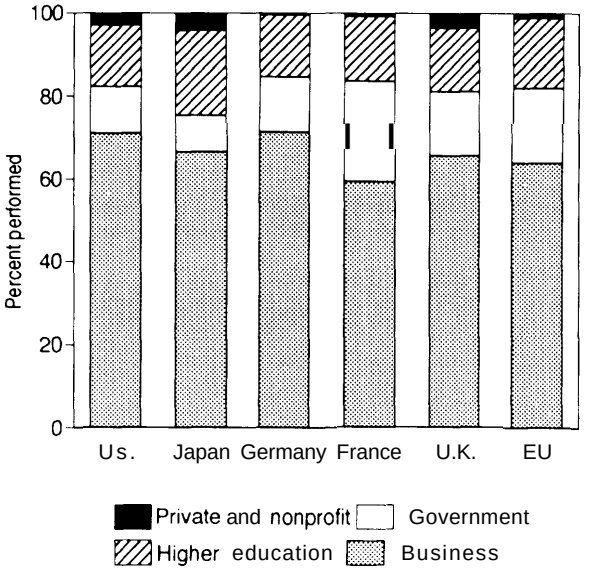
The first half of the chapter examines the principal structural features of each innovation system, which on the whole indicate that the German and Japanese innovation systems are much more oriented toward commercial technologies, while the French, U. K., and especially the U.S. systems direct considerable institutional and financial resources to defense technologies. The French, U. K., and U.S. systems are also characterized by higher degrees of public sector R&D spending and comparatively high levels of foreign funding of domestic R&D, while the German and Japanese systems rely primarily on the domestic private sector for financing national R&D.

The second half of this chapter chronicles recent performance trends across national innovation systems, focusing in particular on the aggregate R&D activities of business enterprises. This section illustrates that the U.S. innovation system remains strong in many respects, but its performance is undercut by comparatively weak R&D investment rates by U.S. businesses, as well as by the



[1] The term "national innovation system'" refers to (he broad set of institutions that shape the ability of national firms to develop, commercialize, and diffuse new product and manufacturing process technologies. See R. Nelson (cd.), *National Innovation Systems: A Comparative Analysis (New* York, NY: Oxford University Press, 1993); and G. Dosi, et al., *Technical Change and Economic Theory* (London: Pinter Publishers, 1988).

FIGURE 3-1: Gross Expenditures on R&D: Performance by Sector, 1981-1992 Average



NOTE: European Union data are averages of all EU member states

SOURCE OTA, based on data in Organisation for Economic Co-operation and Development, Economics Analysis and Statistics Division Database, Main *Science and Technology Indicators,* number 1, tables 17-20, May 1994 (hereafter cited as OECD,*STI,* (1), table number, May 1994)

large level of national R&D resources directed to defense technologies.

NATIONAL INNOVATION SYSTEMS: STRUCTURAL DIFFERENCES

Analysts have long noted fundamental differences in the ways nations pursue technological development. Technology policy in the United States often has been described as mission-oriented, in which public resources are directed toward singular, radical innovations designed to achieve prominent national goals—as has been the case in defense, space, and health technologies. The United Kingdom and France also have mission-oriented innovation systems, with a similar orientation toward defense technologies. By contrast, Germany has structured its technology policy to be more diffusion-oriented, where policy facilitates incremental adaptation to change by encouraging the diffusion of new technology throughout the industrial structure. Japan's innovation system is unique among Organisation for Economic Co-operation and Development (OECD) nations, displaying both mission-oriented and diffusion-oriented characteristics.[2]

These different styles of technology policy reflect important differences in the institutional structure of national innovation systems. The following analysis is divided into three sections, each of which examines a principal structural characteristic of national innovation systems: first, which components of the system (e.g., government, business, university) perform most R&D activities; second, which components finance national R&D activities; and third, which technologies or sectors the system emphasizes.

Sectoral Performance: Who Conducts Research

Across the advanced industrial states, R&D is conducted mostly by the business sector, although the level varies from a low of 59.2 percent in France to 71.4 percent in Germany (see figure 3-l). The percentage of U.S. R&D conducted by business (71 percent) is close to that of Germany, while business conducts slightly lower levels of R&D in Japan and the United Kingdom (66.5 and 65.4 percent, respectively). The percentage of R&D conducted by government ranges from a high of 24.6 in France to a low of 9 in Japan. The United States and Germany have fairly similar levels of governmental R&D activity, respectively accounting for 11.4 and 13.4percent of national R&D. In Japan, the higher education sector and the nonprofit private sectors account for relatively high proportions of national R&D (20.3 percent and 4.2 percent, respectively). Higher education

[2]For a discussion of the distinctions between mission-oriented and diffusion-oriented technology policies, see H. Ergas, "Does Technology Policy Matter'?" in B.R. Guile and H. Brooks (eds.), *Technology and Global industry: Companies and Nations in the World Economy* (Washington, DC: National Academy Press, 1987).

elsewhere accounts for approximately 15 percent of national R&D, while the private nonprofit sector ranges from 3 percent in the United States to 0.5 percent in Germany.

The percentage of total R&D performed by each sector provides a basic measure of the raw magnitude and importance of each sector to its respective national innovation system. However, the measure does not fully capture the importance of each sector to the innovative capabilities of each nation, for four reasons. First, the indicator does not account for the quality or significance of R&D; consequently, some sectors may appear more or less significant than they truly are. For instance, higher education in the United States conducts less than 15 percent of all R&D, but the quality and significance of R&D conducted in U.S. universities are widely considered to be unparalled.[3] Similarly, higher education in Japan accounts for a larger percentage of national R&D than in other advanced industrial states, but the quality and import of Japanese university research is regarded as comparatively weak.

Second, the indicator does not provide information on the character of R&D conducted in each sector. For instance, over half of the governmental R&D in the United States has focused historically on defense technologies.[4] By contrast, governmental R&D in Japan is directed almost exclusively toward industrial technology development.

Third, the measure does not account for the depth and breadth of linkages across sectors, which can affect national innovative capabilities. For instance, strong links between U.S. universities and U.S. industry are critical to the productivity of the U.S. technology base.[5]

Finally, each sector can affect national innovation performance not only by conducting R&D directly but also by financing national R&D efforts. The following section confirms an important observation indicated by figure 3- l—that government plays a significant role in the innovation systems of the United States, France, and United Kingdom, and a comparatively weak role in Japan and Germany.

Financing Patterns: Who Pays for Research

Business and government typically fund most national R&D expenditures. However. business plays a proportionately stronger financing role in Japan and Germany, while government plays a proportionately stronger role in the U. S., France, and the United Kingdom (see figure 3-2).[6] In Germany and Japan, industry finances 61.1 percent and 68.6 percent (respectively) of all national R&D, while government funds a comparatively low 36.8 percent in Germany and 21.5 percent in Japan. In the United States, the government has consistently funded nearly half of all R&D expenditures; only France and, to a lesser extent, the United Kingdom have similarly weighted government sectors. Industry finances approximately 50 percent of total R&D in the United States, and slightly less in France and the United Kingdom. There are similarly pronounced variations in the percentage of gross R&D expenditures financed by foreign sources, ranging from a high of 5.7 and

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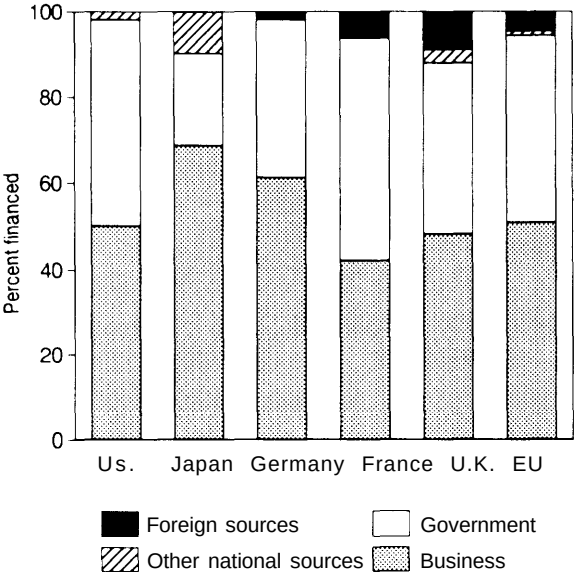
[3] See D.C. Mowery, "The Challenges of International Trade to U.S. Technology Policy," in M.C. Harris and G.E. Moore (eds.), *Linking Trade and Technology Policies: An International Comparison of the Policies of Industrialized Nations* (Washington, DC National Academy Press, 1992); Ergas, op. cit., footnote 2; and Nelson, op. cit., footnote 1.

[4] For additional analysis of this point see the section on gross expenditures on research and development in this chapter. See also J. Alic, et al., *Beyond Spinoff: Military and Commercial Technologies in a Changing World* (Boston, MA: Harvard Business School Press, 1992).

[5] See National Science Board, *Science and Engineering Indicators—1993* (Washington, DC: U.S. Government Printing Office, 1993). pp. 116-127.

[6] Figure 3-2 portrays direct R&D outlays by government, business. foreign sources, and other national sources. R&D also can be supported through indirect channels, such as government procurement practices. Indirect funding mechanisms are, by nature, difficult to measure.

FIGURE 3-2: Gross Expenditures on R&D: Financing by Source, 1981-1992 Average



NOTE: European Union data are averages of all EU member states

SOURCE OTA, based on data in OECD, *STI,* (1), tables 13-16, May 1994

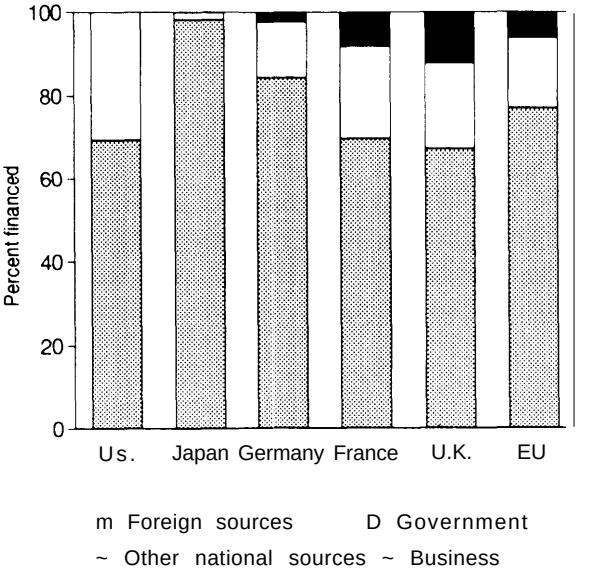
9.1 percent in the United Kingdom and France to a low of 1.6 and 0.1 percent in Germany and Japan.

Patterns in the financing of business expenditures on R&D-as distinct from total national R&D—also reflect differences in the weight of each sector across national innovation systems. As illustrated in figure 3-3, business finances nearly all of its R&D in Germany and Japan (84.3 and 98.2 percent, respectively), while government funds much of the business R&D in the United States (30.7 percent), France (22.2 percent), and the United Kingdom (20.6 percent). Similarly, foreign sources finance little business R&D in Germany and Japan (2. 1 and 0.1 percent, respectively) but have greater impact in France and the United Kingdom (8.1 and 12.3 percent).

The comparatively large financial contribution of the U.S. government to business R&D indicates that corporate R&D in the United States is less financially self-sufficient than in other advanced industrial countries. In essence, this data implies that U.S. businesses may be less able to independently finance and pursue long-term technology development strategies, relative to their competitors across the advanced industrial countries. In addition, the greater financial self-sufficiency of business R&D in Germany and Japan may indicate that corporate R&D in these two countries is comparatively more self-contained and difficult to access through channels other than direct industry contacts.

Moreover, variations in funding source may stem from differences in national attitudes toward technology development. For instance, the U.S. government funds nearly half of all business R&D, but U.S. business receives little public sector assistance for technology diffusion. With the exception of agriculture and, to a certain extent, health, federal expenditures on both military and civilian research and technology development

FIGURE 3-3: Business R&D: Financing by Source, 1981-1992 Average



NOTE European Union data are averages of all EU member states

SOURCE OTA, based on data in OECD, *STI, (1),* tables 32,35-37, May 1994

have "devoted virtually no attention or resources to support. . . the adoption of new technologies."[7]

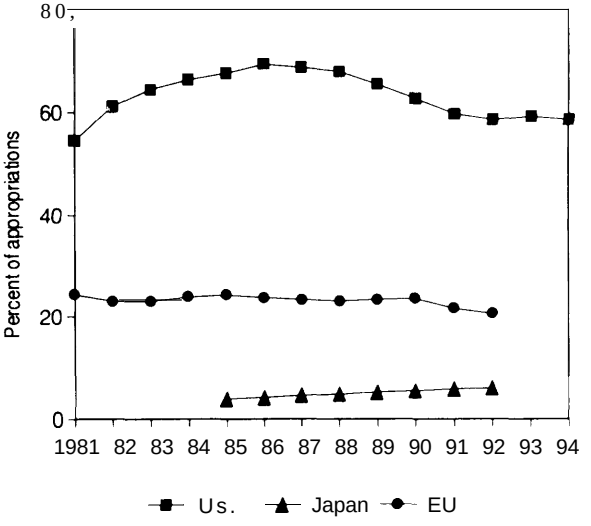
In addition, the U.S. innovation system has a pronounced orientation toward defense technologies. During the 1980s and early 1990s, the defense sector received an average of 63 percent of all U.S. government outlays for R&D, compared to an average of 23 percent for the European Union (EU) and a mere 5 percent for Japan (see figure *3-4).* In the proposed fiscal year 1995 federal budget, defense-related R&D spending comprises 54 percent of federal R&D budget authority; the budget proposes $73 billion for total R&D (a 3 percent increase from 1994 in nominal terms), of which $39.5 billion is directed to defense R&D (a 4 percent increase).[8]

Taken together, cross-national variations in the sectoral performance and financing of domestic R&D efforts reveal a basic structural difference across national innovation systems. On the one hand, the U.S. and to a lesser extent France and the United Kingdom retain innovation systems that reflect the institutional legacy of Cold War defense concerns. On the other hand, Germany and especially Japan have established an institutional structure that largely favors innovation in commercial technologies. An aggregate review of the technologies each system emphasizes reveals additional cross-national differences.

Technological Emphasis: Which Technologies are Produced

As seen in figure 3-1, national R&D across the advanced industrial states is concentrated in the business sector. However, as figures 3-5 through 3-9 show, the sectoral composition and concentration of business R&D varies significantly.[9]

FIGURE 3-4: Defense R&D as a Percent of Total Government R&D Appropriations in the United States, European Union, and Japan, 1981-1994



NOTE: European Union data are averages of all EU member states
SOURCE OTA, based on data In *STI* (1), table 64, May 1994

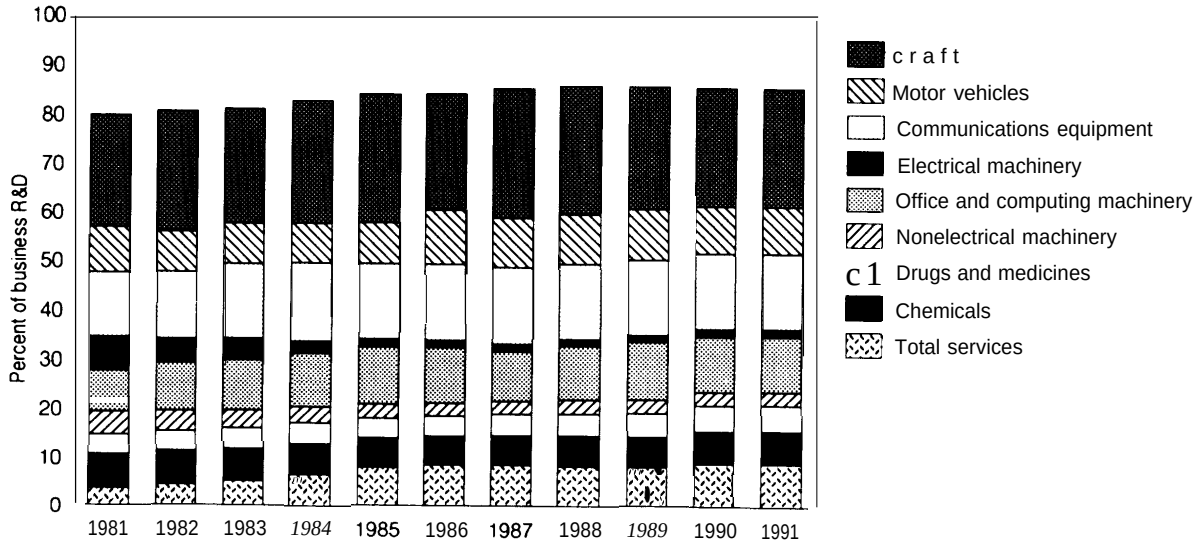
Business R&D in the United States is concentrated in four sectors: aircraft, communications equipment, office and computing machinery, and motor vehicles (see figure *3-5). These* four sectors accounted for 60.7 percent of all R&D expenditures by U.S. businesses in 1991. The aircraft sector consistently represents the largest percentage of business R& D-24.3 percent in 1991. By comparison, in 1991 the communications equipment sector accounted for 15.3 percent of all business R&D, the office and computing machinery sector for 11.4 percent, and motor vehicles for 9.7 percent. The sectoral distribution of U.S. business R&D has been relatively constant over time. The

[7] Mowery, op. cit., footnote 3, p. 124.

[8] Congressional Research Service, Seminar on Proposed FY1995 R&D Budget, Feb.14 1994.

[9] The data in this section have been obtained from the Organisation for Co-operation and Development's Analytical Business Enterprise R& D (ANBERD) database OECD, DSTI (STAN/ANBERD), 1993. See also OECD, *Business Enterprise Expenditure on R&D in OECD Countries: Data at the Detailed Industry Level From 1973 to 1990* (Paris, France: OECD, 1992), pp. 39-41.

FIGURE 3-5: Sectoral Composition of Business R&D in the United States, 1981-1991



NOTES: Chemicals category excludes drugs, electrical machinery excludes communications equipment

SOURCE: OTA, based on data m Organisation for Economic Co-operation and Development, Directorate for Science, Technology, and industry, Aria-*lytical Business Enterprise R&D Database (ANBERD),* (Pam OECD, 1994) ANB/BERD table Ol (hereafter cited as OECD, *STI, ANBERD,* 1994, table number)

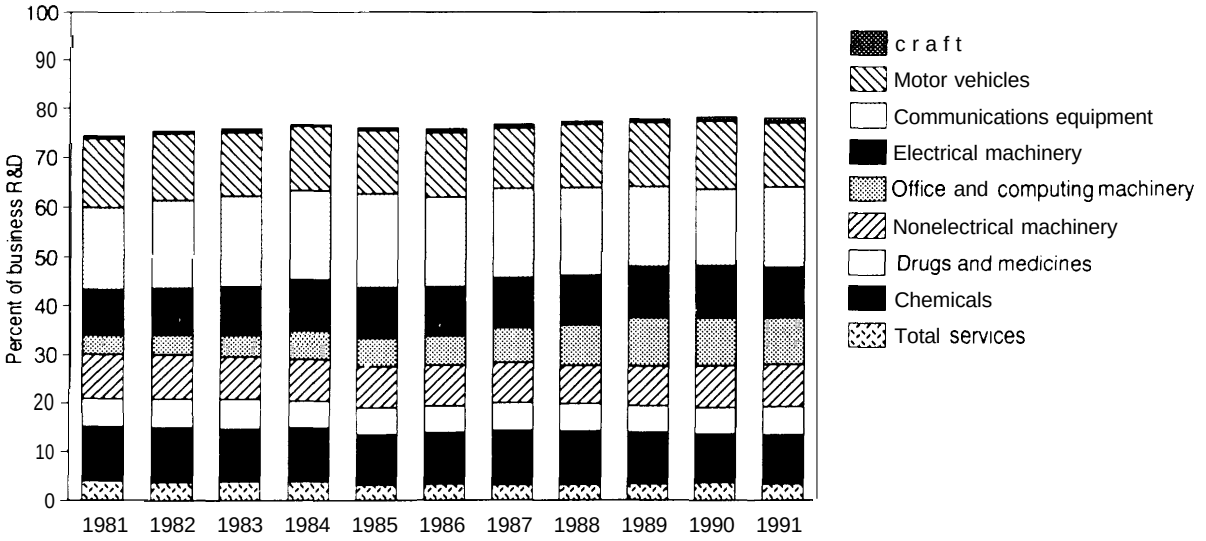
only areas where R&D spending has changed notably have been in electrical machinery (which declined from 6.7 percent in 1981 to 1.4 percent in 1991), communication technologies (which increased from 13.2 to 15.3 percent) and office and computing technology (from 8.5 to 11.4 percent).

By comparison, Japanese business expenditures on R&D are less concentrated than in the United States (see figure **3-6).** In 1991, the top four sectors accounted for 49.3 percent of all business expenditures on R&D, with no single sector dominating the list, as does the aircraft industry in the United States. Moreover, the sectoral emphasis of Japanese business R&D is quite different. In 1991, the communications equipment sector accounted for 16.1 percent of all business R&D expenditures, while motor vehicles accounted for 13 percent, electrical machinery for 10.4 percent, and chemicals for 9.8 percent. This sectoral distribution of R&D expenditures also has been relatively constant over time, apart from office and computing machinery, which increased from 3.8 in 1981 to 9.6 percent in 1991, and chemicals, which decreased from 11 percent to 9.8 percent.

Business R&D in the major European nations is concentrated at levels comparable to that in the United States. In Germany, the top four sectors account for 60 percent of all business R&D, while in France they account for 61.1 percent and in the

10 Since 1980 the greatest rate of change has been in the service sector, which grew from 4. I percent of all business R&D in 1980 to 8.8 percent by 1991. Manufacturing still accounts for over 90 percent of all business R&Din the United States, and therefore remains the analytical focus of this chapter. Some analysts have noted, however, that R&D in the service sector is underrepresented by the available data, and may account for as much as 25 percent of R&D in the United States. See J.A.Alic, "Technology in the Service Industries," *in/ernationu/Journu/ of Technology Management* 9(1)*: 1-14, 1994. The* Office of Technology Assessment is currently studying the role of the service sector in the U.S. economy.

FIGURE 3-6: Sectoral Composition of Business R&D in Japan, 1981-1991



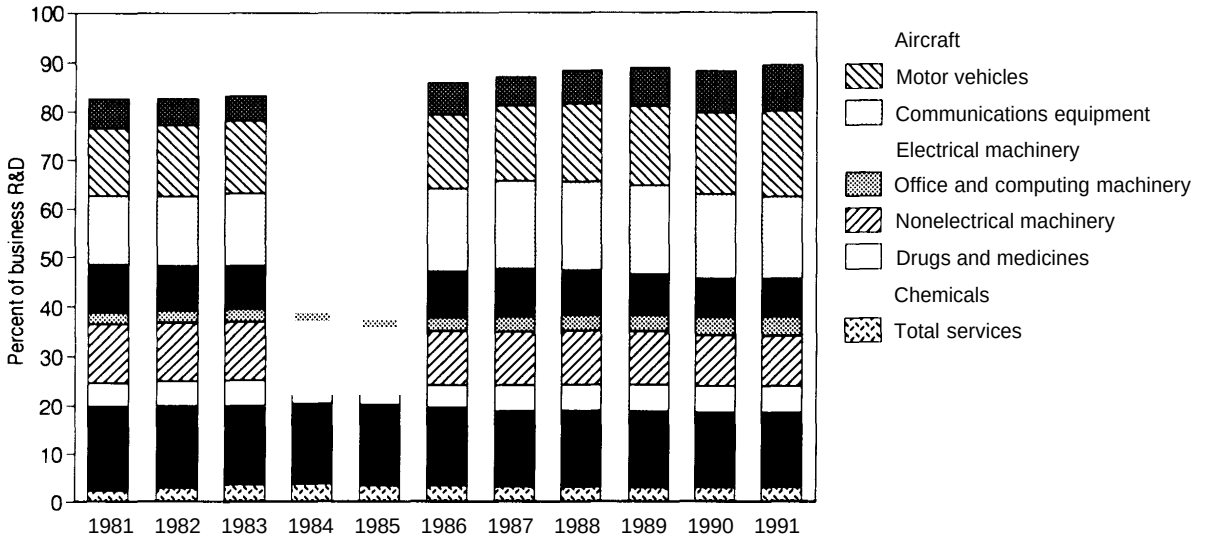
NOTES; Chemicals category excludes drugs electrical machinery excludes communications equipment

SOURCE: OTA based on data in OECD, DSTI/*ANBERD,* 1994 ANB/BERD table OF

United Kingdom 60.2 percent. However, as figures 3-7, 3-8, and 3-9 illustrate, the sectoral distribution varies somewhat. The communications sector accounts for the largest percentage of business R&D in France and the U.K. (21.8 and 19.9 percent, respectively) and the second largest in Germany (16.8 percent). France and the U.K. also devote considerable resources to the aircraft sector (18.9 and 14.4 percent), which receives a relatively small proportion in Germany (9.4 percent). Germany and France emphasize motor vehicles (17.7 and 11.5 percent), while the U.K. directs only 6.8 percent of business R&D to this sector. The pharmaceutical sector receives a large percentage of business R&D in the United Kingdom (14.4 percent), but a relatively small 7.6 percent in France and 5.4 percent in Germany. Finally, the chemical sector receives a large proportion of business R&D in Germany (15.6 percent), but only 9.9 percent in the U.K. and 8.9 percent in France.

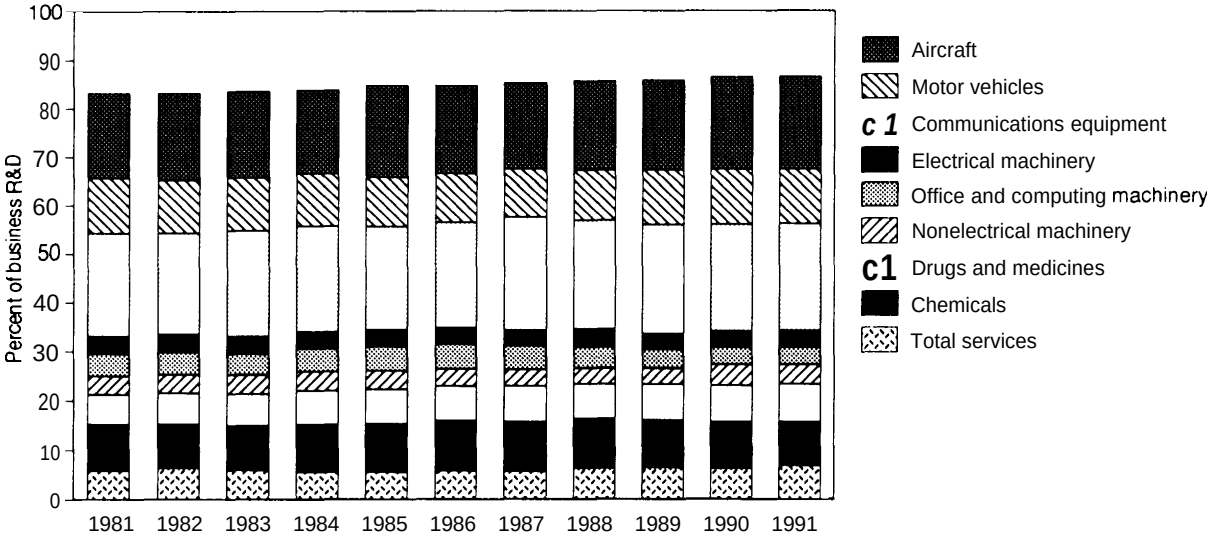
These differences in the national distribution of business R&D expenditures correlate roughly with the sectoral distribution of production across the Triad. As can be seen in figure 3-10, the U.S. share of OECD production is highest in aircraft and lowest in electrical machinery, which corresponds to each sector's relative share of U.S. business R&D. The same relationship holds for Japan's high share of OECD production in communications equipment and low share in aircraft; Germany's relatively high share in motor vehicles and low share in office and computing machinery; France's high share of OECD production in aircraft and low share in office and computing machinery; and the United Kingdom relatively high share of OECD production in drugs and medicines and low share in electrical machinery.

However, there are exceptions to this pattern. Germany's share of OECD production is highest in nonelectrical machinery, which receives a relatively low 9.9 percent of German business R&D expenditures. Likewise, both the French and U.K. share of OECD communications equipment production is low, given that this sector in both countries receives the highest proportion of business R&D (2 1.8 and 19.8 percent, respectively). These and other discrepancies illustrate the broader



NOTES Chemicals category excludes drugs, electrical machinery excludes communications equipment

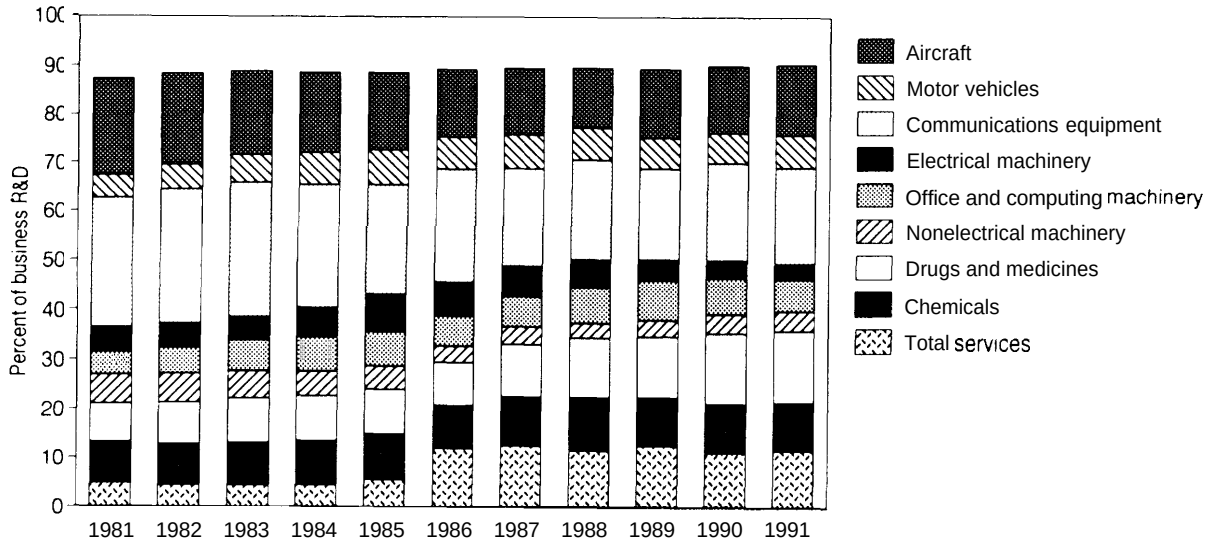
SOURCE OTA, based on datain OECD,DSTI, *ANBERD, 1994,* ANB/BERD table OE



NOTES Chemicals category excludes drugs, electrical machinery excludes communications equipment

SOURCE OTA, based on data in OECD,DSTI, *ANBERD, 1994,* ANB/BERD table 0D

FIGURE 3-9: Sectoral Composition of Business R&D in the United Kingdom, 1981-1991



NOTES: Chemicals category excludes drugs, electrical machinery excludes communications equipment

SOURCE: OTA based on data in OECD, DSTI, *ANBERD,* 1994, ANB/BERD, table OH.

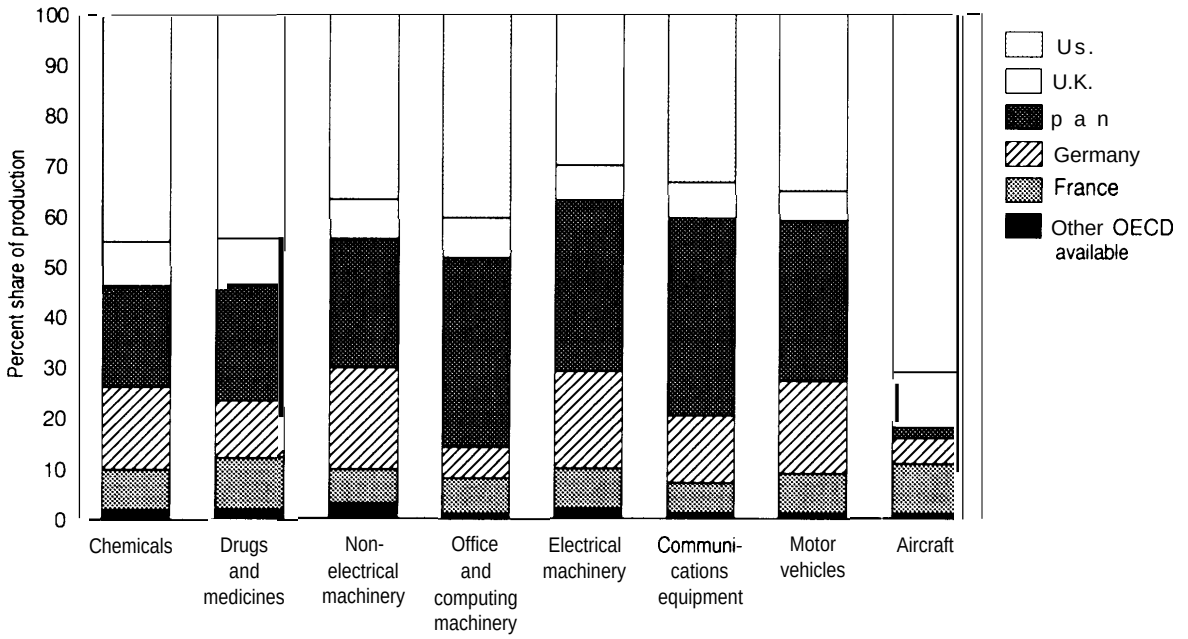
point that it is difficult to link R&D investment rates directly to national, sectoral, or firm-level production and competitiveness. Ultimately, competitiveness at all of these levels is shaped by numerous variables, ranging from corporate structure and strategy to macroeconomic policy and performance. Nevertheless, R&D investment rates are an important indicator of long-term business strategy, and consequently the sectoral distribution of business R&D provides an important measure of the sectoral emphasis of national innovation systems.

In sum, the marked differences in the sectoral performance of national R&D, the financing of national and business R&D, and the sectoral composition of business R&D reveal important structural differences in national innovation systems. The U.S. system is deeply rooted in Cold War political and security concerns. It is characterized by direct governmental involvement, a high degree of national R&D resources directed to the defense sector, and relatively few R&D resources directed to industrial technology adoption. [11] The U.S. innovation system also stands out by virtue of the high quality and large quantity of R&D performed in the higher education sector.

Although few European countries match the degree to which the United States devotes national R&D resources to defense, the United Kingdom and France are similar in that they also have supported large defense-related R&D budgets and have similar mission-oriented innovation systems. By contrast, Germany (along with Switzerland and Sweden) has devoted comparatively few resources to defense.

[11] For an account of the post-WWII origins of (he U.S. R&D system, see D.C. Mowery and N. Rosenberg, *Technology and the Pursuit of Economic Growth (New* York, NY: University of Cambridge Press, 1989). For a description of the contemporary implications of this system, see Mowery, op. cit., footnote 3. See also J.A. Alic, et al., *Beyond Spinoff: Military and Commercial Technologies in a Changing World* (Boston, MA: Harvard Business School Press, 1992).

FIGURE 3-10: Percent Share of OECD Production in Selected High Technology Sectors, 1990



NOTES: Shares are percentage of total available OECD data, "other OECD" category includes data from countries Included in STAN database only when available for all sectors above, 1990 IS most recent year with complete data for selected countries and sectors, numbers may not total 100 due to rounding

SOURCE: OTA, based on data from Organisation for Economic Co-operation and Development, Directorate for Science, Technology, and Industry, *Structural Analysis Industrial Database (STAN),* (Paris OECD, 1994), production tables OD-OG, 0I, and OM-OP

Among the advanced industrial countries, Japan directs the least R&D resources to the defense sector.[12] The commercial orientation of Japan's innovation system is reflected in its institutional structure. The Japanese government has a modest role in directly funding national and business R&D, while the private sector finances and performs the bulk of Japan's most significant R&D. In addition, Japanese universities and other public forums do not provide the central research role that their U.S. counterparts do. Finally, Japan has great strengths in learning and adapting commercial technology generated abroad.] [3]

In their entirety, national innovation systems represent different institutional contexts for the complex set of processes leading from technology - cal innovation to commercial competitiveness. [4]

[12] Japan's defense R&D spending is concentrated i, the Technical Research and Development institute (TRDI) of the Japan Defense Agency. The TRDI's R&D budget is quite modest relative to Japan's total R&D spending, although its programs often benefit from commercial R&D in dual-use technologies. See U.S. Congress, Office of Technology Assessment, *Global Arms Trade*, OTA-ISC-460 (Wash ington, DC: U.S. Government Printing Office, 1991): pp. 116-120.

[13] See R J Samuels, "*Rich Nation, Strong Army*": *National Security and the Technological Transformation of Japan* (Ithaca, NY: Cornell University Press, 1994).

[14] Currently little is known in a systematic sense about cross-national variances in the various stages between innovation and commercialization. OTA is currently conducting an assessment of the commercialization of new technologies in the United States. In addition, a cross-national assessment of barriers to commercialization is being conducted by National Science Foundation in conjunction with the OECD.

As the following section demonstrates, there are important variations in the performance of national R&D systems. Together, the structure and performance of national innovation systems create different contexts for the innovative activities of MNEs.

NATIONAL INNOVATION SYSTEMS: PERFORMANCE PATTERNS[15]

Gauging the relative performance and capacity of the U.S. technology base is a complex and difficult analytical task. Most major studies conducted in recent years conclude that the U.S. technology base has eroded considerably. Studies by the National Critical Technologies Panel of the Office of Science and Technology Policy, the Department of Commerce Technology Administration, and the Department of Defense have identified weaknesses in critical commercial, emerging, and defense technologies.[16] Broader studies by the National Science Foundation and the Competitiveness Policy Council conclude that trends in R&D investment and technology development processes show disturbing weaknesses.[17] Moreover, since technology is a central determinant of the trade performance and competitiveness of national economies, many have linked the international leveling of technological capabilities with the weakened trade performance and competitive posture of the U.S. economy.

This section uses these and other studies of U.S. technology and competitiveness as a reference point for investigating performance trends across national innovation systems. Although far from perfect, aggregate R&D investment patterns constitute the single best indicator of trends in the innovative capacity of the U.S. technology base. The analysis focuses on aggregate R&D investment by private enterprise, because it accounts for the bulk of national technology innovation and development across the advanced industrial countries. Moreover, since competitiveness has become increasingly linked to technological innovation, corporate R&D has assumed greater strategic significance for nations.[20]

Therefore, the analysis below proceeds in three stages. First, it examines data on business R&D across the Triad, which indicate that U.S. businesses have reduced their R&D investment rates to comparatively low levels. Second, it compares data on total national R&D expenditures across the Triad, which indicate that national R&D pat-

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15 Most of the data in this section come from the OECD. R&D data obtained from national governments are notoriously difficult to compare, given different categorization and measurement techniques. The OECD has gone to considerable lengths to adjust the data to account for national variations in reporting, and in some cases to estimate data that national governments do not provide or do not compile.

16 National Critical Technologies Panel, *Report of the National Critical Technologies Panel* (Washington, DC: U.S. Government Printing Office, 1991); and Department of Defense, *Critical Technologies Plan for the Committees on Armed Services United States Congress* (Washington, DC: Department of Defense, March 15, 1990).

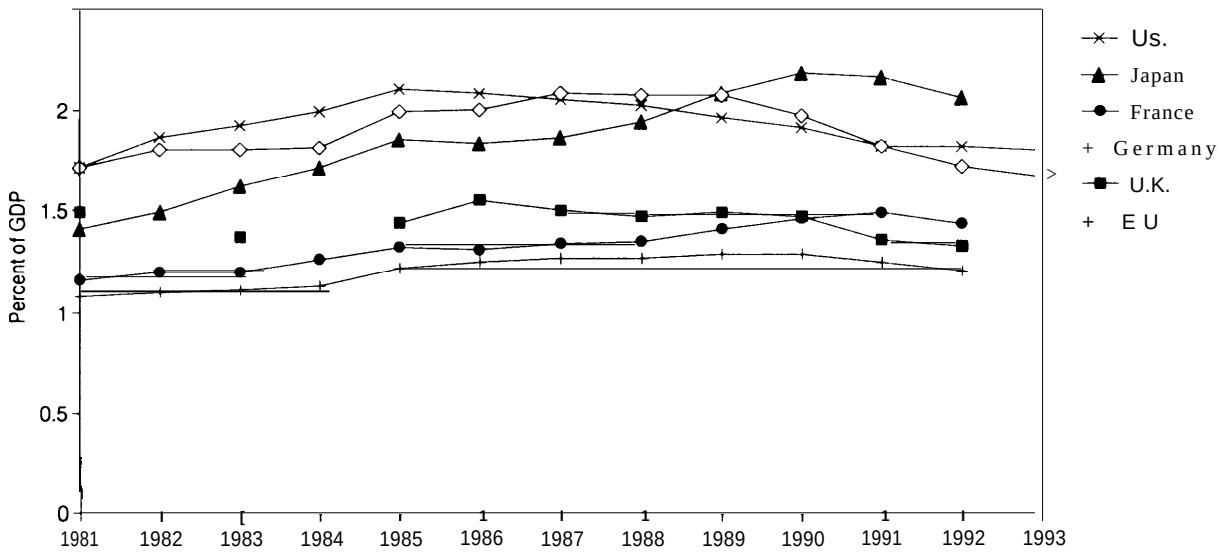
17 National Science Board, Committee on Industrial Support for R&D, *The Competitive Strength of U. S. Industrial Science and Technology?': Strategic Issues* (Washington, DC: National Science Foundation, 1992); Council on Competitiveness, *Gaining New Ground: Technology Priorities for America* Future (Washington, DC. Council on Competitiveness, 199 *I). See* also National Science Board, op. cit. footnote 5.

18 P. Guerrieri, *"Technological"* and Trade Competition: The Changing Positions of the United States, Japan, and Germany," and P.R. Krugman, "Technology and International Competition A Historical Perspective, " in M.C. Hams and G.E. Moore, *Linking Trade and Technology Policies: An International Comparison of the Policies of Industrialized Nations* (Washington, DC: National Academy Press, 1992). See also T.S. Arrison, et al., *Japan's Growing Technological Capability: Implications fur the US Economy* (Washington, DC. National Academy Press, 1992).

19 Although the relative importance of business, government, and university research varies across countries, In most countries and in most sectors (he industrial research lab is the most significant location of technological innovation. See Nelson, op. *cit.,* footnote 1. Of course, the innovative capabilities and activities of firms are shaped by numerous factors external to the firm, including the educational infrastructure as well as direct and indirect forms of governmental support.

20 OECD, Economic Analysis and Statistics Division, *7'he Impact of Foreign Investment on Domestic Economies of OECD Countries* (Paris, France: OECD, Nov.12, 1993), p. 49.

FIGURE 3-11: Business R&D as Percentage of GDP, 1981-1993



NOTES: Breaks in lines indicate unavailable data for Intermediate years: European Union data are averages of all member states
SOURCE: OTA, based on data in OECD, *STI*, (1), table 25, May 1994

terns mirror business R&D trends. And third, it assesses international trends in patenting, which provide the best quantifiable measure of the relative output of national innovation systems.

Business Expenditures on Research and Development

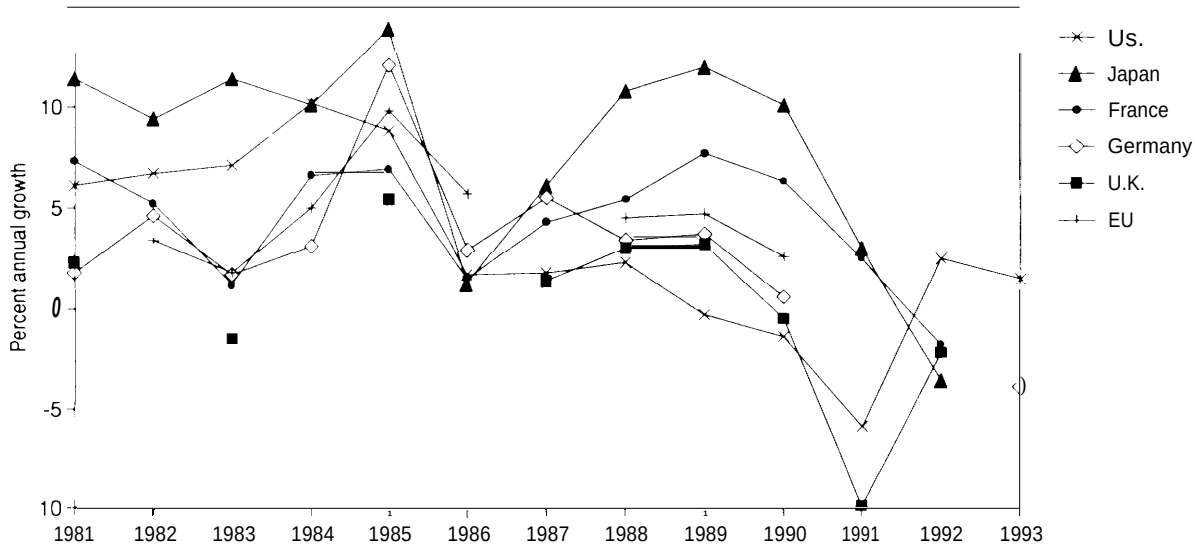
Since World War II, private enterprise has been the central source of commercially significant innovation in most fields. Relative to governments and universities, businesses are well placed to conduct and deploy R&D for a number of reasons. First, because firms use technology directly, they are more likely to understand where new R&D would be most fruitful. Second, businesses can profit from innovation because they can integrate R&D with production and marketing. And third, although they frequently draw on public scientific knowledge, firms often have unique R&D capabilities that derive from practice—indeed, current practioners are most likely to conduct and benefit from R&D because most innovation involves incremental, cumulative improvement to existing technologies. [21]

However, firms based in different nations conduct R&D at markedly different levels. Figure 3-11 portrays total business expenditures on R&D over the course of the 1980s and early 1990s, measured as a percentage of gross domestic product (GDP) .22 Throughout most of the 1980s the U.S. business sector spent more on R&D than any of its major trading partners, averaging just under 2 percent of GDP between 1981 and 1988. However, after peaking at 2.1 percent in 1985, U.S. business

[21] Nelson, op. cit., footnote 1, p.10.

[22] Total business expenditures on R&D should not be confused with R&D financed by business. The former category represents all business R&D outlays, whether they are financed by business itself, government, or other sources. Patterns in business-financed R&D are discussed below; see figure 3-13 and accompanying text. For data on how business R&D is financed in different countries, see figure 3-3 above and accompanying text.

FIGURE 3-12: Compound Annual Growth Rate of Business R&D, 1981-1993



NOTES: Growth rates are based on OECD adjusted expenditures in 1985 dollars As with OTA R&D data, the OECD adjustment employed an implicit GDP deflator breaks in lines indicate unavailable data for Intermediate years European Union data are averages of all EU member states

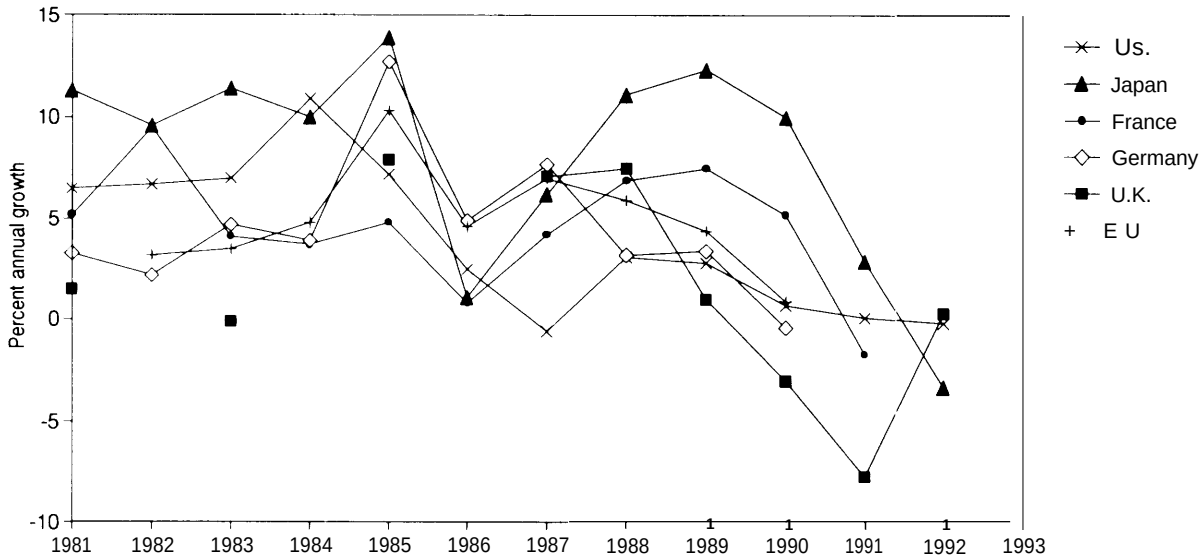
SOURCE: OTA based on data in OECD, *STI (1)* table 23, May 1994

R&D gradually declined to 1.8 percent by 1993. By contrast, Japan's business R&D grew steadily from 1981 to 1990, climbing from 1.4 percent of GDP to a peak of 2.2 percent in 1990, having surpassed the U.S. level for the first time in 1989. After 1990, Japan's level declined slightly, reaching 2.1 percent in 1992. In Europe, Germany has consistently maintained the highest average business R&D rates, with a pattern closely tracking that of the United States. France and the United Kingdom have maintained slightly lower levels, with France's rate growing from 1.2 percent in 1981 to 1.4 percent in 1992, while the United Kingdom's has declined from 1.6 percent in 1986 to 1.3 percent by 1992.

The contrary trends in U.S. versus Japanese business R&D since the mid- 1980s reflects opposite trends in the annual growth rate of R&D spending during that period. As figure 3-12 shows, for much of the last decade R&D spending by Japanese businesses grew at annual rates close to or exceeding 10 percent, although it dropped considerably during adverse economic periods in 1986 and the early 1990s. By contrast, U.S. business R&D growth rates dropped rapidly after 1984, remained low during the expansionary period of the late 1980s, and went negative between 1989 and 1991. In 1992, the U.S. rate increased to 2.5 percent, but then fell again to 1.5 percent in 1993. Between 1986 and 1993, U.S. business R&D grew at an average annual rate of 0.3 percent, compared to 5.7 percent for Japan during the same period. With the exception of the United Kingdom, the major European economies also had stronger growth rates in business R&D than the United States. Between 1986 and 1993, total business expenditures on R&D in France grew at an average rate of 3.7 percent, compared to 2.0 percent for Germany and -0.8 percent for the United Kingdom.

Changes in total business expenditures on R&D do not necessarily imply changes in investment rates by businesses themselves. R&D funding by businesses can come from other sources, including government, other national sources, or

FIGURE 3-13: Compound Annual Growth Rate of Business-Financed R&D, 1981-1993



NOTES: Growth rates are based on OECD adjusted expenditures in 1985 dollars As with OTA R&D data, the OECD adjustment employed an implicit GDP deflator, breaks in lines indicate unavailable data for intermediate years, European Union data are averages of all EU member states

SOURCE: OTA, based on data in OECD, *STI,* (l), table 33, May 1994

foreign sources.[23] However, the changes in business R&D growth rates illustrated in figure 3-12 have been driven less by shifts in government or other nonbusiness financing than by changes in investment outlays by business itself.

Figure 3-13 shows trends in R&D investments financed by business enterprises. In most cases, business R&D expenditures declined during the mid-1980s and early 1990s, generally consistent with national economic trends during those periods. However, there are notable differences in both the rate of decline and the average level over time. Over the last decade, U.S. business stands out for its low R&D growth rates since the late 1980s--despite favorable economic circumstances during much of that period. R&D growth rates for U.S. business declined rapidly from 10.9 percent in 1984 to -0.6 in 1987; although the rate returned to 3.1 percent in 1988, it continued to decline thereafter to -0.2 percent in 1992. The low growth rates since 1987 bring down the U.S. average for the entire period to 3.9 percent.

R&D by German firms also grew at an average rate of 3.9 percent from 1981 to 1993, although it followed a different pattern: it expanded in the early 1980s, remained relatively high in the mid-1980s, and then declined after 1987. R&D growth rates for U.K. firms have been the most volatile, becoming negative in 1983 and again during 1990-1991, and averaging 1.6 percent over the entire period. Of the major European countries, French firms maintained the highest average R&D growth rate of 4.6 percent.

By contrast, growth rates for business R&D in Japan remained close to or over 10 percent throughout most of the 1980s, declining in 1986 and then again in the early 1990s, reaching a negative rate for the first time in 1992. Averaged over the entire period, business-financed R&D in Ja-

[23] See figure 3-3 in this chapter regarding national differences in the financing of business R&D.

pan grew 8.0 percent, over double the rate of U.S. firms.

Apart from U.K. firms after 1988, Japanese business experienced the most rapid rate of decline in R&D growth rates—from 12.3 percent in 1989 to -3.3 percent in 1992. This trend reflects the domestic recession in Japan, the most severe in the postwar period. Further analysis of corporate R&D in Japan, however, indicates that the recession has affected R&D growth rates in some sectors more than others, and that the slower growth rates are likely to be temporary.

OTA interviews suggest that Japanese MNEs have responded to recessionary pressures by cutting unnecessary business costs, reducing labor by encouraging retirement and foregoing new hiring, and looking for new efficiencies through reorganization. These strategies have been extended to R&D as well as production operations. Many Japanese firms have avoided R&D budget cuts by tapering increases in spending levels and shifting resources away from long-term basic research and toward more immediate product development.[24] Japanese firms also have focused their R&D efforts in order to conduct research more efficiently.[25] Through these and other measures, Japanese firms have retained their R&D personnel, maintained steady R&D intensity ratios, and preserved R&D-related plant and equipment investment.[26]

R&D restructuring is likely to be most pronounced in Japan's steel, machinery, electrical machinery, and chemical industries. 27 Japan's computer and electronics industry has also suffered from the recession and scaled back R&D growth rates. Fujitsu cut its 1993 R&D budget by 7.6 percent, and Hitachi by 3.8 percent, while Sony increased its R&D spending by 2.3 percent and NEC maintained a constant level.[28] Japan's top ten R&D spenders show very uneven R&D budget patterns for 1993, ranging from a low of -7.6 percent for Fujitsu to a high of 8.1 percent for NTT, with the average rate of increase for the top 10 being 0.13 percent.[29]

Despite the low aggregate R&D growth rate in 1992 and the strong downturn in important sectors, business R&D spending in Japan is expected to grow by 2.2 percent in 1993 through March 1994.[30] Moreover, survey evidence indicates that Japanese corporations expect their R&D spending plans to be affected only temporarily.[31] In this respect, the mid- 1980s may be a precedent—in

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24 See "' DonaruKigyonoR&D: OyoKaihatsuKenkyu—Zentaiteki ni Oyo Shifto," *Nihon Sangyo Shimbun*, p.5, July 28, 1993. According to this survey, the emphasis on applied R&D was particular] y pronounced in telecommunicate (ins, precision instruments, electronics, and medi - calsupplies. For additional survey data showing a shift toward "'defensive" research (e.g. R&D focused on existing operate see "' Donaru Kigyono R&D Jushi sum Kenkyu," *Nikkei Sangyo Shimbun*, August 9, 1993, p.4.

25 "Japan's Researchers Get Back to Basics," *Nikkei Week/y,* p. 17, Oct. 25, 1993. See also "R&D mo Risutora: Tema Shibori J in in Saihai - chi," *Nihon Kezai Shimbun*, p. 1, July 26, 1993.

26 "DonaruKigyono R&D. Jinin Uriagedaka Atari Kenkyuhi—KaihatsuryokuKakuho NeraiIji," *Nihon Sangyo Shimbun*, p.5, July 29, 1993, and "Donaru Kigyono R&D Kanren Setsubi Toshi—Sogaku Shiborarerunaka, Kencho," *Nihon Sangyo Shimbun*, p.5, July 30, 1993.

27 "Japan Researchers Get Back to Basics," and "R&D mo Risutora," op. cit. footnote 25.

28 "'R&D mo Risutora," op. cit. footnote 25.

29 Ibid.

30 Based on a S_{urv} ey covering 392 leading Japanese companies that was conducted by the Nihon Keizai Shimbun Inc. and the Nikkei R~- search Institute of Industry and Markets. See "'Japan's Researchers Get Back to Basics,"' op. cit., footnote 25. A separate survey of 244 firms also found (hat total corporate R&D budgets were up 2.2 percent from 1992 levels. See "Donaru Kigyono R&D: Kiso Kenkyu-Chuin tIkigire Kei- ko, Joi Kigyo niha Zogaku ga Ooi," *Nihon Sangyo Shimbun*, p.5, July 27, 1993.

31 I i$_n$the Nihon Keizai Shimbun Inc. and the Nikkei Research Institute of Industry and Markets survey, only 3.4 percent of the respondents expect their R&D spending to decline over the next five years. "The majority of companies w ant to maintain or expand on past R&D efforts, but in the present economic circumstances they find that very hard to do. The current trend is to focus on a select group of research themes in order to make more efficient use of 1 imited resources. " "'Japan's Researchers Get Back to Basics," op. cit., footnote 25.

1986 corporate R&D rates dropped from very high levels to levels comparable with those of the European Union and the United States, and then rebounded quickly (see figure 3-1 3). Much the same may be happening in the recent downturn. This tendency to preserve R&D investment reflects the oft-noted Japanese penchant for the long-term view, summed up by a Sony executive's comment: "If we cut research and development, we cut our future."[32] This sentiment was echoed by a number of Japanese executives interviewed by OTA.

The staunch effort by Japanese corporations to preserve their R&D budgets contrasts with consistently low R&D growth rates among U.S. firms since 1987, despite a more favorable economic environment during much of the period. Moreover, U.S. firms appear to have made only modest increases in R&D expenditure plans for 1994. The Industrial Research Institute found that only 18 percent of U.S. firms planned to increase R&D expenditures from 1993 levels, while 33 percent expected to decrease; total R&D as a percentage of sales is expected to decrease slightly from 3.5 percent to 3.4 percent .[33] This pattern may reflect continued pressure to constrain costs while quickening product development. The efficiency movement that first hit the factory floor in the 1980s may now be extending to the lab. U.S. corporate R&D strategists are emphasizing R&D productivity and trying to obtain faster product development without additional R&D outlays.[34]

It is difficult to forecast private-sector R&D into to mid- 1990s. However, past trends and current survey evidence point toward sustained national differences in private sector R&D investment. In particular, U.S. firms, compared to their Japanese counterparts, appear less willing and/or able to commit financial resources to R&D over the long term.

Unfortunately, little is known about the central reasons for the relative weakness of U.S. business R&D spending. The most optimistic explanation is that U.S. firms are more efficient in their R&D efforts than are their foreign competitors. To the extent that U.S. firms successfully offset R&D budget cuts by increasing efficiency, the comparatively low growth rates in corporate R&D spending may be less serious than they appear. Similarly, higher business R&D rates in Japan could reflect corporate efforts to overcome an inefficient R&D system. However, although the proposition is logically possible, there is no direct evidence showing that low corporate R&D rates in the United States are offset by greater efficiency.

A second and more common explanation for cross-national differences in business-financed R&D rates points to discrepancies in corporate time horizons. By this account, U.S. firms are less willing to conduct long-term investment strategies because they are more oriented toward short-term return on investment than are most European and Japanese firms. Cross-national variations in corporate time horizons reflect different systems of corporate governance and finance. These systems, and their particular effects on corporate investment behavior, are examined in Part IV of this report.

Over the long term, corporate R&D investment strategies are likely to affect national competitiveness, although the precise effect is difficult to gauge. Linking business R&D expenditures to economic performance is difficult due to a combination of data limitations and the rapid rate of economic and technological change in the U.S.

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[32] As quoted in A. Pollack, "Japanese, in a Painful Recession, Trim Industrial Research Outlay s," *New York Times,* p. A 1, Nov. 291993. According to Pollack, Sony's R&D budget is rising I percent in 1994.

[33] "Industrial Research Institute's Annual R&D Trends Forecast," *Research Technology Management 37(1): 15-17,* January-February I 994.

[34] See "R&D Scoreboard: In the Labs, the Fight to Spend Less, Get More," *Business Week (3325): 102-127,* June 28, 1993.

economy.[35] In addition, possible differences in the efficiency of national innovation systems indicate that there may not be a perfectly linear relationship between R&D rates and innovative performance. Moreover, R&D investment is just one of several important determinants of innovation and competitiveness. Developing and successfully commercializing new technologies often require large investments in new plant and equipment, new production skills, organizational changes throughout the firm, and new marketing strategies.

Nevertheless, R&D expenditure rates remain a key indicator of long-term investment strategies, and one of the most significant determinants of long-term economic performance.[36] However imperfect the data, few would doubt that technological innovation is strongly associated with private sector R&D. Higher R&D spending alone may be insufficient to generate new technologies, but it is necessary.

The significance of business R&D to national economies is further illustrated by the fact that total R&D trends+. g., the combined R&D efforts of business, government, and academe—mirror the business R&D trends described in this section. As demonstrated below, total U.S. R&D expenditures, although large in absolute terms, have weakened in comparative terms over the course of the last decade, as has U.S. business R&D. Moreover, the commercial significance of total U.S. R&D expenditures is undercut by the U.S. innovation system's longstanding emphasis on defense technologies.

Gross Expenditures on Research and Development

In absolute terms, the United States commits far more resources to R&D than any other nation. As seen in figure 3-14, throughout the 1980s and early 1990s total U.S. R&D spending rose steadily and far exceeded that of other OECD nations. On average between 1981 and 1992, U.S. R&D spending was 53 percent higher than the combined expenditures of European Union member states (it was over 600 percent higher than the European Union's single largest R&D spender, Germany), and 154 percent higher than that of Japan.[37]

In relative terms, however, aggregate R&D spending patterns reveal more complex patterns. The most comprehensive relative indicator of national R&D efforts measures gross national expenditures on R&D as a percentage of GDP. As seen in figure 3-15, total R&D spending trends across the United States, Japan, and the European Union chart a course that is quite similar to that of U.S. business R&D (see figure 3-11 above). Prior to 1987, the United States consistently maintained the highest R&D investment levels, peaking at 2.89 percent of GDP in 1985. In 1988, however, Japan began leading the world in total R&D rates, climbing from 2.86 percent in 1988 to 3.08 percent in 1990. As of 1992, Japan still led with gross R&D expenditures totalling 2.68 percent of its GDP. Throughout this period European Union member states collectively maintained relatively weak R&D expenditure rates, although some of

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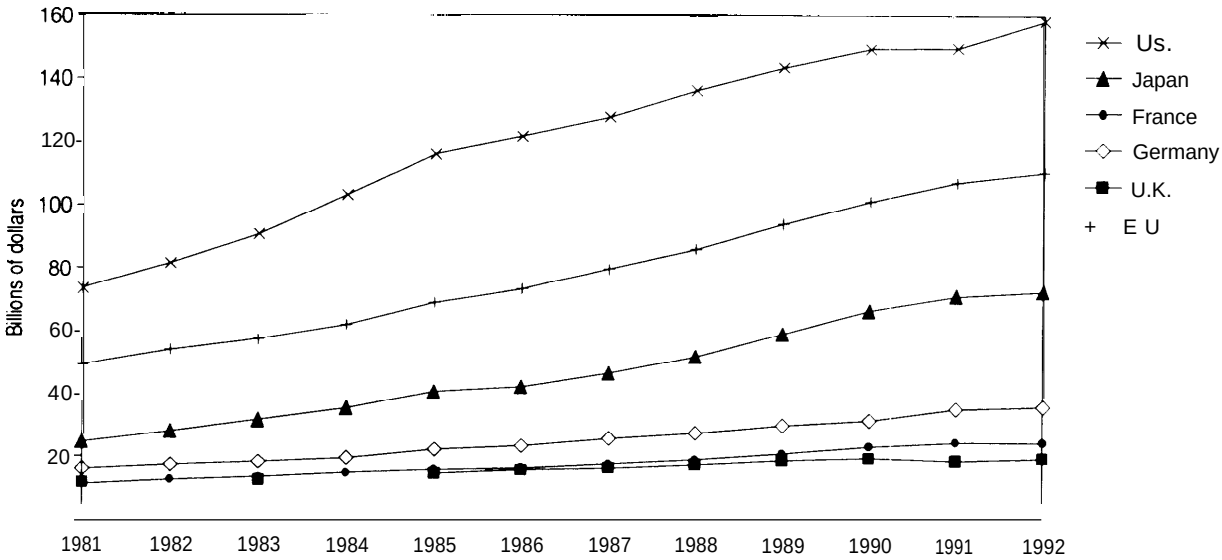
[35] Z Griliches "Productivity, R&D, and the Data Constraint," *The American Economic Review 84(I): I-23,* March 1994.

[36] Z. Griliches, "Productivity, R&D, and Basic Research at the Firm Level in the 1970s" *American Economic Review 76(I): 141-195,* March 1986.

[37] The numbers provided in figure 3-14 are stated in terms of purchasing power parity (PPP). Since countries denominate R&D expenditures in national currency units, it is difficult to compare national R&D data directly. There are two generally accepted methods for comparing R&D data. The first measures R&D as a percentage of GDP, which provides a rough relative indicator of national R&D efforts. This measure is presented in figures 3-15 and 3-17 below. The second method involves converting currencies into a single unit, which allows comparisons of absolute R&D spending levels. The preferred method for converting currencies to compare R&D levels is to use PPPs, which account for international differences in the cost of buying a similar basket of goods and services. For a concise statement of the utility of PPPs for comparing national R&D data, see National Science Board, op. cit. footnote 5, pp. 98-99.

FIGURE 3-14: Gross Expenditures on R&D in Selected Countries, 1981-1992
(purchasing power parity based dollars)



NOTES: The purchasing power parity levels are developed by the OECD's Economic Statistics and National Accounts Division; European Union data are totals for all EU member states

SOURCE: OTA, based on data in OECD, *STI,* (1), table 2, May 1994

the larger member nations were strong on this measure: in 1992 Germany directed 2.58 percent of GDP to R&D, France 2.36 percent, and the United Kingdom 2.08 percent (in 1991).

The relative decline of U.S. R&D investment can be traced to enormous cross-national variations in total R&D growth rates during the 1980s (see figure **3-16).** In all but two years during the 1980s, Japanese annual growth rates in gross R&D expenditures significantly outpaced those of either the United States or the European Union. Total U.S. R&D spending has grown at low rates since 1986. From 1986 to 1988 it increased by approximately 2 percent, then descended to 0.9 in 1989 and even further to negative numbers during 1990-91, rebounding modestly to 1.6 percent by 1992. Between 1986 and 1992, total U.S. R&D expenditures grew at an average annual rate of 1.0 percent. During this time Japanese R&D expenditures increased at an average annual rate of 5.1 percent. For most of the period Japan's gross R&D expenditures expanded at rates exceeding 7 percent, but those rates dropped to 3.2 percent in 1991 and fell negative in 1992.

Between 1986 and 1992, total R&D expenditures in the European Union grew at an average annual rate of 3.9 percent. During this period Germany's total R&D spending increased at an average rate of 2.8 percent, while France's spending grew at 3.1 percent. The United Kingdom's total R&D spending declined sharply from rates of approximately 4 percent in the mid-1980s to -5.0 percent in 1991, which brought its average annual R&D growth rate for the period down to 1.0 percent.

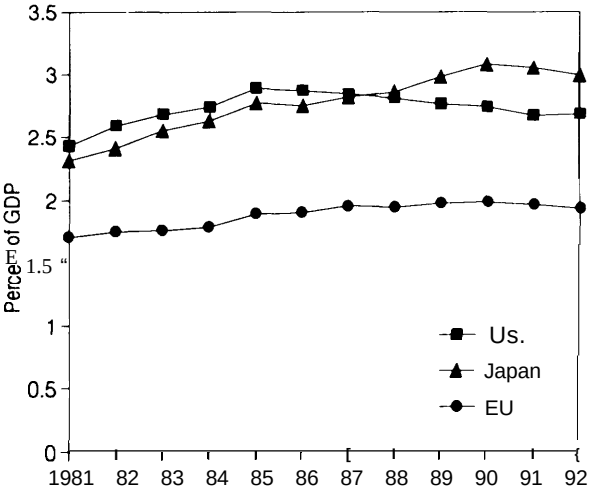
Figure 3-16 also suggests that U.S. and Japanese growth rates in gross R&D spending may be converging. In 1992, total U.S. R&D spending grew by 1.8 percent of GDP; in 1993, U.S. R&D expenditures tallied $161 billion, an inflation-

adjusted increase of 1.6 percent from 1992.38 In Japan, total R&D spending seems likely to increase at a moderate rate. The Japanese government has increased its budget for science and technology by 6.2 percent in 1994 (to approximately $21 billion),[39] while estimates of corporate R&D spending indicate a relatively modest growth rate of 2.2 percent in the fiscal year through March 1994.[40] Even if U.S. and Japanese R&D expenditures grow at similar rates, the trend over the last decade casts a long shadow. Between 1981 and 1992, the compound annual growth rate in total U.S. R&D expenditures averaged 3.4 percent, compared to 6.7 percent for Japan.[41]

From the point of view of commercial competitiveness, U.S. R&D investment rates appear even lower when defense-related R&D outlays are removed from gross R&D figures. Instead of maintaining R&D spending at levels close to those in Japan, U.S. expenditures are more similar to those of Europe, while Japanese expenditures are much higher. As illustrated in figure 3-17, between 1981 and 1991 Japan's total expenditures on civil R&D grew from 2.3 percent of GDP to 3 percent; during the same period, total U.S. investment in civil R&D moved from 1.8 percent to 2.1 percent, and the average of the European Union from 1.5 percent to 1.8 percent. Within the European Union, France's civil R&D expenditures increased from 1.6 percent to 2 percent, while the United Kingdom's remained flat at 1.8 percent.[42]

Figure 3-17 illustrates that, from the point of view of commercially relevant R&D, Japan ranks considerably higher than the United States and other advanced industrial states. For the United States, this comparison may be more relevant than that of gross R&D expenditures because so little of U.S. defense R&D contributes directly to the industrial technology base. Much of the U.S. defense R&D budget is devoted to purely military activities. Of the Pentagon's research, development, test, and evaluation (RDT&E) budget, the science and technology portion—arguably the

FIGURE 3-15: Gross Expenditures on R&D as Percentage of GDP, 1981-1992



NOTE: European Union data are totals for all EU member states

SOURCE: OTA, based on data in OECD, *STI* (1), table 5, May 1994

38 National Science Foundation, Division of Science Resource Studies, "Data Brief," no. 6, Sept. 24, 1993.

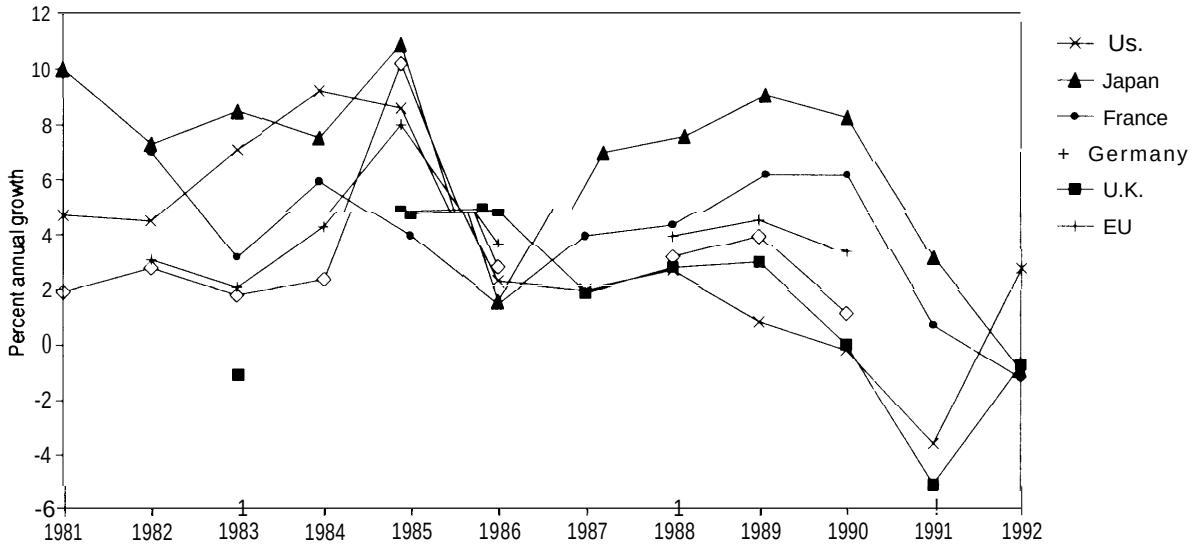
39 Pollack, op. cit., footnote 32. According to one budgetary analysis, the Japanese government's commitment to R&D remains "rock solid." See J. Choy, "1993 Update on Japanese Research and Development: The Party's Over," *JEI Report No. 38A*, Oct. 15, 1993.

40 "Japan's Researchers Get Back to Basics," op. cit. footnote 25; and "Donaru Kigyo no R& D," op. cit. footnote 30.

41 Calculated from OECD, Economic Analysis and *Statistics* Division, *Main Science and Technology Indicators* database, 1994 no. 1, table 3 (measured in constant dollars). According to the National Science Foundation, growth in total U.S. R&Din real terms averaged only 0.6 percent per year from 1987 to 1993, compared to the annual increase of 5.2 percent from 1980 to 1987. NSF, "Data Brief," op. cit., footnote 38.

42 Calculated from OECD *Main Science and Technology Indicators*, op. cit. footnote 41, table 6. The OECD does n@ provide estimated figures for Germany's civil GERD. Characteristically, Germany directs comparatively few R&D resources to the defense sector.

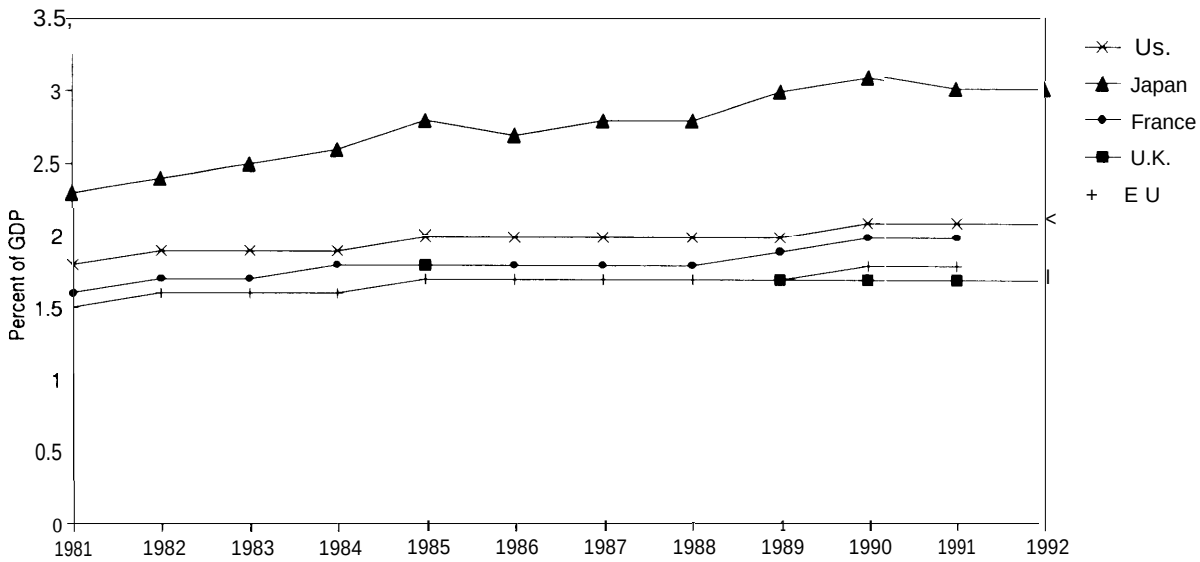
FIGURE 3-16: Compound Annual Growth Rate of Gross Expenditures on R&D, 1981-1992



NOTES Growth rates are based on OECD adjusted expenditures in 1985 dollars As with OTA R&D data, the OECD adjustment employed an implicit GDP deflator, breaks in lines indicate unavailable data for intermediate years, European Union data are averages of all EU member states

SOURCE OTA, based on data in OECD, *STI,* (1), table 3, May 1994

FIGURE 3-17: Estimated Gross Expenditure on Civil R&D as Percentage of GDP, 1981-1992



NOTE European Union data are totals for all EU member states

SOURCE OTA, based on data in OECD, *STI,* (1), table 6, May 1994

area with the greatest potential for spinoff effects—totaled less than 50 percent throughout the 1980s, even though the Pentagon's total RDT&E budget ballooned.[43] In fiscal year 1993, 29 percent of the Department of Defense RDT&E budget went to science and technology; the ratio for FY 1994 is estimated to be the same, while the portion requested for science and technology in FY 1995 is slightly lower, at 26 percent .[44] Second, there are longstanding legal, institutional, and administrative barriers that restrict technology transfer between the defense and civil sectors. 45 Third, the spinoff effects of military R&D that in the past contributed to civilian technology development (such as in semiconductors, computers, jet engines, and airframes) have declined substantially in recent years, and in some technologies the flow has reversed.[46] Many observers believe that, in the context of increasingly intense technological and commercial rivalry in the contemporary international system, the historical orientation of the U.S. R&D system toward defense technologies may prove to be more a liability than an asset.

Ultimately, aggregate R&D investment rates provide an important but incomplete view of trends in the innovative capacity of the industrial technology base. Patent data provides a limited but crucial measure of the actual output or performance of national innovation systems. Patent trends can be used to gauge the comparative inventiveness of national systems, the level of foreign patenting within each system, the degree of overseas patenting by residents of individual countries, and the ratio of foreign to domestic patenting.

9 Patents

As with total R&D expenditures, national patenting rates are best measured relative to the size of the economy. Figure 3-18 charts such a measure of national inventiveness: the number of patent applications by residents as a proportion of the population. For most OECD countries, the level of resident patenting activity has been stable over time. The two exceptions are the United States and Germany. The U.S. level increased gradually, from 2.7 per 10,000 in 1981 to 3.5 in 1991, while Germany's level declined from over 5 per 10,000 to 4.1 by 1991 (a trend that may have more to do with the increase in Germany's population after unification than any decline in inventive activity per se). Japan is not represented on this graph because it is literally off the scale. In 1981 Japan resident patent application level was 16.3 per 10,000, and it increased even further to 27.1 by 1991. Japan's high patenting level, however, is due largely to the peculiarities of Japan's patent system. Patent grants in Japan typically have a narrow scope, which encourages multiple filings to cover permutations of an invention that in most OECD nations would be covered by a single patent. Japan's "mosaic" patenting practices make it impossible to compare Japan's resident patenting

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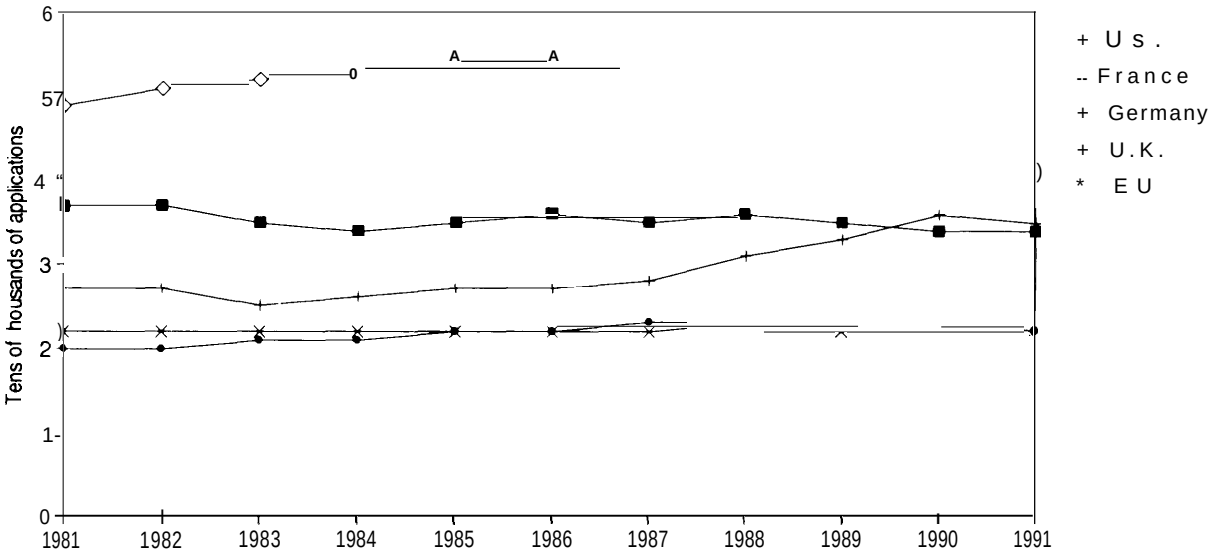
43 U S Congress, Office of Technology Assessment, *Defense Technology Base: Introduction and Overview*, ISC-309 (Washington, DC: U.S. Government Printing office, June 1987), p. 34.

44 Calculated from the Department of Defense RDT&E budget FY 1993-FY 1995, as provided by Congressional Research Service R&D Budget Seminar, op. cit., footnote 8.

45 U.S. Congress, Office of Technology Assessment, *Holding the Edge* (Washington, DC: U.S. Government Printing office, 1989), p. 176.

46 Alic et al., op. cit., footnote 4. See also Mowery, op. cit., footnote 3, p. 125.

FIGURE 3-18: Resident Patent Applications in Selected Countries, 1981-1991



NOTE: European Union data are totals for all EU member states

SOURCE: OTA, based on data in OECD, *ST/,* (l), table 77, May 1994

level with other OECD countries, although it is possible to observe the rate of change. Between 1981 and 1991 Japan's resident patenting level increased 66 percent, compared to a 31 percent increase in the U.S. level.[47]

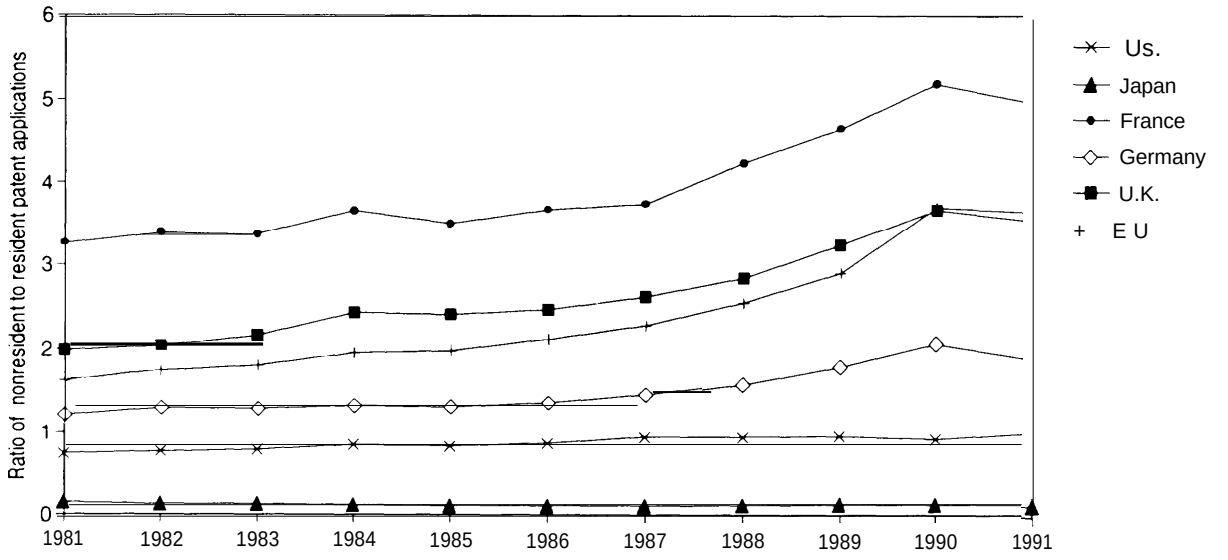
Compared to resident patenting levels, patent applications by nonresidents have increased significantly within most of the advanced industrial states. In the United States, nonresident patent applications rose 91 percent between 1981 and 1991; the level rose 75 percent in France, 70 percent in Germany, 65 percent in the United Kingdom, and 57 percent in Japan.[48] Consequently, most countries the ratio of nonresident to resident patent applications has increased (see figure 3-19). France, the United Kingdom, and the European Union exhibit the strongest expansion in the ratio of nonresident to resident patenting activity, which reflects the increase in nonresident patent applications during a period of little growth in resident applications. The lowest ratio is in Japan, and it declined from 0.15 to 0.13, reflecting the large growth in resident patenting compared to the relatively smaller growth in nonresident applications. The ratio is also comparatively low for the United States, although it increased from 0.7 in 1981 to 1.0 in 1991 (reflecting the slower rate of increase in resident patenting compared to the large growth in nonresident patent applications). In sum, the different nonresident to resident patenting levels shown in figure 3-19 suggest that there is proportionately more foreign patenting activity taking place in France, the United Kingdom, and the smaller European Union states than in Germany, the United States, and Japan.

The propensity of residents from each of these nations to patent abroad has increased steadily, as indicated in figure 3-20. Although in absolute

[47] OECD, Main *Science and Technology Indicators*, op. cit., footnote 41, table 77.

[48] Ibid., table 73.

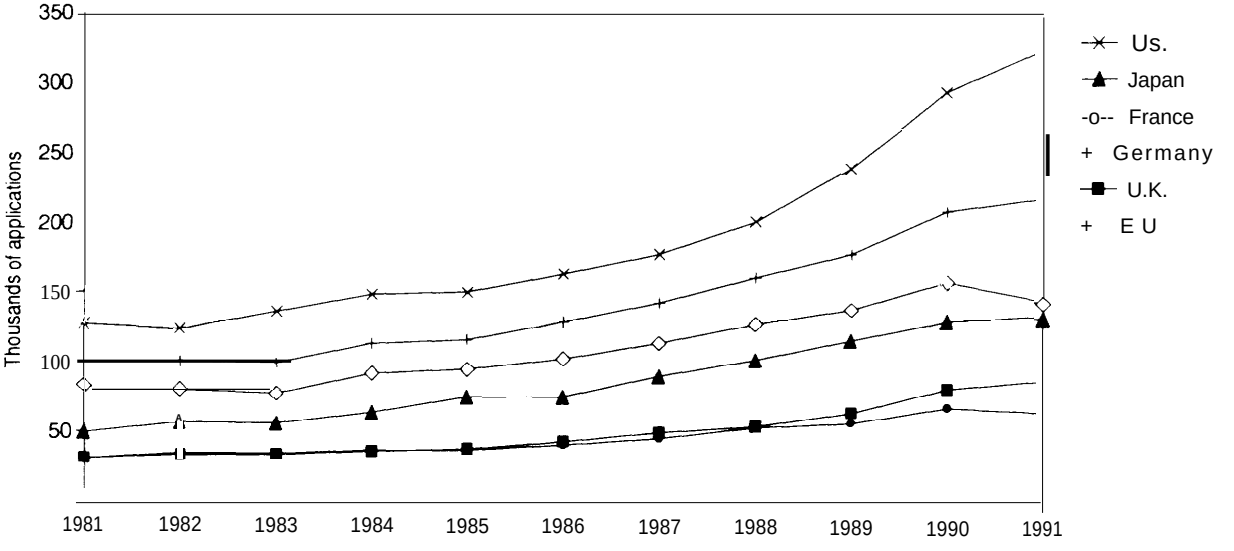
FIGURE 3-19: Ratio of Non-Resident Patent Applications to Resident Patent Applications in Selected Countries, 1981-1991



NOTE European Union data are totals for all EU member states

SOURCE OTA, based on data in OECD, ST/, (l), table 75, May 1994

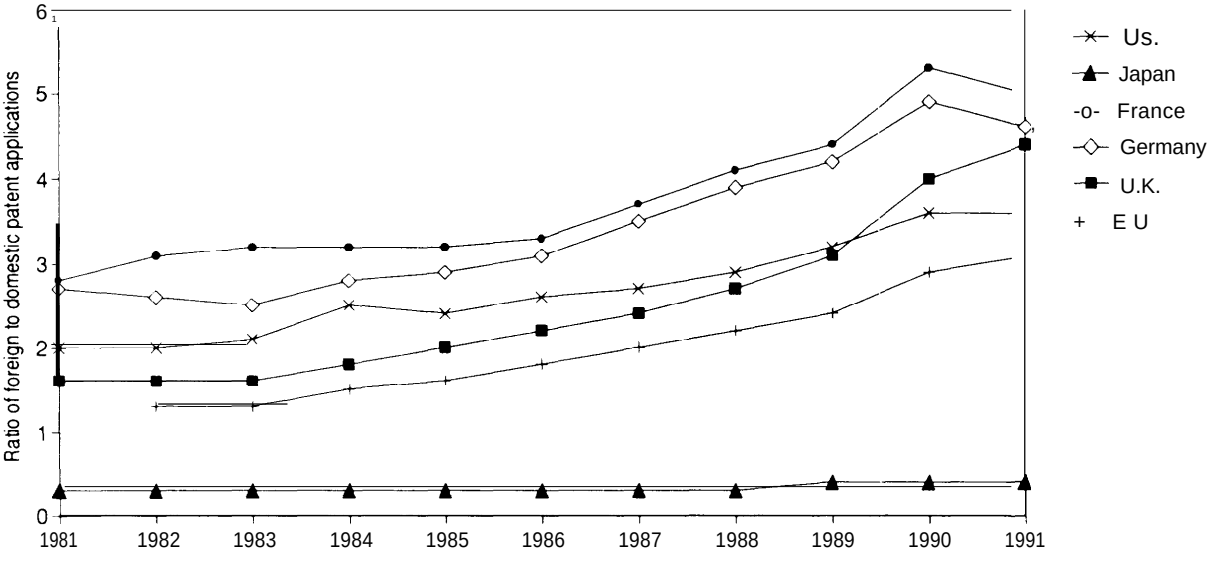
FIGURE 3-20: Number of Foreign Patent Applications by Residents of Selected Countries, 1981-1991



NOTE European Union data are totals for all EU member states

SOURCE OTA, based on data in OECD, *ST/,* (1), table 74, May 1994

FIGURE 3-21: Ratio of Foreign to Domestic Patent Applications by Residents of Selected Countries, 1981-1991



NOTES: Foreign patent applications concern inventions already covered by internal applications, one domestic application can give rise to several foreign applications European Union data are totals for all EU member states

SOURCE: OTA, based on data in OECD, *STI,* (1), table 78, May 1994

terms the United States files by far the most foreign patent applications, the rate of expansion since 1981 has been substantial across the advanced industrial states. The United Kingdom shows the strongest growth in external patenting, increasing 17.5 percent per year since 1981. External patenting by U.S. citizens increased 15.6 percent, while the number increased 17.0 percent for Japan, 10.3 percent for France, and 7.4 percent for Germany.[49]

The widespread increase in external patenting shown in figure **3-20** indicates that firms and individuals are increasingly likely to patent in foreign markets. This trend is confirmed by the ratio of external to resident patent applications, which shows that the internationalization of patenting activity has been increasing steadily for all but Japan (see figure 3-21).[50] These trends suggest that technology has been following the international expansion of business activity. However, as chapter 4 demonstrates, the internationalization of technology has been progressing at a much slower rate than that of production and commerce.

CONCLUSIONS

Taken together, aggregate patenting and R&D trends point to considerable challenges for U.S. technology policy. First, R&D investment rates by U.S. businesses are relatively low, particularly

[49] I bid., table 74.

[50] Again, it is difficult to compare Japan's patent trends with the rest of the OECD due to the unusual character Of Japan's domestic patenting system. The comparatively low ratio of foreign to domestic patenting for Japan, shown in figure 3-21, is partly due to the unusually high level of domestic patenting in Japan. As figure 3-20 illustrates, Japan's level of external patenting has increased substantially, and in 1991 was comparable to Germany's level.

in comparison with Japanese firms. Second, total U.S. R&D investment no longer leads the world as a percentage of GDP. Moreover, the large percentage of total resources devoted to defense technologies reduces the commercial impact of U.S. R&D expenditures. Third, patenting data reveal trends toward the internationalization of technology, as firms and individuals are increasingly likely to seek patents in foreign markets as well as the domestic market. In short, U.S. industry is continuing to invest in R&D at low rates and total U.S. R&D rates are declining in relative terms at the very time that technology is diffusing more rapidly and becoming increasingly internationalized.

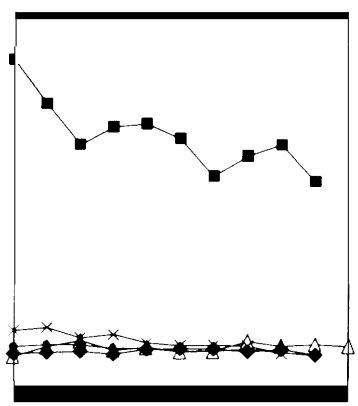
At root, the principal mechanism behind the internationalization of technology is the multinational enterprise. The patent trends outlined above measure one dimension of internationalization, but technology can also be internationalized through other business activities, such as overseas R&D, international sales of technology in the form of intellectual property, and cross-national corporate collaboration on technology development. As the following chapter demonstrates, close analysis of these processes indicates that MNEs have magnified the internationalization of technology, but that—relative to their highly internationalized production capabilities—they tend to keep their core technology development functions in the home market. This conclusion describes a central tendency. As chapter four shows, MNEs based in different countries and operating in different sectors often internationalize their core technology development functions in different ways and to different degrees.

Multinationals and the Location of Innovation

4

Chapter 4 builds on numerous recent analyses that register concern about the comparative performance of the U.S. innovation system and the long-term health of the domestic technology base. OTA and others have analyzed the impact of the U.S. innovation system's orientation toward defense technologies on the nation's relative technological position and international competitiveness. [1] Other analyses have focused on the relative inability of U.S. firms to commercialize new technologies, and the dearth of policy efforts to encourage the diffusion of new technologies along with more tacit forms of knowledge.[2] Given the central role of multinational enterprises (MNEs) in the production and diffusion of new technology—and hence in the competitiveness of national economies—this chapter focuses on the relationship between MNEs and national innovation systems.

Many analysts have noted that MNEs in recent years have increased the cross-border transfer of technological knowledge and



[1] See U.S. Congress, Office of Technology Assessment, *Defense Conversion: Redirecting* R&D, OTA-ITE-552 (Washington, DC. U.S. Government Printing Office, May 1993); U.S. Congress, Office of Technology Assessment, *Competing Economies: America. Europe. and the Pacific Rim*, OTA-ITE- 498 (Washington, DC: U.S. Government Printing Office, October 199 l), National Science Board, *The Competitive Strength U/ U.S. Industrial Science and Technology: Strategic Issues* (Washington, DC: National Science Foundation, 1992).

[2] See J.A.Alic, "'Technical Knowlege and Technology Diffusion: New Issues for U.S. Government Policy," *Technology Analysis and Strategic Management* 5(4):369-383, 1993; U.S. Congress, Office of Technology Assessment, *Making Things Better: Competing in Manufacturing*, OTA-ITE-443 (Washington, DC: U.S. Government Printing Office, February 1990). OTA is conducting an assessment of difficulties U.S. industry has faced in the commercialization of new technologies.

assets, a process referred to as the globalization of technology.[3] However, globalization does not imply that national technology bases are becoming more integrated and interdependent. First, most of the core research and technology development activities of MNEs remain centralized in the home market. Second, much of the technology sold across borders stays within MNE networks. And third, cross-border technical alliances and other forms of interfirm collaboration are prominent in a limited number of sectors, although the available data are inadequate to assess the net significance of alliances as a channel for international technology diffusion.

OTA's analysis shows that, although technology has become increasingly global and will likely become more so in the future, technology development in the aggregate remains firmly rooted in national technology bases. Moreover, MNEs based in different countries and operating in different industrial sectors vary in their tendency to retain core technology development capabilities in the home market.

These conclusions follow from an analysis of three principal mechanisms through which MNEs can extend technology across national borders: first, through overseas R&D activities; second, through the direct sale of technology in the form of intellectual property, in exchange for royalties and license fees; and third, through cooperative R&D agreements or alliances between firms, as well as between firms and other R&D organizations such as universities.[4] If there are consistent national differences in the strategic technology activities of MNEs, then those differences should be reflected in each of these areas.

THE LOCATION OF RESEARCH AND DEVELOPMENT

Historically, R&D has been the last aspect of corporate activity to take on a global dimension, since the economies of scale associated with research activities tend to favor centralization. However, as firms establish foreign production capabilities, they often decentralize selective elements of their R&D. In addition to supporting local production facilities, firms will move R&D abroad for a variety of reasons:

- to acquire foreign technology;
- to customize products for local markets;
- to stay abreast of technological developments;
- to gain access to foreign R&D resources, such as universities, public and private laboratory facilities, and scientists and engineers;
- to assist the parent company in meeting foreign regulations and product standards; and
- to gain cost efficiencies.

Consequently, as production and commerce become increasingly international, R&D should likewise exhibit a more global character.

Analysts differ, however, on the extent and breadth of the globalization of R&D. Some studies conclude that technology has globalized so extensively that it is becoming difficult to identify technologies with individual firms or to distinguish one national technology base from another.[5] Others note that while R&D has indeed become

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[3] See "Technology and Globalization," in Organisation for Economic Co-Operation and Development (OECD), *Technology and the Economy: The Key Relationships* (Paris, France: OECD, 1992), pp. 209-236. For an extended analysis with particular reference to MNEs, see O. Granstrand, L. Håkanson, and S. Sjölander, *Technology Management and International Business: Internationalization of R&D and Technology* (New York, NY: John Wiley, 1992).

[4] Two of these phenomenon—the increased frequency Of both offshore R&D and international technical alliances-are associated with the rise of "technoglobalism" during the 1980s. See OECD, Economic Analysis and Statistics Division, *Performance of Foreign Affiliates in OECD Countries* (Paris, France: OECD, forthcoming), pre-publication copy p. 49.

[5] T.H. Lee and pp. Reid (eds.), *National Interests in an Age of Global Technology* (Washington, DC: National Academy Press, 1991), P. 72.

more mobile, MNEs move R&D abroad far more slowly than production, sourcing, marketing, and other business activities.[6] Others contend that firms are responding to global competition by watching R&D activities closely and striving to retain centralized control.' Still others agree that MNEs conduct relatively little R&D outside the home country, but note that the strategies and policies of MNEs can affect the way R&D is owned, organized, and located.[8] Finally, OECD analyses indicate that major MNEs may be expanding their core R&D activities across national borders. Some foreign acquisitions appear aimed at gaining access to technology and other R&D resources that are already established in particular markets (for instance, biotechnology in the United States). In the United States, Germany, and the United Kingdom, foreign firms "are spending substantial sums on R&D, mainly for local markets though increasing y for global ones, reflecting new strategies in R&D intensive industries."[9]

OTA's analysis indicates that R&D has become more global in character, as demonstrated by the overseas R&D activities of foreign affiliates. Nevertheless, relative to production and sourcing, R&D across the advanced industrial states remains highly centralized in the home market operations of MNEs. The degree of centralization, however, varies by country of origin as well as by sector. The patterns underlying this assessment can be seen in three areas of inquiry: the R&D activities of foreign affiliates in the United States; the R&D activities of U.S. affiliates in foreign markets; and the relationship between R&D conducted by affiliates and that conducted by MNE parents.

R&D by Foreign Affiliates in the United States

R&D spending by foreign affiliates in the United States has increased substantially, measured as a percentage of total R&D expenditures by U.S. businesses. In 1982 foreign affiliates accounted for 9.4 percent ($4.5 billion) of all business R&D spending in the United States; by 1992 that share had risen to 16.4 percent ($10.7 billion).[10] Although relatively small in absolute terms, the rate of increase in R&D spending by foreign affiliates has been much more rapid than that of total U.S. business R&D. Between 1982 and 1992, R&D expenditures by foreign affiliates in the United States grew by 138 percent (see figure 4-1), while total business R&D expenditures grew by 39 percent (from $48.6 to $67.0 billion in constant dollars).[11]

Affiliates from other advanced industrial nations increased their total R&D spending in the United States rapidly over the course of the 1980s and early 1990s (see figure 4-2). During that period U.K. and German affiliates consistently outspent French and Japanese affiliates. Adjusted for inflation, U.K. affiliates in the United States spent $1.8 billion on R&D in 1992, and German affili-

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[6] J.A. Cantwell, *Technological Innovation and Multinational Corporations* (Oxford, UK: Basil Blackwell, 1989).

[7] P. Patel and K. Pavitt, "Large Firms in the Production of the World's Technology: An Important Case of 'Non-Globalizatic m'" *Journal of International Business Studies* First Quarter: 1-21, 1991.

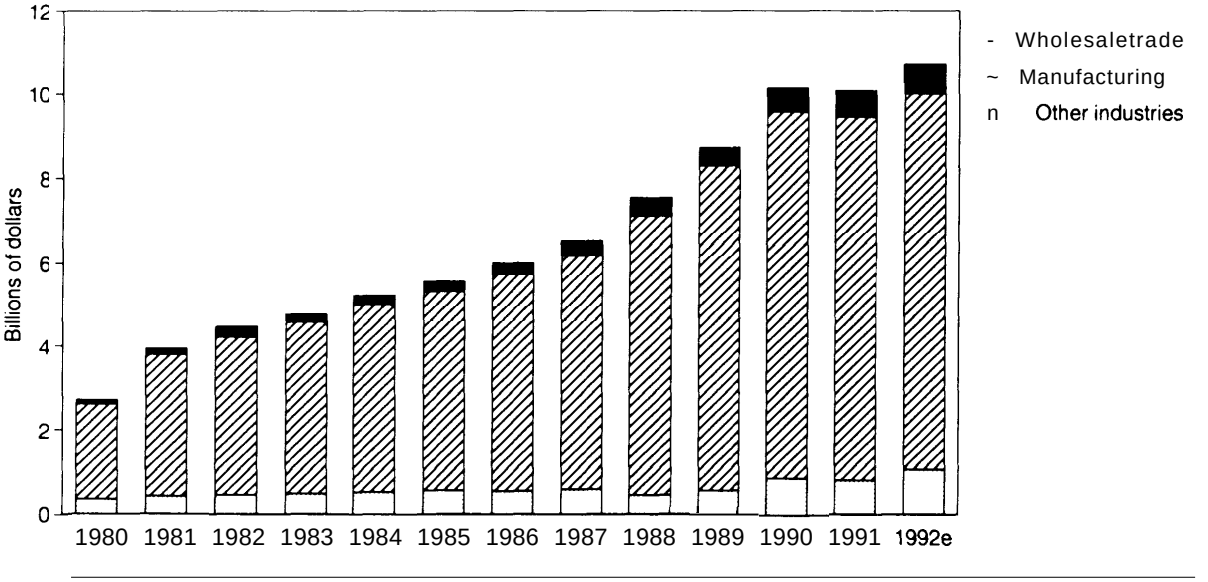
[8] J.H. Dunning, "Multinational Enterprises and the Globalization of Innovatory Capacity," *Research Policy* 23(1):67-88, Jan. 1994.

[9] G. Vickery, "Global Industries and National Policies," *OECD Observer 179:* 1 1-14, December 1992/January 1993. Smaller countries with limited domestic R&D resources (e.g. Sweden, Netherlands, Switzerland) tend to locate even more R&D abroad, often as a means of tapping foreign technological resources.

[10] In constant 1987 dollars. Data on R&D spending by foreign affiliates from U.S. Department of Commerce, *Foreign Direct Investment in the United States: An Update* (Wash ington, DC: US GPO, June 1993), table 56; and U.S. Department of Commerce, *Foreign Direct Investment in the United States: Preliminary 1992 Estimates* (forthcoming, 1994), table H-3A. Data on total U.S. business R&D are from National Science Board, *Science and Engineering Indicators—1993* (Washington, DC: U.S. GPO, 1993), NSB 93-1, appendix table 4-4, p. 333.

[11] National Science Board, *Science and Engineering Indicators—1 993. Op cit.* footnote 10.

FIGURE 4-1: R&D Expenditures of Foreign Affiliates in the United States by Sector, 1980-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary.

SOURCE: OTA, based on data on U S Department of Commerce, Economics and Statistics Administration, *Foreign Direct Investment* in *the United States: An Update, Review and Analysls of Current Developments* (Washington, DC U.S. Government Printing Off Ice, June 1993), appendix C, table 56 (hereafter cited as ESA, *FDIUS), U S* Department of Commerce, Bureau of Economic Analysis, Foreign *Direct Investment* in *the United States Operations of U.S. Affiliates of Foreign Companies, 1987* Benchmark Survey, revised 1988-1991 estimates, and preliminary 1992 estimates (Washington, DC U S Government Printing Off Ice, 1990-1994), table H-1 (hereafter cited as BEA, *FDIUS)*

ates spent $1.6 billion. Japanese and French affiliates have spent comparatively less on R&D over time—$l.3 billion and $1.0 billion, respectively, in 1992. [12]

Since 1980,86 percent of the total R&D by foreign affiliates in the United States has been in manufacturing, increasing slightly from 82 percent in 1980 to 84 percent in 1992.'3 Canadian firms accounted for the largest share—19 percent—among foreign affiliates in the United States during 1992 (see figure **4-3).** German, U. K., and Swiss affiliates each accounted for $1.5 billion or 16 percent, compared to $1.0 billion or approximately 10 percent for French and Japanese affiliates.

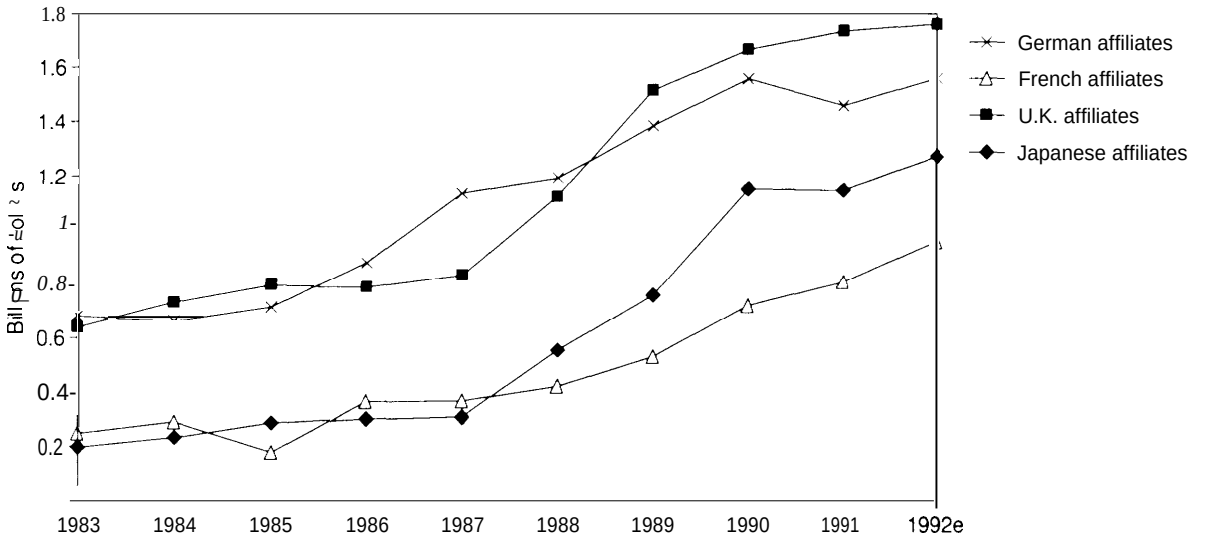
Between 1985 and 1992, over half of all R&D and 81 percent of the manufacturing R&D conducted by foreign affiliates in the United States was concentrated in three sectors: chemicals (28 percent); pharmaceuticals (23 percent); and electrical and nonelectrical machinery (29 percent combined). [14] The most rapid rate of growth has been in the pharmaceutical sector, where foreign

12 In constant 1987 dollars. Data from U.S. Department of Commerce, Bureau of Economic Analysis, Survey *of Current Business* (Washington, DC: May 1993); table 1, p. 89; and U.S. Department of Commerce, Bureau of Economic Analysis, *Foreign Direct Investment in the United States: Preliminary 1992 Estimates* (Washington, DC: forthcoming, 1994); table H-3A.

13 See figure 4-I.

14 U.S. Department of Commerce, BEA, *Foreign Direct Investment in the United States: Preliminary 1992 Estimates,* op cit. footnote 12.

FIGURE 4-2: Gross R&D Expenditures of Foreign Affiliates in the United States by Nationality of Ownership, 1983-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary.

SOURCE: OTA based on data in BEA, *FDIUS,* tables 8 and H-6 (1 983-1986) and tables A-6 and H-2 (1 987-1992)

affiliates increased their R&D spending from $596 million in 1985 to $2.8 billion in 1992 (in constant dollars), an average increase of 26 percent per year. R&D spending by foreign affiliates also has grown rapidly in industrial chemicals and machinery, again with the most rapid rates of growth taking place in the late 1980s (see figure 4-4).

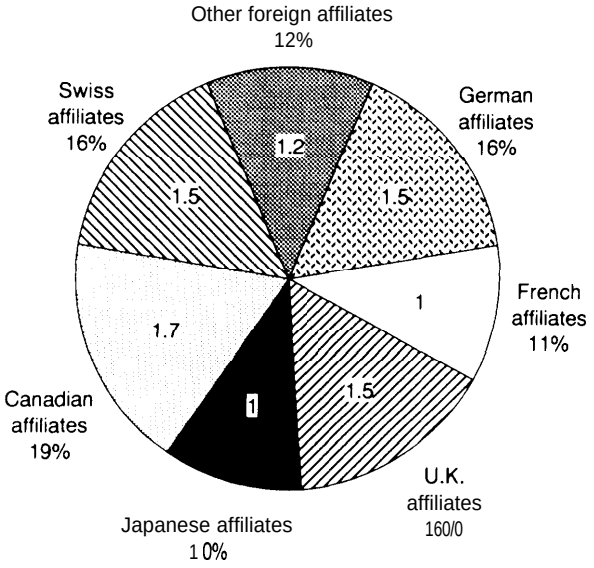
The R&D spending increases shown in figure 4-2 correspond to a very active period of merger and acquisition activity by foreign investors. The value of foreign acquisitions in the United States jumped from $31.5 billion in 1986 to $64.9 billion in 1988, and remained quite high during 1988-90.[15] The correspondence between this period of high acquisition activity and the rise in R&D spending by foreign affiliates after 1986 implies that much of the increase in affiliate R&D was due to acquisitions of U.S. research facilities, as opposed to the transfer of R&D activities from the home market to existing affiliates in the United States.[16] With only a few notable exceptions, such as NEC's laboratory in Princeton, most industrial laboratories run by foreign affiliates in the United States have been established not through new investment dedicated to R&D activities per se but rather through the merger and acquisition strategies of foreign firms.[17]

15 See figure 5-8 in chapter 5.

16 For supporting analyses, see OECD, *Performance of Foreign Affiliates*, op. cit., footnote 4, p. 50; U.S. Department of Commerce, BEA, *Foreign Direct Investment in the United States: An Update,* op. cit., footnote 10, p. 70; and H. Fusfeld, *Industry's Future: Changing Patterns of Industrial Research* (unpublished manuscript, 1994).

17 H. Fusfeld, op. cit. footnote 16.

FIGURE 4-3: Manufacturing R&D Expenditures of Foreign Affiliates in the United States by Nationality of Ownership, 1992



NOTE: Brackets show R&D expenditures in constant 1987 dollars, total expenditures for manufacturing R&D by foreign affiliates = $95 billion

SOURCE: OTA, based on data in BEA, *FDIUS,* preliminary 1992 estimates, table H-4

Variations in investment strategies affect the average R&D intensity of foreign affiliates in the United States.[18] Figure 4-5 shows that the R&D intensity for European affiliates is above the average for all affiliates, which reflects the relatively high percentage of European foreign direct investment in the United States (FDIUS) that is directed to manufacturing. German affiliates in the United States consistently have had the highest R&D intensity, which reflects the concentration of German affiliates in R&D-intensive manufacturing industries, such as chemicals and pharmaceuticals.[19] Similarly, the comparatively low R&D intensity of Japanese affiliates in the United States reflects the relatively low percentage of Japanese FDIUS directed to manufacturing: in 1992, 19 percent of Japan's FDIUS was in manufacturing and 34 percent in wholesale trade, compared with 47 percent and 8 percent, respectively, for European FDIUS.[20]

Table 4-1 shows cross-national variations in the sectoral focus of manufacturing R&D by foreign affiliates in 1992. The distribution of spending reinforces the above observation that the average R&D intensity of foreign affiliates varies with respect to the sectoral distribution of FDIUS. However, there are also notable cross-national differences in R&D intensity within individual sectors. As table 4-2 shows, in 1992 the average R&D intensity for all foreign affiliates in U.S. manufacturing industries was 2.7 percent; the average for German affiliates was 3.5 percent, while it was 2.9 for French affiliates, 2.2 for U.K. affiliates, and 1.7 percent for Japanese affiliates. Across the major industrial sectors, German affiliates typically have the highest R&D intensity levels and Japanese affiliates the lowest, while U.K. and French affiliates share the middle ground.

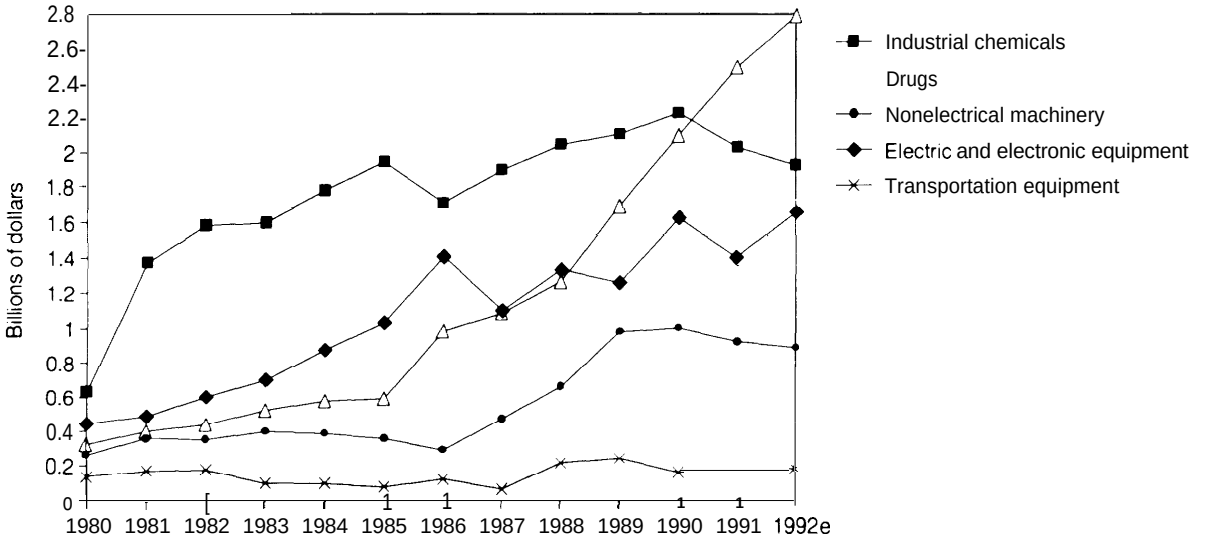
In short, the scope and intensity of R&D by foreign affiliates in the United States varies both by country and by sector. Most of the manufacturing R&D conducted by foreign affiliates in the United States is concentrated in industrial chemicals, drugs, and electrical and electronic machinery (see figure 4-4). In these areas the R&D intensity of foreign affiliates is two or more times the na-

18 R&D intensity is the ratio of R&D expenditures to total output (sales).

19 OECD, *Performance of Foreign Affiliates*, op. cit., footnote 4, table 1, p. 80. For an analysis of FDIUS by country and by sector, see ch. 5 of this report.

20 U.S. Department of Commerce, BEA, *Foreign Direct Investment in the United States: Preliminary 1992 Estimates*, op. cit., footnote 12. See chapter 5 for a complete analysis of the composition of FDIUS.

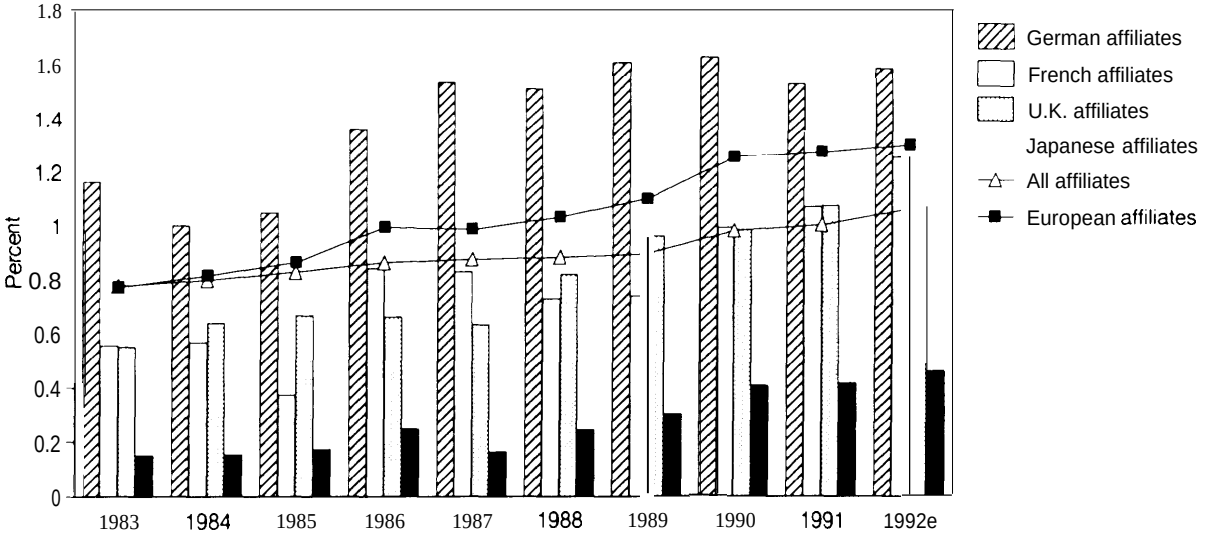
FIGURE 4-4: Manufacturing R&D Expenditures of Foreign Affiliates in the United States by Sector, 1980-1992 (constant 1987 dollars)



NOTE 1992 data are preliminary

SOURCE OTA based on data m ESA, *FDIUS*, appendix C, table 56, BEA, *FDIUS*, table H-1 (1987-1992)

FIGURE 4-5: R&D Intensity of Foreign Affiliates in the United States by Nationality of Ownership, 1983-1992



NOTES R&D intensity measures total affiliate R&D expenditures as a percent of total sales 1992 data are preliminary

SOURCE OTA based on data in BEA, *FDIUS* tables 8 and H-6 (1983-1986) and tables A-6 and H-2 (1 987-1992)

TABLE 4-1: Manufacturing R&D Expenditures of Foreign Affiliates in the United States by Sector, 1992 (millions of constant 1987 dollars)

	All countries	Germany	France	U.K.	Japan
All manufacturing	*9,393*	1,462	1,007	1,492	981
Chemicals and allied products	*5,095*	871	*239*	958	141
Industrial chemicals	1,926	626	n/a	86	53
Drugs	2,787	n/a	n/a	795	63
Machinery	2,549	379	403	141	612
Nonelectrical machinery	894	51	168	46	457
Electric and electronic equipment	1,656	328	235	94	156
Transportation equipment	179	34	26	60	13

SOURCE: Adapted from U S Department of Commerce, Bureau of Economic Analyses, *Foreign Direct Investment* in *the United States Operations o/ U.S. Affiliates of Foreign Companies* preliminary 1992 estimates (Washington, DC U S Government Printing Off Ice, forthcoming), table H-4

TABLE 4-2: Manufacturing R&D Intensity of Foreign Affiliates in the United States, by Sector, 1992 (R&D expenditures as a percent of total affiliate sales)

	All countries	Germany	France	U.K.	Japan
All manufacturing	2,7	3.5	2.9	2.2	1.7
Chemicals and allied products	5.0	4.5	*3.2*	4.4	2.7
Primary and fabricated metals	0.6	8.0	n/a	69	4.0
Machinery	3.6	3.9	5,7	2.0	3.6
Other manufacturing	1.3	2.0	n/a	12	0.8

NOTE: R&D intensity measures total affiliate R&D expenditures as a percent of total sales, a more complete sectoral breakdown of 1992 affiliate sales data wiII be available only after this publication has been released

SOURCE: OTA, based on data in U S Department of Commerce, Bureau of Economic Analyses, Foreign D/reef/nves[menf/nfhe*Inded States:* Operations *of U.S. Affiliates of Foreign Companies* preliminary 1992 estimates (Washington, DC U S Government Printing Office, forthcoming), tables E-4 and H-4

tional average for all industries.[21] Affiliates in these sectors (mostly Swiss, German, U. K., and Japanese firms) are technologically and commerc i ally powerful global competitors, and can mobilize substantial R&D resources. Moreover, the fact that they concentrate R&D resources in the United States indicates the attractiveness of the U.S. market for companies that have successfully developed new technologies.[22]

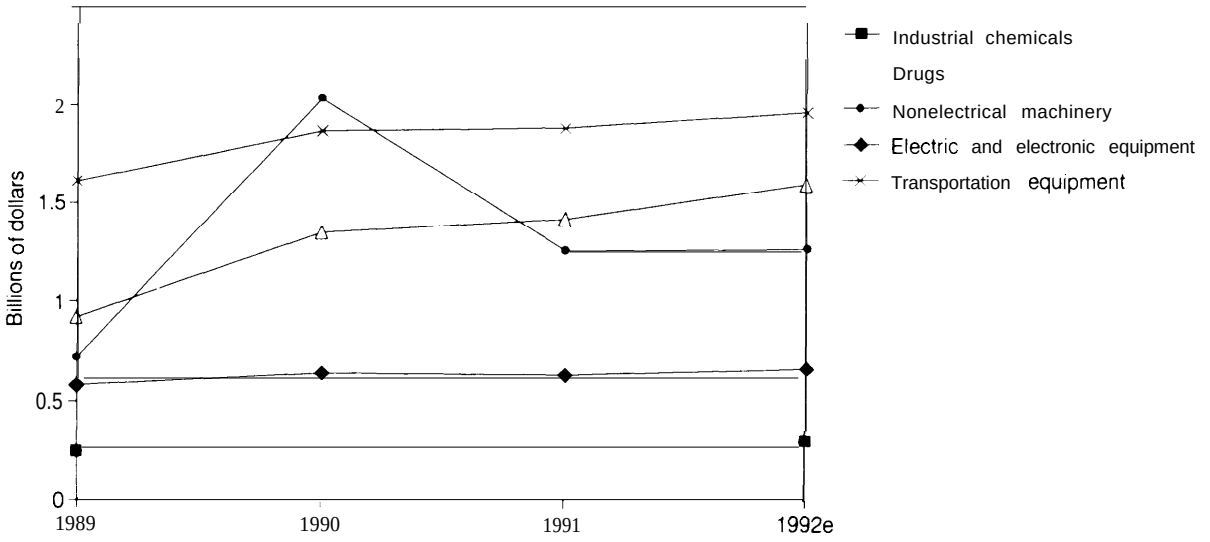
R&D by U.S. Affiliates in Foreign Markets

Like the R&D activity of foreign affiliates in the United States, the overseas R&D by affiliates of

21 In most countries, the R&D intensity of affiliates is lower or at most equal to the average R&D intensity for all manufacturing industries in host countries. The United States is one of the few exceptions to this tendency. OECD, *Performance of Foreign Affiliates*, op. cit., footnote 4, p. 5 I .

22 Ibid.

FIGURE 4-6: R&D Expenditures of U.S. Affiliates in Foreign Markets by Sector, 1989-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary.

SOURCE: OTA based on data in U.S. Department of Commerce, Bureau of Economic Analysis, *U.S. Direct Investment Abroad Operations of U S Parent Companies* and *their Foreign Affiliates* revised 1989-1991 estimates and preliminary 1992 estimates (Washington DC U S Government Printing Office, 1992-1994) table III I 2-5 (hereafter cited as BEA, *USDIA)*

U.S. MNEs has increased rapidly over time. Between 1982 and 1992, R&D expenditures by majority-owned foreign affiliates of U.S. MNEs increased from $4.3 billion to $8.4 billion in real terms.[23] Also like foreign affiliates in the United States, the location and character of this R&D ac - tivity varies by country arid by sector.

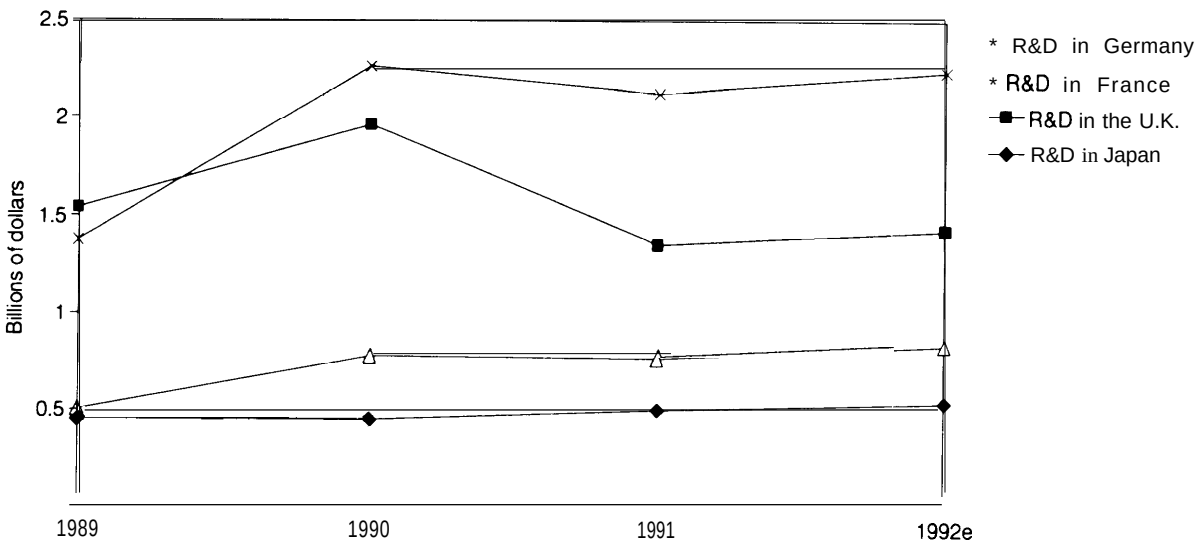
Most of the overseas R&D conducted by U.S. affiliates is in manufacturing. Between 1989 and 1992, manufacturing R&D accounted for an average of 84 percent (or $6.7 billion) of all R&D spending by U.S. affiliates in foreign markets .24 This ratio is equivalent to the average of 86 percent for the manufacturing R&D of foreign affiliates in the United States. However, while R&D by affiliates in the United States is concentrated in chemicals, pharmaceuticals, and machinery, the R&D by U.S. affiliates abroad is focused on machinery and transportation equipment. Of total overseas manufacturing R&D by U.S. affiliates between 1989 and 1992,29 percent was in electrical and nonelectrical machinery combined, 27 percent in transportation equipment, 20 percent in pharmaceuticals, and just 4 percent in chemicals (see figure 4-6).[25]

[23] U.S. Department of Commerce, BEA, *Survey of Current Business* (Washington, DC: July 1993), table 5, p.44; and U.S. Department of Commerce, BEA, *U.S. Direct Investment Abroad: Preliminary 1992 Estimates* (forthcoming, 1994), table 111.13. Data adjusted to constant 1987 dollars.

[24] U.S. Department of Commerce, BEA, *U.S. Direct Investment Abroad,* annual series (Washington, DC: 1992-1 994), tables 111.13 and III.E 3. The R&D data in this series goesbackonlyto 1989. Data adjusted to constant 1987 dollars.

[25] U.S. Department of Commerce, *U.S. Direct Investment Abroad: Preliminary 1992 Estimates*, op cit. footnote 23.

FIGURE 4-7: R&D Expenditures of U.S. Affiliates in Foreign Markets by Country, 1989-1992 (constant 1987 dollars)



SOURCE: OTA, based on data in BEA, *USDIA,* table III.I.3 (1989-1992)

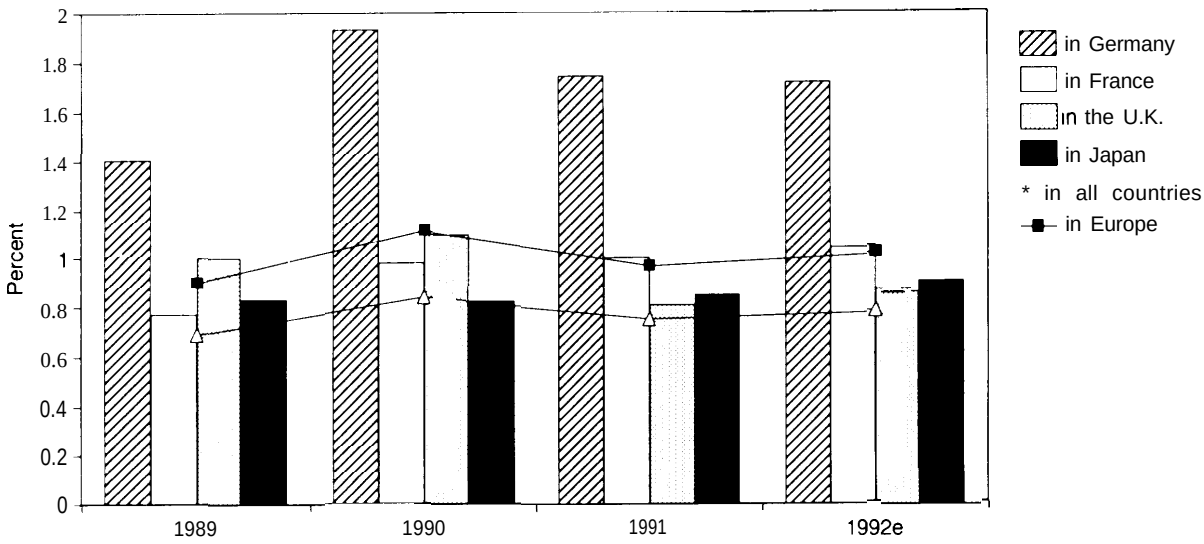
By country, the distribution of R&D expenditures by U.S. affiliates mirrors that of foreign affiliates in the United States. In relative terms, R&D by U.S. affiliates is concentrated in Germany and to a lesser extent the United Kingdom, with comparatively little R&D in France and Japan (see figure 4-7). Between 1989 and 1992, U.S. affiliates on average spent $2 billion per year in Germany (25 percent of the total by U.S. affiliates) and $1.6 billion per year in the United Kingdom (20 percent of the total), compared with $722 million (9 percent) in France and $488 million (6 percent) in Japan.

Like foreign affiliates in the United States, U.S. affiliates abroad have higher R&D intensities in the markets where they are more concentrated in manufacturing industries (see figure **4-8).** In 1992,96 percent of R&D by U.S. affiliates in Germany was in manufacturing industries; the same ratio for the United Kingdom was 83 percent, while it was 76 percent for France and 80 percent for Japan. Of the $2.2 billion in manufacturing R&D conducted by U.S. affiliates in Germany, 59 percent ($1.3 billion) was in transportation, 14 percent in machinery, and 11 percent in chemicals and allied products. In the United Kingdom, 38 percent ($462 million) of the manufacturing total ($1.2 billion) was in chemicals and allied products, and 18 percent was in machinery. In France, 63 percent ($402 million) of the total $641 million in manufacturing R&D was in chemicals and allied products. And in Japan, 49 percent ($213 million) of the total $437 million in manufacturing R&D by U.S. affiliates was in chemicals and allied products, while 32 percent ($ 139 million) was in machinery (of which 74 percent or $103 million was in electric and electronic equipment).zc

In sum, the R&D activities of both foreign affiliates in the United States and U.S. affiliates abroad have increased significantly in recent years, but the scope and intensity of that activity

26 ibid. All amounts have been converted to constant 1987 dollars.

FIGURE 4-8: R&D Intensity of U.S. Affiliates in Foreign Markets by Country, 1989-1992



NOTES: R&D intensity measures total affiliate R&D expenditures as a percent of total sales, 1992 data are preliminary

SOURCE: OTA based on data in U S Department of Commerce, Bureau of Economic Analysis, Survey *of Current Business* 73(7) 53-54 table 11 1 and 112 July 1993 (hereafter cited as BEA, SCB): BEA, *USDIA,* table III I 3 (1 989-1 992)

varies by country and by sector. The magnitude and intensity of R&D activity is the highest between the United States and Germany and the United Kingdom, in both directions; likewise, the magnitude and intensity of R&D activity is the lowest between the United States and France and Japan, also in both directions.

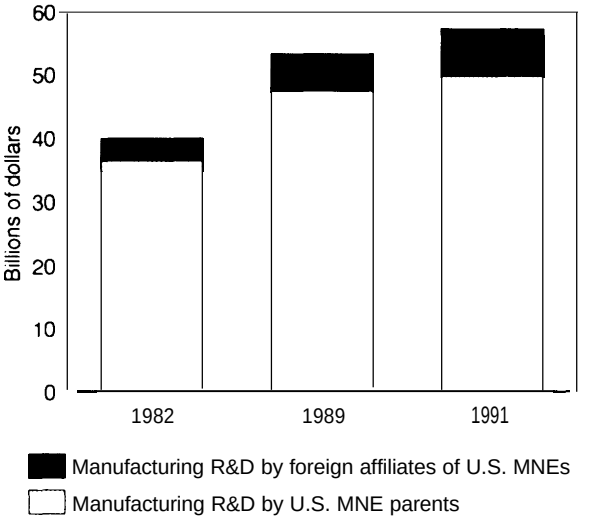
Although these measures of R&D activity provide useful indicators of the magnitude of R&D conducted by MNEs in host countries, they do not provide sufficient information to judge whether R&D has become significantly more decentralized during recent years. For instance, the rise in R&D by affiliates may represent acquisitions of foreign R&D facilities more than the transfer of research from the home market to foreign sites. In addition, R&D spending data do not distinguish between types of technology and types of R&D, which makes it difficult to assess the character and import of R&D conducted in different locations. In short, assessing the scope and impact of R&D by MNEs requires a more detailed comparison of the R&D conducted by affiliates with that conducted by their parent groups in their home markets.

R&D Within Multinational Networks

Although the volume of overseas R&D by affiliates has increased substantially, it is still a small fraction of the total R&D conducted by MNEs. The domestic and overseas R&D conducted by U.S.-based MNEs since the early 1980s illustrates both of these points (see figure 4-9). Between 1982 and 1991 manufacturing R&D expenditures by U.S. MNE parents increased an average of 4.8 percent per year, from $36.5 billion to $50 billion. During the same period manufacturing R&D spending by affiliates of U.S. MNEs grew at a faster rate of 12.1 percent per year, rising from $3.5 billion to $7.2 billion.[27] The faster rate of growth of R&D by affiliates indicates that R&D

[27] Adjusted to constant dollars from data provided in U.S. Department of Commerce, BEA, *Survey of Current Business*, op. cit. footnote 23. See also figure *4-9.*

FIGURE 4-9: Manufacturing R&D of U.S.-based MNEs (constant 1987 dollars)



SOURCE: OTA, based on data in BEA, SCB 73(7): 44, table 5, July 1993

has become more international in scope. At the same time, however, the proportion of total MNE R&D conducted by affiliates remains small. In 1991, the R&D conducted by majority-owned affiliates comprised 12.7 percent of the total manufacturing R&D expenditures of U.S. MNEs, up from 8.7 percent in 1982.28 Although no comparable data exists for European and Japanese MNEs, the available evidence suggests that they conduct similar if not smaller percentages of their R&D overseas than do U.S. firms.

Like the aggregate level of R&D spending, the R&D intensity of foreign affiliates tends to be substantially lower than that of parent groups. For example, the R&D intensity of U.S. MNE parent groups in 1991 was 2.1 percent, compared with 0.8 percent for their majority-owned foreign affiliates.[29] In general, across the advanced industrial states the R&D intensity of foreign affiliates tends to be lower than or at best equivalent to the average for all manufacturing industries in the host country.[30] However, as with the volume of R&D spending, the R&D intensity of foreign affiliates has been increasing at a faster rate than that of MNE parent groups. For example, between 1982 and 1991 the annual growth rate in the R&D intensity of majority-owned foreign affiliates of U.S. MNEs averaged 5 percent, compared with 3 percent for their parent groups.[31] Again, though, much of the growth in the R&D intensity of both foreign affiliates in the United States and U.S. affiliates abroad can be attributed to overseas acquisitions and/or joint ventures, and consequently does not necessarily represent a transfer of R&D operations from the home country to foreign markets.[32]

Although relatively low, the rapid increase in both the magnitude and intensity of overseas R&D by foreign affiliates does represent a gradual globalization of R&D. However, it is extremely difficult to assess the significance of this trend due to the lack of data regarding the technological and strategic contribution of the R&D conducted by

28 Ibid. The proportion of R&D by majority-owned affiliates of U.S. MNEs varies somewhat by sector. In 1991 it was highest in food and kindred products (18 percent), chemicals and allied products (15 percent), and transportation equipment (14 percent), and lowest in electric and electronic equipment (8 percent) and primary and fabricated metals (5 percent).

29 U.S. Department of Commerce, BEA, *Survey of Current Business,* op. cit., footnote 23, table 5, p 44, table 7, p. 46.

30 OECD, op. Cit., footnote 4, p. 51. One of the few exceptions to this rule is the United States, where the average R&D intensity of foreign affiliates is driven up by the particularly high R&D intensity of foreign affiliates in pharmaceuticals, chemicals, and mechanical engineering (respectively two, three, and four times that of all manufacturing industry in the United States).

31 U.S Department of Commerce, BEA, *Survey of Current Business, op.* cit., footnote 23, p. 46.

32 For data and analysis of U.S MNEs see U.S. Department of Commerce, BEA, *Survey of Current Business*, op. cit., footnote 23, p. 46. For an analysis of foreign affiliates in the United States, see U.S. Department of Commerce, BEA, *Foreign Direct Investment in the United States: An Update*, op. cit., footnote 10, p. 70.

foreign affiliates to the global competitiveness of MNEs.[33] Indeed, the most challenging analytical task is to determine whether the R&D conducted by foreign affiliates contributes to the core technological activities of the parent firms, or whether it contributes primarily to the product and process technology utilized by overseas production facilities.

Most studies indicate that, over time and across countries, the most significant reason for conducting R&D in foreign markets is to customize products to accommodate local market conditions.[34] It typically takes quite long for firms to develop complex overseas R&D operations that support local production facilities. For example, Philips Electronics N.V. has maintained a U.S. research facility at Briarcliff Manor, NY, for over two decades. The facility now accounts for approximately 15 percent of all corporate research activity, and is an integral part of Philips laboratory network (the company maintains four laboratories in Europe—the central lab at corporate headquarters in Eindhoven, The Netherlands, plus smaller facilities in France, Germany, and England). While each of the foreign facilities has its own technological capabilities and its own mix of research programs, most basic research is conducted in Eindhoven. The U.S. facility focuses mostly on supporting Philips' substantial U.S. manufacturing facilities.[35] OTA interviews with a number of MNEs in the electronics industry indicate that it takes at least a decade to establish an overseas research facility that can closely support affiliate manufacturing operations.

Fully integrated affiliates that conduct independent product R&D are relatively rare. For instance, Ford Motor Company, after many years of foreign production in Europe and elsewhere, has just begun to reorganize its operations and become a truly global MNE.[36] The company is planning to create a single operating unit, Ford Automotive Operations, that oversees five vehicle program centers (VPCs), each with worldwide responsibilities for the development and production of independent product lines.[37]

In sum, R&D moves overseas much more slowly than production, sourcing, and other business activities. Production facilities often can be established quickly and moved quickly, as market conditions change. By comparison, R&D facilities take a long time to set up and, once established, are very difficult to move. Consequently, most MNEs centralize basic research and product development in the home market, while research oriented toward customization and foreign production support is gradually conducted locally as affiliates become more deeply integrated into local markets.

The tendency for R&D to move overseas slowly, in the wake of foreign direct investment and local production, suggests an R&D life cycle that corresponds to the FDI life cycle discussed in chapter 6. In the initial stages of overseas production, firms tend to use product and process technology developed in the home market. As overseas production units become more established, local R&D activities emerge to customize

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33 OECD, op. cit., footnote 4, pp. 49-50.

34 For example, see U.S. Department of Commerce, Technology Administration, Japan Technology Program, *U.S. Research Facilities of Foreign Companies*, prepared by D.H. Dalton and M.G. Serapio, NTIS Pub. No. 93-134328 (Washington, DC: Jan 1993); U.S. Department of Commerce, Technology Administration and The Japan-U.S. Friendship Commission, *Japan-U. S. Direct R&D Investments in the Electronics Industries*, prepared by M.G Serapio, NTIS Pub. No. 94-127974 (Washington DC: 1994); OECD, op. cit., footnote 4.

35 On Philips' R&D operations, see Philips Electronics N. V., *Annual Report 1993* (Eindhoven, The Netherlands, 1994); Philips Electronics N. V., "Electronics for People," Corporate Brochure (Eindhoven, The Netherlands, 1993), p. 13; Philips Research, "Philips Research A Gateway to the Future," Corporate Brochure (Eindhoven, The Netherlands, 1993).

36 For distinctions between "global" and other types of MNEs, see box 1-1 in chapter 1.

37 Kevin Done, "Tomorrow, the World," *Financial Times*, Apr. 22, 1994, p. IS.

products in accordance with local market conditions and, eventually, to support affiliate production operations. In advanced stages, as affiliates become deeply integrated into local economies, they may undertake more substantial forms of R&D to develop products exclusively for the local market. Few firms reach this last stage.

If this R&D cycle is the rule rather than the exception, then one would expect overseas R&D to be more pronounced for European affiliates in the United States than for their Japanese counterparts, and likewise more pronounced for U.S. affiliates in Europe than for Japanese affiliates. To some extent the evidence is consistent with this expectation. Both the magnitude and intensity of R&D conducted by European affiliates in the United States is substantially higher than R&D by Japanese affiliates. Similarly, recent studies of Japanese investment in Europe indicate that Japanese affiliates conduct substantially less R&D there than do U.S. affiliates.[38]

This pattern, however, could be attributed to one or more of several different factors. First, it could represent a life-cycle effect, such that Japanese affiliates would eventually reach R&D levels achieved by U.S. affiliates in Europe and European affiliates in the United States. Second, it could reflect differences in the composition of FDI. By this account, the difference in R&D intensities between European and Japanese affiliates in the United States is due to the comparatively large percentage of European investment in manufacturing industries, which account for far more R&D per unit of sales than other areas of FDI.[39] And third, the pattern could be due to different national propensities to conduct R&D overseas, as opposed to other methods of acquiring technology in foreign markets.

Moreover, the degree to which R&D is centralized or decentralized often conforms to different technological and sectoral characteristics. For instance, one of the reasons pharmaceutical companies conduct R&D overseas is to accommodate different national regulatory standards and prac(ices.[w] In the consumer electronics industry, firms often conduct R&D abroad to keep in touch with leading-edge technological developments as well as to adapt technologies to local standards, such as different voltages or broadcasting systems.[41] In the automotive industry, the uniform nature of core technologies tends to encourage centralized R&D, even though production has become highly globalized.[42] In the semiconductor industry, the high R&D component of new product costs is pressuring firms from different countries to collaborate on next-generation product development.[43]

Nevertheless, even when R&D trends are observed on a sectoral basis, there are notable variations in the degree to which MNEs based in different countries conduct R&D in foreign markets. For instance, in the pharmaceutical industry, U.S. firms have set up more secondary R&D facilities than MNEs based elsewhere; European pharmaceutical firms tend to locate their second-

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38 M. Gittelman and E. Graham, "The Performance and Structure of Japanese Affiliates in the European Community" in M. Mason and D. Incarnation, *Does Ownership Matter? Japanese Multinationals in Europe,* (Oxford, UK: Clarendon Press, forthcoming 1994), pre-publication copy pp. 154-55.

39 See chapters 5 and 6 for a description of differences in the composition of FDI across the Triad.

40 OECD, "Globalisation in the Pharmaceutical Industry," draft manuscript dated Mar. 10, 1993, p. 9.

41 D.E. Westney, .. Cross-Pacific Internationalization Of R&D by US and Japanese Firms," *R&D Management* 23(2): *171-181,* 1993; OECD, "Globalisation of Industrial Activities: Sector Case Study of Globalisation in the Consumer Electronics Sector,' 'draft paper dated Nov. 9, 1993, p. 17.

42 R. Miller, "Global R&D Networks and Large-Scale Innovations: The Case of the Automobile Industry," *Research Policy* *~(~) :27-46, May *1993. See* also Pavitt and Patel, op. cit., footnote 7. As noted above, though, Ford recently embarked on a strategy that involves decentralizing some of its product R&D.

43 The chip development alliance between IBM, Seimens, and Toshiba is frequently cited in this regard.

ary R&D facilities in the United States, while Japanese pharmaceutical firms have very little exposure in foreign markets.[44] In the consumer electronics industry, Japanese firms conduct the bulk of their R&D at home, unlike European firms.[45] And in the automotive industry, U.S. firms have long had independent operations in Europe that conduct advanced R&D work. By contrast, Japanese auto producers have only recently begun to establish local technological support operations for their foreign assembly operations.[46]

These sectoral variations are consistent with aggregate national patterns. The U.S. firms conduct more R&D and have higher average R&D intensities overseas than either European or Japanese firms. European businesses, particularly those in Germany and the United Kingdom, conduct far more R&D abroad and have much higher average R&D intensities than Japanese affiliates. However, these tendencies coexist with national differences in the sectoral distribution as well as the timing of FDI. Consequently, it is difficult to judge the relative influence of national origins, sectoral characteristics, or vintage effects on the propensity of firms to decentralize their R&D operations across national borders.

Moreover, even though more R&D is being conducted across national borders, relative to production and sourcing R&D remains highly centralized across the advanced industrial states. For instance, the most R&D-intensive industries---electronics, computers, and pharmaceuticals[47]—are largely global in terms of production, sourcing, and marketing. Nevertheless, R&D in each sector remains relatively centralized. For instance, pharmaceutical firms conduct very little research and basic clinical evaluation outside of the home country,[48] while R&D in the computer industry is among the most highly centralized (a fact some analysts ascribe to domestic support programs that favor local firms).[49] The pattern is much the same in less R&D-intensive industries, especially those where core product technology varies little across national markets. For example, R&D in the auto industry remains relatively centralized, although design custom ization is often conducted locally.[50]

In sum, the evidence regarding the location of R&D leads to two principal conclusions:

1. MNEs are conducting increasing levels of R&D in foreign markets, thereby contributing

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44 OECD, op. cit., footnote 40, pp. 9, 39. In 1989, Japanese pharmaceutical firms commanded only 1.1% of the US market, while European firms commanded 26.7 percent of US market share. The pattern in Europe is similar: Japanese firms have a very low market presence, while US pharmaceutical firms command from 18 percent (in Germany) to 33 percent (in the United Kingdom).

45 OECD, "Globalisation of Industrial Activities: Sector Case Study of Global isation in the Consumer Electronics Sector, " draft paper dated Nov. 9, 1993, p. 17.

46 "Much of their activity is in component testing, procurement and process development, but more substantial product development is slowly gathering pace—the Honda Accord in the United States and the Nissan Primera in the United Kingdom had substantial local design inputs." OECD, "Globalisation of Industrial Activities: Sector Case Study of Globalisation in the Automobile Industry," draft paper dated June 16, 1993, p. 27.

47 Aerospace is also consistently among the top four R& D-intensive sectors. It is not widely anal yzed in this report due to its unique relationship to the defense industry as well as its unusually high degree of government regulation.

48 OECD, op. cit., footnote 40, p.9, table 4 p. 42.

49 OECD "Globalization of Industrial Activities: Sector Case Study of Globalisation in the Computer Industy," draft paper dated Sep. 27, 1993, p. 11.

50 Patel and Pavit op. cit., footnote 7; Miller, op. cit., footnote 42. Although the R&D intensity of the automotive industry is low relative to electronics, computers, and pharmaceuticals, it has been increasing over time and is well above the national average for manufacturing industries. OECD, op. cit., footnote 46, p. 10.

to the international expansion of technology. However, R&D across the advanced industrial states remains fairly centralized relative to production and sourcing activities, even in global industries.

2. Overseas R&D conducted by MNE affiliates varies by national origin, by sector, and over time, such that it is difficult to separate these influences analytically. On the whole, European affiliates conduct far more R&D in the United States than do Japanese affiliates. This variance may reflect different national propensities to conduct R&D overseas, although the relationship could also be explained by the distribution and relative age of FDI.

These conclusions can be taken further by analyzing cross-national variations in other technologically significant transactions. Apart from carrying out R&D overseas, MNEs can also extend technology across borders through direct trade.

TECHNOLOGY TRADE

Technology can be transferred in different forms and through various mechanisms, many of which are very difficult to measure. The best available quantitative measure of technology flows is the number of royalty and license fee transactions, representing cross-border sales and purchases of intellectual property.[51] Net sales over purchases constitutes the technology trade balance, which represents both the financial significance of technology transactions and the volume and direction of technology flows.

Until the mid-1980s, many U.S. corporations did not treat their intellectual property as a productive asset—in fact, few corporations even included it on their balance sheets. Throughout the 1980s, however, these companies gradually recognized and harnessed the financial power of their intellectual property. Figure 4-10 shows that sales of U.S. intellectual property, adjusted for inflation, have increased steadily from $8.2 billion in 1986 to $16.7 billion by 1992. Moreover, throughout this period the technology trade balance has remained decidedly positive, rising from a surplus of $6.7 billion in 1986 to $12,6 billion in 1992.[52]

Outside of the United States, few countries have had a positive technology trade balance. In fact, with the exception of the United Kingdom until 1986, no other large OECD country has had a positive balance.[53] Figure 4-11 shows the ratio of sales to purchases for the United States, Japan, France, Germany, and the United Kingdom. Throughout the 1980s and early 1990s the ratio for most countries remained just under one, with the exception of the United Kingdom during the early 1980s. In other words, except for the United States, the major OECD countries export roughly

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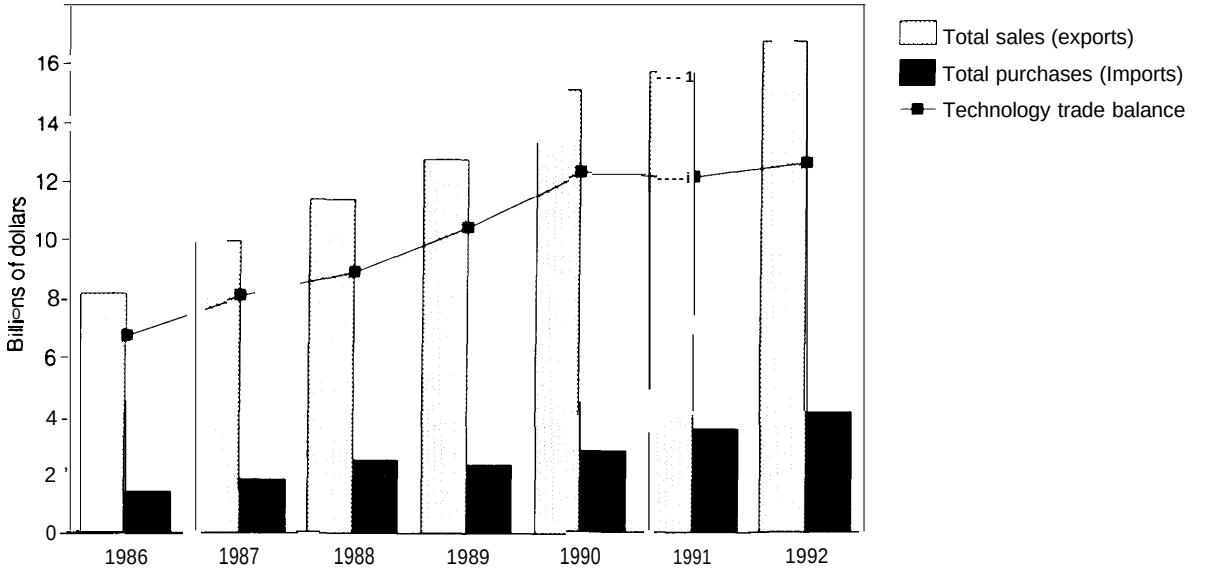
51 This indicator only approximates technology transfer per se, due to three limitations. First, the available U.S. data for royalties and license fees includes transactions of all forms of intellectual property—e.g. it combines industrial process technology along with other forms intellectual property such as copyrights, trademarks, franchises, and rights to broadcast live events. (BEA provides data on industrial process technology only for unaffiliated or arms-length transactions; for a discussion of these transactions see the following pages.) Second, it is difficult to measure intellectual property traded between affiliated firms, since the value of affiliated transactions is not always determined on the open market. Although MNEs dispute the contention, many observers believe that both U.S. and foreign MNEs adjust intellectual property fees to shift costs from their firms in low-tax regions to those in high-tax regions, thereby lowering their net tax obligations. Third, technology also can be transferred through a variety of channels that are not captured by this or any other reliable measure—for instance, technology can be transferred through the exchange of technologically intensive goods, depending on how the purchaser utilizes those goods. Despite these limitations, analysts frequently rely on intellectual property transactions to gauge technology transfer by MNEs.

52 Since intellectual property is an intangible good, the U.S. records sales and purchases of intellectual property on the services account, not the merchandise trade account, Sales of intellectual property represent exports, while purchases of intellectual property represent imports. To the extent that intellectual property transactions represent technology exchange, intellectual property sales are equivalent to technology exports, while intellectual property purchases are equivalent to technology imports. (See footnote 51 regarding the accuracy of this measure.)

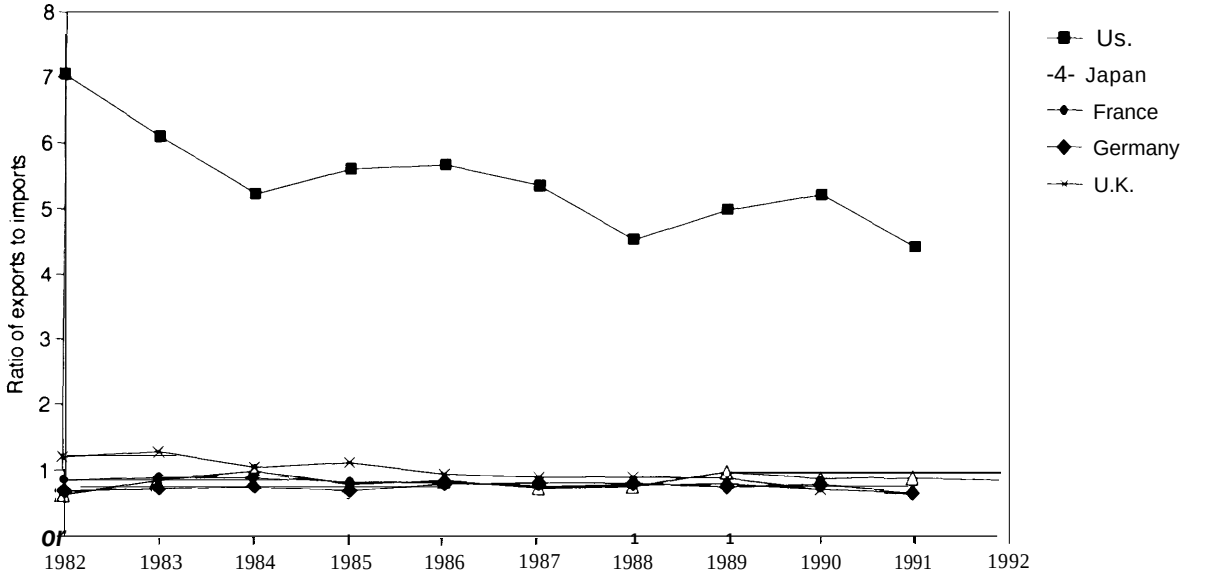
53 Organisation for Economic Co-operation and Development, Economics Analysis and Statistics Division Database, Main *Science and Technology Indicators, (1),* table 82, May 1994.

FIGURE 4-10: U.S. Technology Trade: Royalties and License Fee Transactions, 1986-1992 (constant 1987 dollars)



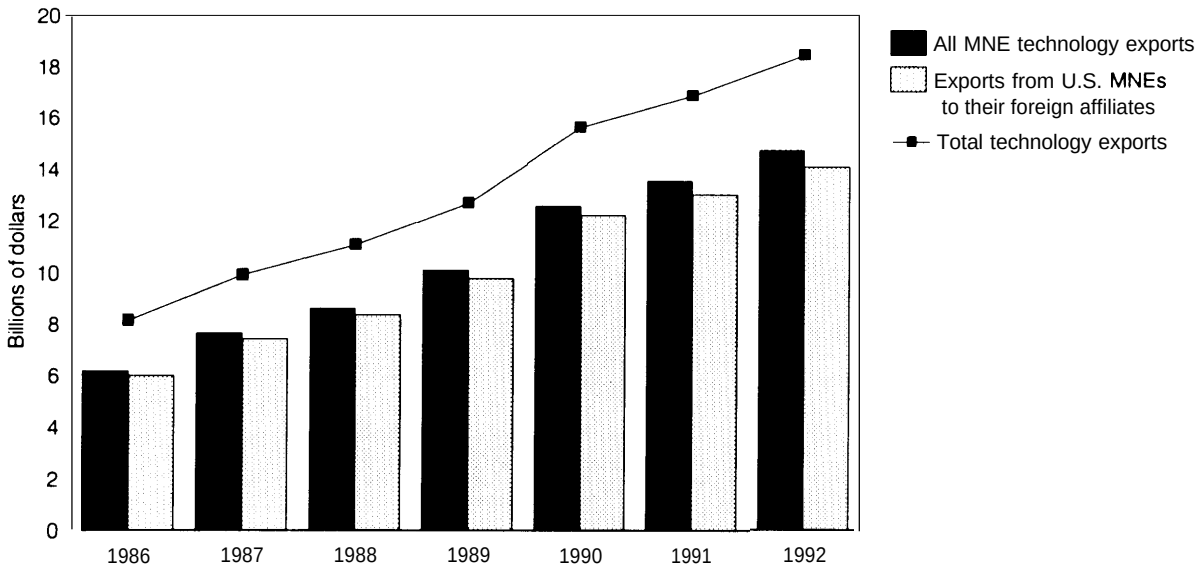
SOURCE OTA, based on data in BEA, *SCB* 73(9) 122, table 2, September 1993

FIGURE 4-11: Technology Trade: Ratio of Technology Exports to Imports by Country, 1982-1992



SOURCE OTA based on data m Organisation for Economic Co-operation and Development Economics Analysis and Statistics Division Database *Main Science and Technology Indicators,* table 82, May 1994

FIGURE 4-12: MNEs and U.S. Technology Exports, 1986-1992 (constant 1987 dollars)



SOURCE: OTA, based on data in BEA, *SCB* 73(9) 122, table 2, September 1993

the same amount of technology that they import. By contrast, U.S. technology exports have consistently outweighed imports by a substantial margin.[54]

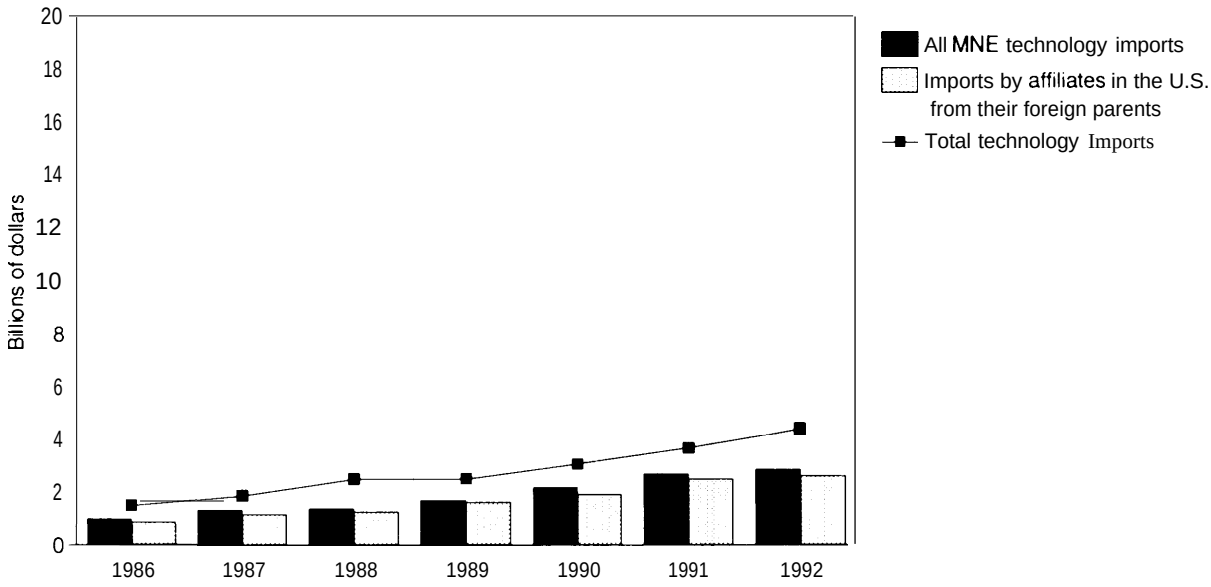
The unusually high U.S. ratio of exports to imports could be interpreted in contradictory ways. On the one hand, it indicates that the U.S. technology base is very robust, producing valuable and highly marketable knowledge that contributes positively to the U.S. trade balance. In this respect, the comparatively high level of technology exports indicates a healthy and vibrant technology base. On the other hand, it could indicate a relatively low willingness or ability of U.S. firms to import foreign technology, which could limit the growth of the U.S. technology base.[55] Moreover, the large surplus of technology exports over imports points to a massive flow of technology out of the country, which also may not bode well for the health of the technology base. Sorting out these conflicting interpretations requires further analysis of the direction and composition of technology trade.

As figures 4-12 and 4-13 indicate, a large percentage of U.S. technology trade is associated with MNEs. Between 1986 and 1992, U.S. MNEs and U.S. affiliates of foreign MNEs together sold

[54] This observation holds insofar as intellectual property transactions represent technology exchange per se. The validity Of this indicator is somewhat stronger for OECD data on technology trade than for BEA data on intellectual property transactions, due to slight measurement differences. The available BEA measure covers all intellectual property transactions, which includes patents for industrial process technology along with copyrights, trademarks, franchises, rights to broadcast live events, and other intangible property rights. The OECD measure is more tightly focused on technology trade per se, covering patents, licenses, trademarks, designs, know-how, and closely related technical services for industrial R&D. For the purposes of this analysis, the difference in the two measurements is not significant. This chapter uses OECD data for international comparisons of technology trade, and national data sources such as the BEA for more detailed, country-level analysis of technology trade patterns.

[55] See M.E Mogee, "Inward International Licensing by U.S.-Based Firms: Trends and Implications," *The Journal of Technology Transfer 16(2): 14-19,* Spring 1991.

FIGURE 4-13: MNEs and U.S. Technology Imports, 1986-1992 (constant 1987 dollars)



SOURCE: OTA, based on data in BEA, SCB 73(9) 122 table 2, September 1993

79 percent of all technology exports and bought 67 percent of all technology imports. However, the figures also show that U.S. MNEs sell virtually all of the MNE technology exports (see figure 4-12), while U.S. affiliates of foreign MNEs purchase most of the MNE technology imports (figure 4-13). Between 1986 and 1992, 97 percent of all MNE technology exports was sold by U.S. MNEs to their foreign affiliates, while 3 percent was sold by affiliates in the United States to their foreign parents. The obverse pattern holds for imports: 9 percent of all MNE technology imports was purchased by U.S. MNEs from their foreign affiliates, while U.S. affiliates purchased 91 percent of all technology imports from their foreign parents.[56] In short, technology trade not only is dominated by MNEs, but also flows from parent firms to their foreign affiliates.[57]

The rapid increase in both technology exports and imports can be linked to FDI trends during the same period. Between 1986 and 1992, technology exports from U.S. MNEs to their foreign affiliates increased at an average annual rate of 27 percent, which corresponds to the growth in U.S. direct investment abroad during this period. Similarly, during the same period imports by U.S. affiliates from their foreign parents increased at an annual rate of 45 percent, corresponding to the rapid increase in FDI in the United States during the late 1980s.[58]

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[56] U.S. Department of Commerce, BEA, *Survey of Current Business* (Washington, DC: September 1993), table 2 P. 122; see also tables 4.1 - 4.4, pp. 129-132.

[57] Again, this conclusion hol& only to the extent that intellectual property transactions represent technology "od e .

[58] For trends in FDI in the U.S. see chapters 5 and 6. For data and supporting analysis of the relationship between FDI and technology trade flows, See U.S. Department of Commerce, *Survey of Current Business*, op. cit. footnote 56, table 4.4 p. 132; and U.S. Department of Commerce, BEA, "U.S. International Sales and Purchases of Private Services," *Survey of Current Business* (Washington, DC: 1992); p.85.

Altogether, the aggregate technology trade data from the mid-1980s to the early 1990s indicate that technology increasingly flows across national borders, but tends to stay within MNE networks.[59] Moreover, the data imply that technology typically is developed in the home market operations of MNEs and gradually extends abroad in the wake of foreign direct investment.[60] From this perspective, one could conclude that technology development remains relatively centralized in the home market operations of MNEs.

However, there are noticeable differences in the propensity of firms based in different nations to trade technology within or outside of MNE networks. Unaffiliated or arms-length technology trade takes place among firms that have no economic relationship other than through the market. Since unaffiliated technology transactions take place through market-based bargaining, they reflect the market value of technology more accurately than trade among firms within MNE networks. Moreover, unaffiliated transactions imply less control by the originator and more control by the purchaser. Consequently, cross-national differences in technology acquisition strategies should be reflected in the propensity of firms based in different countries to purchase technology from unaffiliated sources.

The data on unaffiliated technology trade show that Japanese firms buy an unusually large percentage of U.S. technology through arms-length transactions. In 1992, 43 percent of all U.S. technology sales to Japan were purchased through arms-length transactions. By contrast, 11 percent of all U.S. technology sales to Europe were purchased through arms-length channels, while the percentages of arms-length purchases by firms in the larger European countries were lower than the European average—10 percent for the United Kingdom, 8 percent for France, and 9 percent for Germany.[61] Consequently since unaffiliated transactions impart a higher degree of control to the purchaser, Japanese firms retain greater control over the technology they purchase from the United States than do European firms.

Most of the unaffiliated U.S. technology exports are of industrial process technology. Between 1987 and 1992, industrial process technology accounted for 62 percent of unaffiliated U.S. technology exports. This subset of technology trade is particularly critical to commercial competitiveness, given the direct impact of industrial process technology on productivity and production costs. Consequently, trends in the unaffiliated sale of industrial process technology provide an important indicator of the near-term competitive strategies of MNEs across the advanced industrial states.

As with total technology trade, unaffiliated U.S. exports of industrial process technology have consistently outweighed U.S. imports, resulting in an average annual surplus of $2.0 billion between 1987 and 1992. Japan is the largest consumer of unaffiliated U.S. industrial process technology—in 1992, U.S. exports to Japan accounted for 50 percent ($1.1 billion in real terms) of all industrial process technology exports, compared with 5 percent for Germany, 4 percent for the United Kingdom, and 23 percent for Europe as a whole (see figure 4-14). This pattern has been consistent; since 1987, Japan has accounted

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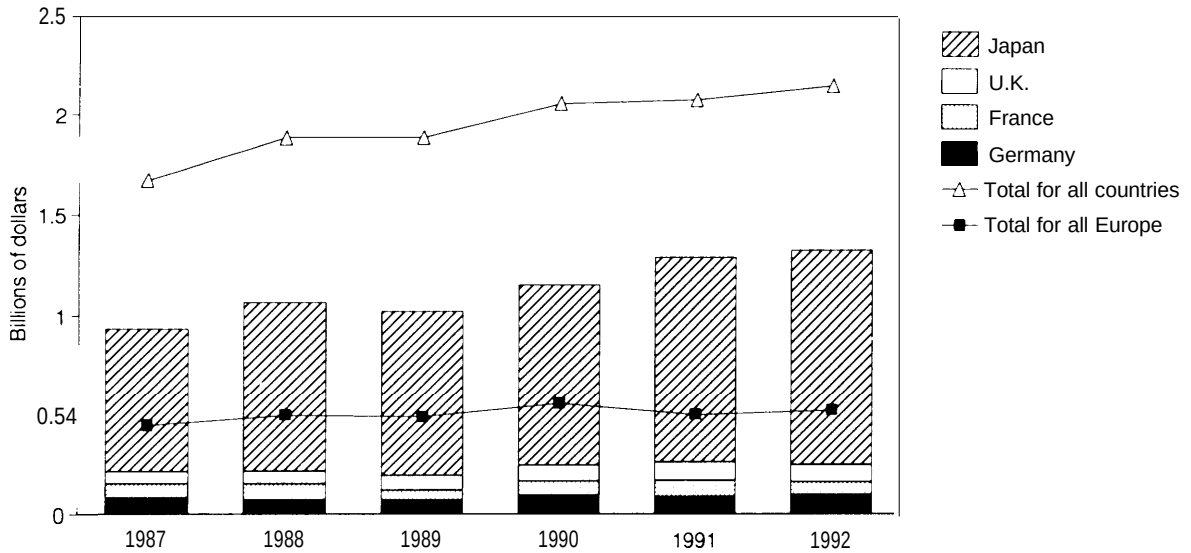
59 In 1992, 42.5 percent of all U.S. technology imports were by U.S. affiliates of European firms, while 12 percent were by U.S. affiliates of Japanese firms. Likewise, 49 percent of all U.S. technology exports were received by U.S. affiliates in Europe, while 9.4 percent were received by U.S. affiliates in Japan. U.S. Department of Commerce, BEA, *Survey of Current Business,* op cit. footnote 56, p. 121, and table 4.4 p. 132.

60 Data on technology trade between Japan and Europe could provide confirming evidence of this observation. Unfortunately this data is not readily available.

61 Importing patterns by U.S. affiliates of foreign firms are more mixed. In 1992, 64 percent of total U.S. technology imports from Europe were from European MNEs to their U.S. affiliates, although there were large variations among the large European countries—80 percent from the United Kingdom, 63 percent from Germany, and just 38 percent from France. Of all 1992 U.S. technology imports from Japan, 79 percent were purchased by the U.S. affiliates of Japanese MNEs. U.S. Department of Commerce, BEA, op. cit., footnote 56.

FIGURE 4-14: U.S. Exports of Industrial Process Technology to Unaffiliated Firms in Selected Countries, 1987-1992 (constant 1987 dollars)



SOURCE: OTA based on data in BEA, SCB 72(9) 95-99, September 1992, and 73(9) 129-132, September 1993

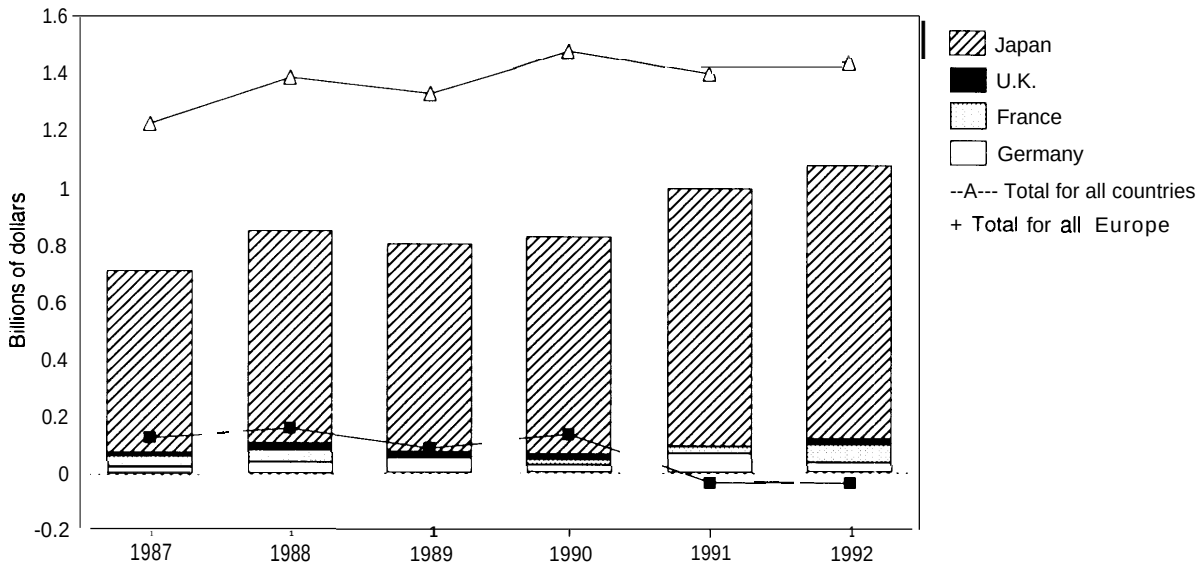
for an average of 46 percent of all unaffiliated exports of industrial process technology, compared with 4 percent for Germany, 4 percent for the United Kingdom, and 26 percent for all of Europe.

The large percentage of unaffiliated industrial process technology purchased by Japanese firms is further reflected in the regional distribution of the U.S. balance in unaffiliated industrial process technology trade. As shown in figure 4-15, the consistent U.S. surplus in unaffiliated industrial process technology exchange is driven largely by trade with Japan. Between 1987 and 1992, the average annual surplus with Japan accounted for 57 percent of the total U.S. surplus in arms-length trading of industrial process technology. During this period Japan ran average annual deficits with the United States of $789 million, compared with $71 million for all of Europe combined. The only countries with which the United States has had a trade deficit in unaffiliated industrial process knowledge have been the United Kingdom and Germany, averaging $-15 million and $-40 million per year respectively between 1987 and 1992.

In sum, U.S. royalties and 1icense fee data illustrate two important patterns in the international exchange of technology. First, most of the cross-border exchange of technology takes place within MNE networks—in particular, most of the technology flows from parents to their affiliates.[62] This pattern implies that, although technology m may follow production overseas, the development of new technology remains centralized in the home market operations of MNEs. Second, there are notable differences in the propensity of firms based in different nations to acquire technology through unaffiliated channels. In particular, Japanese firms purchase far more U.S. technology through arms-length transactions than do European firms-in fact, the total U.S. surplus in the unaffiliated trade of industrial process knowledge is due largely to surpluses with Japan, while the

62 Again, this conclusion is based on the US technology balance of payments data, which is the (rely available data of this type

FIGURE 4-15: U.S. Unaffiliated Trade Balance in Industrial Process Technology with Selected Countries, 1987-1992 (constant 1987 dollars)



SOURCE: OTA, based on data in BEA, SCB 72(9) 95-99, September 1992, and 73(9) 129-132, September 1993

United States has been a net importer of U.K. and German industrial process knowledge. This finding suggests that MNEs based in Japan have very different technology acquisition strategies than their European and U.S. counterparts.[63]

Although both the R&D and technology trade data indicate that technology development remains relatively centralized, technology can be globalized through other mechanisms such as international strategic alliances and related forms of intercorporite cooperation designed to spread investments costs and gain access to a wider range of technologies. The abundance of interfirm alliances and joint ventures in R&D and product development, along with the growing density of translational networks linking firms with each other as well as with public and private-sector research institutes, significantly complicates any assessment of how MNEs do and do not contribute to technology development in host countries.

INTERNATIONAL TECHNICAL ALLIANCES[64]

MNEs and domestic firms can cooperate on technology development through a variety of

63 Historically, Japan has acquired foreign technology more through direct purchases than has been the case for either the United States or Europe; see OECD, op. cit., footnote 4. The relatively high percentage-of arms-length technology purchases by Japanese firms from U.S. intellectual property owners is consistent with Richard Samuels characterization of the technology acquisition strategies of Japanese firms. See R.J. Samuels, *"Rich Nation, Strong Army": National Security and the Technological Transformation of Japan* (Ithaca, NY: Cornell University Press, I 994).

64 Little enough is known about international technological collaboration among firms that analysts frequently use different terms to describe the phenomenon. There are important distinctions in the literature between short-term tactical alliances and relatively longer term strategic alliances, There are also important distinctions bet ween alliances used to develop and/or diffuse technology and those used to gain market access and pursue other non-technological goals. For simplicity, this chapter uses a single term-international technical alliances—to describe any interfirm collaboration (equity or non equity) that includes arrangements for joint research and/or technology transfer. For a more general discussion of international strategic alliances, see OTA, *Multinationals and the National Interest: Playing by Different Rules*, OTA-ITE-569 (Washington, DC': U.S. Government Printing Office, September 1993), ch. 5. See also box 8-1 in chapter 8 of this report.

mechanisms. In the 1970s, the most common form of international technology collaboration was through joint ventures and research corporations, where firms share equity ownership (and corresponding profits and losses) in a separate and distinct corporate entity. By the late 1980s, joint equity col1aboration was eclipsed by nonequity alliances, in which firms forego formal equity linkages and directly organize joint R&D activities to reduce the cost and risk of pursuing related innovations.[65] Through these mechanisms, international technical alliances have grown from just 86 during 1973-76 to 988 during 1985-88.[66]

The most recent data indicate that international technical alliances are most common in high-technology industries, and are more extensive in some sectors than others (figure 4-16). Technical alliances are particularly prevalent in information technologies, where technology changes rapidly and firms must maintain knowledge of and access to numerous complex technologies simultaneously (as in multimedia, for example). Alliances are also quite common in biotechnology, where research is often conducted in the context of collaborative agreements between U.S. dedicated biotechnology companies and large pharmaceutical MNEs.[67] Figure 4-15 also indicates that alliance activity across sectors is most common between U.S. and European firms, although there have been a relatively large number of alliances between U.S. and Japanese firms in the automotive sector.

Contemporary economic and technological conditions provide a variety of incentives for firms to engage in international technical alliances. Firms pursue technical alliances for three primary reasons:

1. To improve their ability to conduct research, given the complexity and interdisciplinary character of new technologies, the difficulty of monitoring evolving scientific disciplines and new technologies, the need to retain access to scientific and technological knowledge, and the need to reduce the costs and risks of pursuing R&D.
2. To expand their ability to produce new technologies, given shorter innovation to commercialization periods, more rapid product life cycles, and the frequent need to capture competitors' tacit knowledge in order to equilibrate production costs and prevent technological leapfrogging.
3. To pursue market access and search for new business opportunities, given the increasing importance of foreign markets to competitiveness, as well as the need to maintain smooth and broadly dispersed pipelines from innovation to market.[68]

It appears that cooperative research does not substitute for but rather complements firms' internal research activities.[69] Some studies tentatively

65 In very general terms, joint ventures are more common among firms seeking to improve their long-term market position, while techical all lances are more common when firms are pursuing more immediate technological achievements. See J. Hagedoorn, "Understanding the Rationale of Strategic Technology Partnering Interorganizational Modes of Cooperation and Sectoral Differences," *Strategic Management Journal* 14 (1993) 37 I.

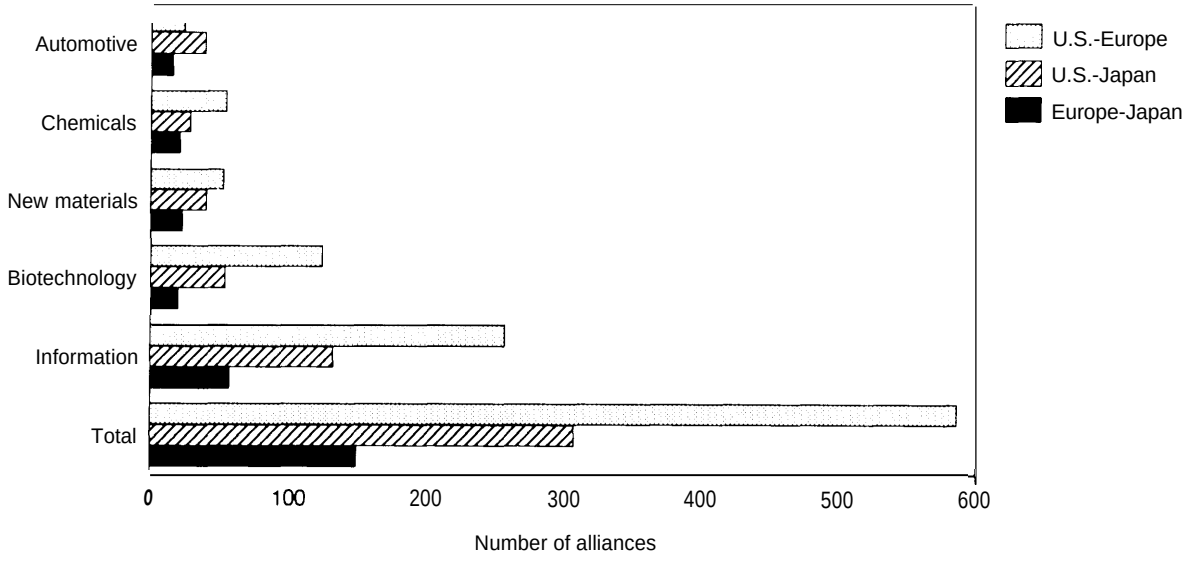
66 *National Science* Board, op. cit., footnote 10, p. 123. The *data* cited in this source is drawn from the Maastricht Economic Research Institutes' MERIT CAT] database. The CATI database covers (rely interfirm agreements that involve technology transferor joint research, and is used to develop the numbers cited above and in figure 4-16. Although this is the best and most up-to-date aggregate database on international technical alliances, it is limited due to intrinsic difficulties in gathering complete and reliable data in this area. T'he data, therefore, should be viewed as a useful but incomplete indicator.

67 MNEs are attracted to the research capabilities of U.S. dedicated biotechnology companies, which are in turn attracted to the financial capabilities of pharmaceutical MNEs.

68 See Hagedoorn, op. cit., footnote 65, p. 371.

69 National Science Board, op. cit., footnote 10, p. 122.

FIGURE 4-16: Sectoral Distribution of International Technical Alliances, 1985-1989



SOURCE: Adapted from National Science Board, Science *and Engineering* /nd/caters—1993 (Washington, DC U S Government Printing Office, 1993), p 123, p 383, table 4-42

conclude that technology transfer invariably accompanies interfirm alliances, and that close management of diffusion is critical to the success of the alliance for each partner.[70] Other studies have concluded that technical alliances tend to be limited and are frequently unsuccessful .[71]

However, systematic and reliable information on international technical alliances is sparse. OTA interviews and other anecdotal information suggest that technical alliance activity has grown significantly in recent years, but the impact of the trend is difficult to assess. Given the increasing R&D content of new products and the escalating cost of developing new products, many high-tech firms are likely to focus their R&D efforts and technology strategy on core competencies, relying on networks of alliances to learn about and adapt to new technologies in related areas. A number of firms interviewed by OTA indicated that they needed to keep abreast of technological developments globally, given the broad dispersion of leading-edge technological capabilities in their industries. An executive at one prominent MNE in the electronics industry told OTA that, although the company has resisted alliance activity to date, it is bound to pursue future alliances due to the increasing complexity and costs associated with R&D in that industry.

Pending further data and analysis of this relatively new phenomena, OTA can only conclude

[70] See D C Mowery, *. International Collaborative Ventures and U.S. Firms' Technology Strategies," in Granstrand, Håkanson, and Sj~}l~der, *Technology Management and International Business (New* York: John Wiley, 1992): 224-229.

[71] The literature is rife with debates over the determinants of success in international alliances. Some maintain that success is more Common" in alliances that involve technologically comparable firms; for example, see M.E. Porter and M.B. Fuller, "Coalitions and Global Strategy," in M.E. Porter (cd.), *Competition in Global Industries* (Boston, MA: Harvard Business School Press, 1986). Others argue that successful alliances are more likely between firms that have different, complementary technological assets; for example, see Mowery, op. cit., footnote 70. The literature generally does agree that there is insufficient data on international technical alliances to develop reliable interpretations.

tentatively that international technical alliances are indeed more common and more strategically significant for an important array of high-technology firms. Yet their net effect on national technology development and international technology diffusion is unclear and difficult to measure.

CONCLUSIONS

Taken together, the evidence linking MNEs and the globalization of technology remains somewhat mixed. On the one hand, some data point to the increased globalization of technology via the business activities of MNEs. Higher rates of external patenting, more rapid diffusion of technology across borders, increasing rates of overseas R&D activity, and in some respects the increasing prevalence and greater strategic significance of international technical alliances all point in this direction, with MNEs at the heart of the process.

However, closer inspection of these trends indicates that the degree of globalization is limited, and the propensity of MNEs to extend core technological functions across borders varies across the advanced industrial states.

First, overseas R&D by affiliates remains quite limited when compared to both the R&D activities of the parent group and the more extensive globalization of production and sourcing. The R&D that does move overseas tends to be associated with product customization and local production processes. Only rarely do companies transfer basic research functions to foreign markets.[72] In short, inside the corporation-where the bulk of commercially significant innovation takes place—R&D appears to remain relatively centralized. This finding is reinforced by the data on technology trade, which show that most intellectual property flows from parent firms to their foreign affiliates.

Second, data on exports and imports of intellectual property indicate that most of the international flows of technology occur within MNE networks. This tendency does vary by national origin. Japanese firms have a much stronger propensity toward arms-length technology trade, which is consistent with the oft-noted historical tendency for Japanese firms to acquire overseas technology by buying it directly rather than by initiating R&D activities in foreign markets.

Third, the role of international technical alliances appears to be somewhat limited, although the data are insufficient to draw any solid conclusions in this area.

These conclusions should be qualified in light of the difficulties of measuring technological innovation and diffusion. The available measures of R&D are biased toward the research side of the innovation equation, and may miss commercially significant forms of technology development and diffusion. Some analysts have argued that important elements of national technological capabilities lie in tacit forms of knowledge—that is, forms of technical knowledge that can be extremely important to successful commercialization and production but that are embodied in both people and organizations in ways that are difficult to measure and evaluate.[73] In addition, new technology can be transferred across borders in the form of goods themselves, which can be reverse engineered to reveal (and perhaps reconstruct) particular technological innovations. Therefore, it is possible that MNEs, with their ability to transfer people, organizational assets, and goods across borders, in effect may diffuse technology far more extensively through their overseas production facilities than can be captured by the measures used in this chapter.

Nevertheless, the measures reviewed here are sufficient to conclude that the core research and development activities of MNEs remain relatively centralized in the home market. If MNEs were extensively and systematically developing and dif-

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[72] "One exception to this tendency is biotechnology, where a number of European and Japanese MNEs have close basic research contacts and arrangements with small U.S. biotechnology" firms.

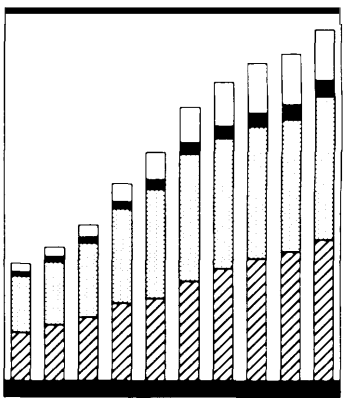
[73] Alic, op cit. footnote 2.

fusing technology abroad, it would register in the overseas R&D data as well as the technology trade data. To date, the evidence reveals that MNEs are indeed moving more technology across national borders, but that the extent of this process is quite limited in comparison to the global production and sourcing activities of MNEs. This conclusion implies that the globalization of technology is less an autonomous force that is shaping and integrating national economies and more a multifaceted process that centers on networks of firms with strong roots in distinct national innovation systems.

Part III: Trade and Investment in the Triad

Chapters 5 and 6 analyze the changing nature of global trade and investment, focusing not only on international trends but also on national variations in the behavior of MNEs. These chapters seek to describe the dynamics of trade and investment, unravel the relationship between the two, and assess the implications of contemporary patterns for the U.S. trade balance and—more importantly-the health and relative position of the U.S. technology base.

Since the mid 1980s, the volume, direction, and character of trade and investment across the advanced industrial states has changed substantially. The privatization of assets and the liberalization of investment barriers have stimulated foreign direct investment (FDI), which grew dramatically over the past decade. By 1992, the global stock of FDI reached approximately $2.0 trillion (in nominal terms). This surge of investment transformed the world economy. Rather than substituting locally produced goods and services for imports, investment also augmented and created trade, often through international trade among foreign affiliates and their parent groups—i.e., intrafirm trade.



Not only has FDI among the advanced industrial states increased substantially, but also a growing portion of global trade and investment now extends beyond the confines of the OECD nations. The world's largest MNEs increasingly trade with and invest in emerging markets, especially those in East Asia and China. Investment in Latin America runs a distant second, while investment in Eastern Europe remains relatively small.

At the same time, the traditional focus of FDI on integrated manufacturing facilities has been augmented by forms of direct investment that promote intrafirm trade. As a result, FDI and trade have become less antithetical and more complementary.

This change, along with changes in the size, source, and composition of FDI across the developed world, has had a major impact on the global diffusion of production processes, the sourcing of high value-added manufacturing parts and components, and on international trade. [1]

Together, chapters 5 and 6 generate a series of findings which suggest that there is little convergence in the behavior of MNEs based in different regions.

FINDINGS

1. The nature of foreign direct investment has changed fundamentally. Historically, many MNEs used FDI to shift manufacturing facilities abroad, reducing the export of products accordingly. In the 1990s, MNEs are likely to invest in manufacturing, wholesale trade, and service facilities in order to export domestic products for foreign assembly and retail sales through the mechanism of intrafirm trade (IFT). Macro-economic and firm-level data suggest that IFT is particularly prominent within Japanese MNEs and, to a lesser extent, German MNEs (see figures **6-11** and 6-12 in chapter 6).
2. The United States remains an attractive location for foreign direct investment, although the flow of FDI fell from a record high of $69 billion in 1989 to $3.4 billion in 1992. In OTA interviews, some foreign investors complained of weak profits in the United States, which they characterized as a mature market (see figure **5-7** in chapter 5). At the same time, they recognize the need to sustain a local presence in the U.S. market because of its size, the access to technology that it provides, and the need to be near major customers.
3. In the last decade, the flow of FDI has increased substantially to non-OECD regions, particularly East Asia and, to a lesser degree, Latin America and Eastern Europe. East Asia, for example, more than doubled its share of global investment stock from 6.2 to 13.6 percent during the 1980s, a period when global investment stock grew dramatically. Labor costs, currency fluctuations, pressures for customization, regional trade agreements, and market access considerations are factors often cited in explaining the spread of FDI.
4. Although the NAFTA and GATT were successfully concluded in 1993, and are likely to assist MNEs in increasing market access and efficiency, no comparable mechanisms are in place to govern international direct investment.[2] The lack of enforceable multilateral investment agreements continues to limit the ability of U.S.-based MNEs to make profitable investments abroad and to obtain foreign technology that would enrich the U.S. technology base. This problem is most pronounced in the U.S. investment relationship with Japan.
5. Access to investment opportunities remains a significant problem for many European and U.S. firms seeking to do business in Japan, despite recent efforts to increase inward direct investment by the Japanese government and some elements of Japanese business. Because they believe that unilateral efforts to invest in Japan are likely to fail, many foreign firms enter into joint venture agreements with Japanese partners. This strategy often results in a minority investment position that limits the ability of the U.S. firm to grow or to use the joint venture as a conduit for trade. The inability of most foreign firms to compete in the Japanese market as independent entities provides Japanese firms with a significant advantage in Japan.
6. Over the past decade, the U.S.-European investment relationship has been reasonably well balanced in scale and composition, and in recent years has stabilized at nearly equal levels

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[1] See OECD, Directorate for Science, Technology and Industry, *Globalisation of Industrial Activities: Background Synthesis* Report (Paris, France: OECD, Nov. 26, 1993), p.10.

[2] The TRIMs agreement under GATT is only embryonic for this purpose.

(see figures 5-10 and 5-11 in chapter 5). With respect to the U.S.-Japan relationship, however, broad differences persist in the scale and composition of U.S. direct investment in Japan as compared to Japanese investment in the United States, Japanese direct investment in the United States exceeds U.S. investment in Japan by a factor of 3.1:1. In addition, it is far more concentrated in wholesale operations (and less concentrated in manufacturing) than is European or U.S. direct investment (see figures **5-14** and 5-15). As the stock of U.S. inward and outward direct investment expanded in the 1980s, U.S. investment in Japan failed to keep pace with the overall trend (figure **5-9).**

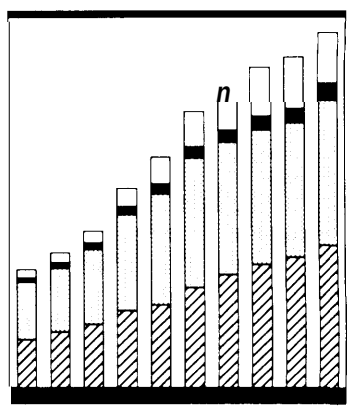
7. As a result of the increase in FDI and the prominence of intrafirm trade, investment is increasingly associated with trade in the 1990s. A comparison of the merchandise, affiliate, and IFT trade balances between the United States and Europe on one hand, and the United States and Japan on the other, yields very different results. The relative convergence of these three measures in the Japanese case (figure 6-4) and their divergence in the European case (figure 6-3) are closely associated with the bilateral balance of foreign direct investment in both cases.
8. Affiliates of foreign-based MNEs account for a substantial portion of the U.S. merchandise trade deficit (see figure 6-1). Intrafirm trade is a major factor. In 1980, foreign affiliates in the United States imported $36 billion more from their parents than they exported to them. By 1990, the IFT trade deficit had more than doubled to reach $88 billion dollars. In 1992, IFT totaled $331 billion or about 38 percent of all U.S. merchandise trade.
9. The character of U.S. intrafirm trade with Europe differs markedly with the character of U.S. IFT with Japan. Over the past decade, IFT has accounted for 71 percent of all merchandise trade between the United States and Japan as opposed to only 43 percent of all U.S.-European trade (see figures 6-5 and 6-6). Over the same period, Japanese MNEs have dominated intrafirm trade with the United States, accounting for 92 percent of bilateral IFT while European MNEs account for 57 percent of U.S.-European IFT (see figures 6-9 and 6-1 O). These figures indicate that the U.S.-Japanese trading relationship is heavily weighted toward Japanese MNEs, and that the U.S. relationship with Europe is more evenly diversified across corporate structures and national ownership. The U.S. and European economies are, accordingly, far more integrated than are the U.S. and Japanese economies.

Trends in Foreign Direct Investment

5

Through foreign direct investment (FDI), individuals or corporations obtain partial or total ownership of firms located in another country.[1] FDI can take many forms and can be directed at diverse sectors of the economy. At the level of the firm, it often means the establishment or acquisition of a foreign affiliated company. With foreign ownership comes the assumption of foreign interest and influence over the operations of the enterprise in question. Ul timately, FDI is what differentiates a multinational enterprise from a local or nationally oriented firm.

Since the 1980s, the global pattern of foreign direct investment has changed significantly. The following sections describe and analyze changes in the global distribution of FDI, in foreign direct investment in the United States (FDIUS), and in the composition and volume of FDI across the United States, Europe, and Japan.



[1]Foreign direct investment, according to the International Monetary Fund, "refers to investment that is made to acquire a lasting interest in an enterprise operating in an economy other than that of the investor, the investor's purpose being to have an effective voice in the management of the enterprise.'" IMF definition cited in D. Julius, *Global Companies and Public Policy: The Growing Challenge of Foreign Direct Investment* (London, UK: Royal Institute of International Affairs, 1990), p. 15. Foreign direct investment in the United States has a specific legal meaning. It is defined by the International Investment and Trade in Services Act as [he ownership by a foreign person or corporation of 10 percent or more of the voting equity of a firm located in the United States. See U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest: Playing by Different Rules*, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993), p. 47. FDI is distinct from portfolio investment, which is passive in nature.

GLOBAL TRENDS IN INWARD AND OUTWARD INVESTMENT

Since 1980 the world stock of inward direct investment has increased dramatically, from $491 billion to nearly $2.0 trillion by 1992.[2] With the exception of the United States, the distribution of inward direct investment across the major advanced industrial states has been relatively stable during this time: Europe accounted for about 37 percent in the early 1980s and early 1990s, and Japan for less than 1 percent in both periods, while the U.S. percentage grew from 16.4 to 22 percent.[3]

The rate of growth in inward direct investment in the United States, however, was not as large as foreign investment in East Asia, which more than doubled, rising from 6.2 to 13.6 percent. As a result, that region now attracts a larger share of world inward investment than traditionally large recipients of foreign investment such as the United Kingdom. OTA interviews with senior executives of numerous Japanese, European, and U.S. MNEs suggest that both the absolute and relative amounts of foreign investment in East Asia will grow significantly during the next decade. However, although many business leaders forecast major investment in the region, to date the U.S. investment position is relatively small: in 1993, the U.S. direct investment position in China was $877 million; in Thailand it was $2.9 billion, $3.0 billion in the Republic of Korea, $3.1 billion in Taiwan, and $10.5 billion in Hong Kong.[4]

Over the past decade, inward investment flows to the major industrialized economies have fluctuated less than outward flows, with the exception of the rapid decline in inward investment to the United States after 1989 (see figures 5-1 and 5-2). Outward U.S. investment increased steadily throughout most of the 1980s and early 1990s, although it declined substantially in 1988 and 1990.

Investment flows for Germany and Japan have been quite different than those for the United States. For both countries, outward investment increased rapidly throughout most of the period, but then declined substantially after 1988 for Germany and after 1990 for Japan. In terms of inward investment, both Japan and Germany consistently have remained comparatively low. The contrast between inward and outward investment was particularly strong for Japan in the late 1980s, when its outward flows were 4 to 5 times greater than its inward flows. Figure 5-3 charts Japan's inward and outward direct investment flows with the U.S. and Europe from 1986 to 1992.5

Japan and Germany are exceptions among the advanced industrial economies in that, during the 1980s, they became relatively more permeated by trade than by investment. OECD data indicate

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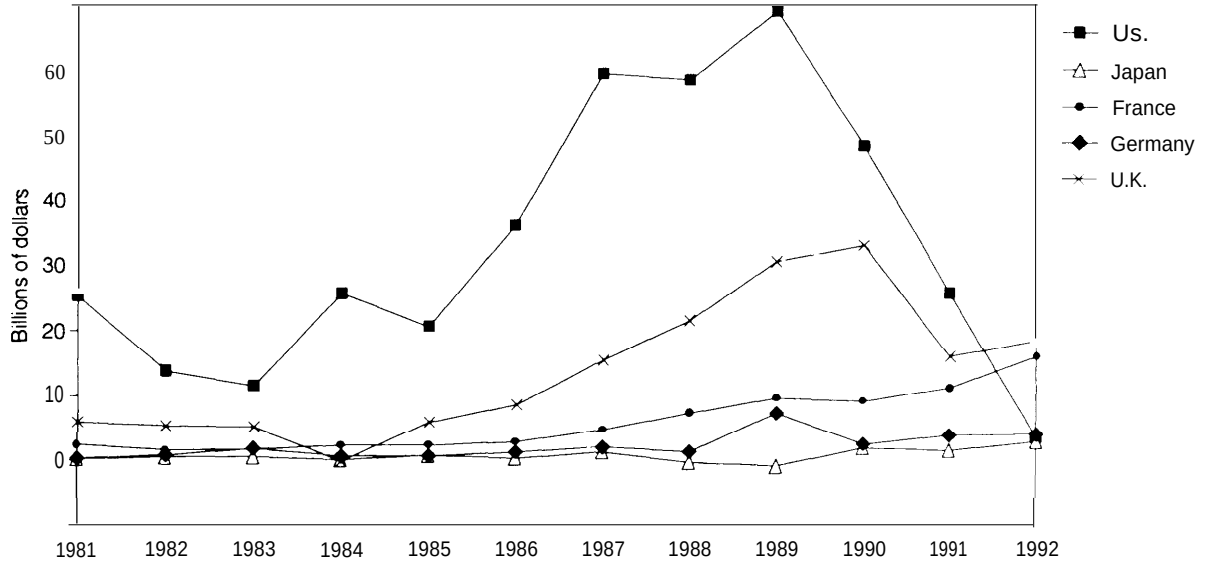
[2] U.S. Department of Commerce, International Trade Administration, *International Direct Investment: Global Trends and the U.S. Role,* 1988 edition (Washington, DC: U.S. Government Printing Office), table 2 p. 90; and United Nations, *World Investment Report 1993: Transnational Corporations and Integrated International Production (NY:* United Nations, 1993), table I. l p. 14. Inward investment refers to the flows of foreign direct investment into a given country. Outward investment refers to the flows of direct investment abroad from a given country. In principle, world inflows and outflows should balance. In practice, however, they often do not (as is the case with other balance-of-payments items). Reasons for the discrepancy between total inflows and outflows of investment include cross-national differences in accounting for unremitted branch profits, capital gains and losses, reinvested earnings, real estate and construction investment, and the transactions of offshore enterprises.

[3] organisation for Economic Co-operation and Development (OECD), Directorate for Science, Technology, and Industry, *Globalization of Industrial Activities: Background Synthesis Report* (Paris, France: OECD, 1993), p. 54, table 9.

[4] U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *United States Department of Commerce News* (Washington, DC: June 28, 1994), table 2. All figures are on a historical cost basis at year end.

[5] Ministry of Finance of Japan, *Zaisei Kin'yu Tokei Geppo* No. *452,* December 1989, No. 476, December 1991, and No. 500, December 1993. Ministry of Finance data on inward investment is slightly higher than that provided by the OECD, which shows negative flows during some years in the 1980s; see figure 5- I above and OECD, *International Direct Investment Policies and 'Trends in the 1980s* (Paris, France: OECD, 1992), table 3.

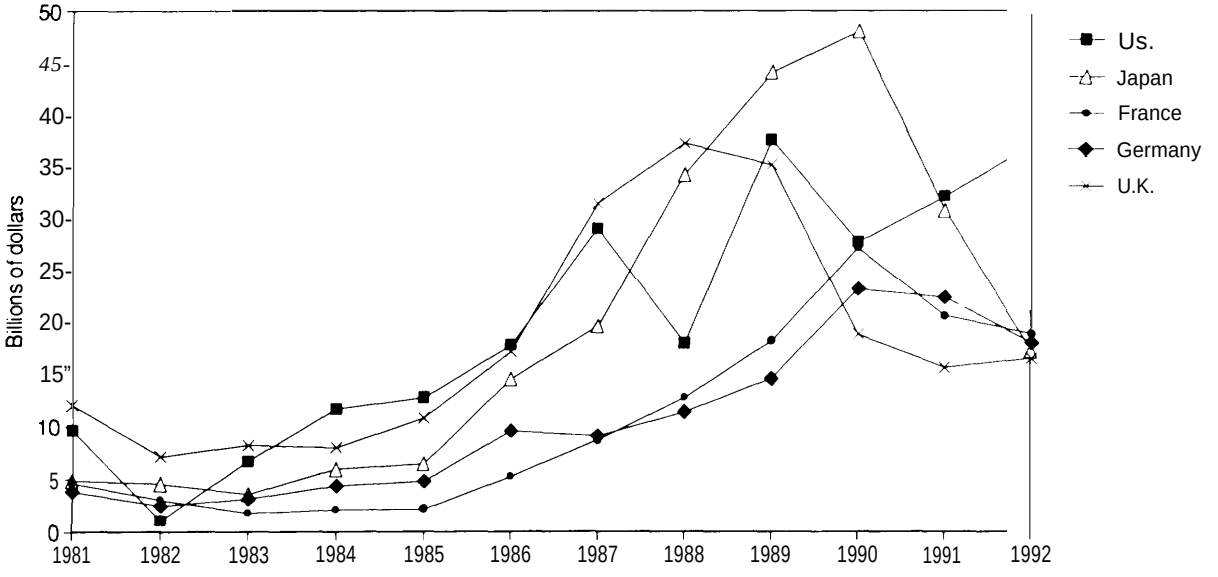
FIGURE 5-1: Inward Direct Investment Flows of Selected Countries, 1981-1992 (current dollars)



NOTE Reinvested earnings are not Included in some national data The source is one of a series with similar appendix data tables on OECD investment flows

SOURCE Organisation for Economic Co-operation and Development *OECD Reviews of Foreign Direct Investment Ireland 1994* (Paris OECD 1994), p 68, **table 1** (hereafter cited as OECD, Reviews of FDI)

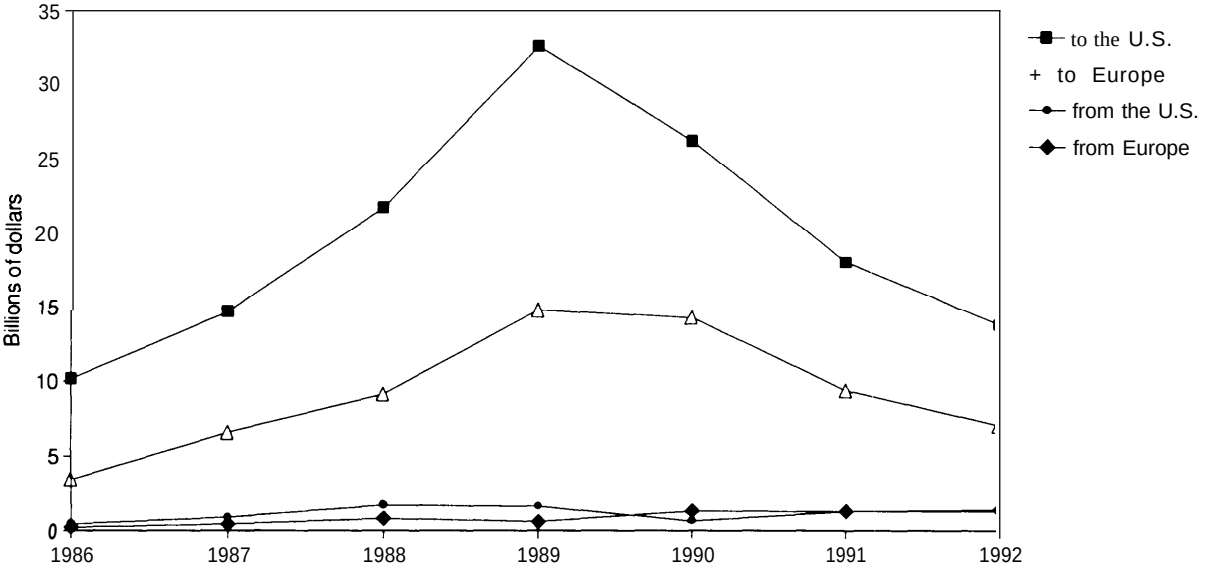
FIGURE 5-2: Outward Direct Investment Flows of Selected Countries, 1981-1992 (current dollars)



NOTE Reinvested earnings are not Included in some national data The source is one of a series with similar appendix data tables on OECD investment flows

SOURCE OECD, *Reviews of FDI*, p 70 table 3

FIGURE 5-3: Japan's Inward and Outward Direct Investment Flows with the United States and Europe, 1986-1992 (current dollars)



SOURCE: OTA, based on data from Ministry of Finance of Japan, *Zaisei Kinyu Tokei Geppo* vol. 452 (December 1989) 26-29, vol. 476 (December 1991) 30-35, and vol. 500 (December 1993) 28-30, 78-79

that, among the major industrialized countries, only Japan and Germany became more penetrated by imports than by FDI during the 1980s.[6] Both of these countries emphasized trade rather than FDI reform in the 1980s, and both began from a starting point where barriers to investment exceeded barriers to trade. For instance, Japan—starting from a highly protected base—liberalized its trade barriers and, to a lesser degree, its barriers to investment.[7]

Other indicators are consistent with this distinction between those OECD countries whose proportion of inward investment increased greatly or was already high, and those that remained low or declined further. Table 5-1, for example, shows changes in manufacturing employment by foreign affiliates in the major industrialized countries. Between 1980 and 1990, manufacturing employment by foreign affiliates expanded from 1.1 to 2.2 million in the United States and from 677 to 775 thousand in the United Kingdom; by contrast, it fell from 779 to 617 thousand in Germany and from 178 to 145 thousand in Japan.

6 Austria and Canada are the only other countries with a similar trend during the 1980s, although both are already far more penetrated by FDI than are Germany or Japan. OECD, Economic Analysis and Statistics Division, Directorate for Science, Technology and Industry, *Performance of Foreign Affiliates in OECD Countries* (Paris, France: OECD, forthcoming), pp. 25,27, diagram 6. See figure 5-1 above for inward FDI flows of Japan and Germany.

7 In Japan, governmental efforts to improve the conditions for inward FDI often have been weakened by the bureaucracy. For example, a recent Keidanren report criticized the Office of Trade and investment Ombudsman (OTC), which handles foreign companies' and importers' complaints about impediments to inward FDI) because their filing claims take too long. In addition, bureaucratic barriers often provide needless constraints-for instance, tiling rules require the claimant to provide a comparison between Japanese and foreign regulations as well as a concrete improvement plan. See "Unsatisfied with the Capability of Handling Complaints: Keidanren Submits a Request for Improvements to OTO," *Nihon Keizai Shimbun*, Oct. 1 1, 1993, p. 3.

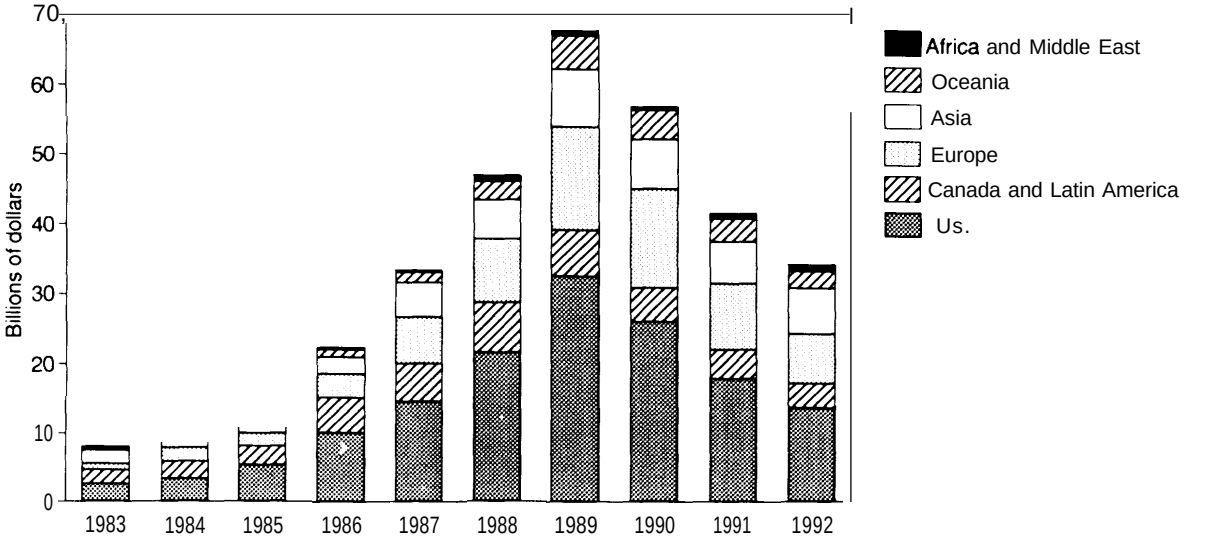
TABLE 5-1: Manufacturing Employment by Foreign Subsidiaries in Selected Countries, 1980 and 1990

	U.S.		Japan		Germany		France		U.K.	
Industries	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
Food, Beverages, and Tobacco	120,354	25[illegible],000	[illegible],020	3,455	48,000	35,000	n/a	n/a	57,700	73,400
Chemicals	307,079	[illegible]1[illegible]7,000	5[illegible],851	54,830	[illegible]5,000	19,000	1[illegible]8,325	182,3[illegible]3	88,500	96,100
Basic Metals	75,308	135,000	11,150	4,8[illegible]2	68,000	15,000	[illegible]5,762	63,864	21,[illegible]00	23,600
Electrical Machinery and Equipment	418,162	794,600	94,464	75,611	456,000	399,000	377,548	361,409	359,500	417,200
Other Manufacturing	184,057	405,800	13,577	6,013	52,000	49,000	n/a	n/a	149,800	64,800
Total Manufacturing	,104,960	2,197[illegible]000	[illegible]78,[illegible]62	44,721	779,000	6[illegible]7,000	80[illegible],000	7[illegible]2,5[illegible]4	677,100	775,100

NOTE: Total may be higher than sum of listed industries because some data could not be broken down by industry; n/a denotes not available.

SOURCE: Adapted from Organisation for Economic Co-operation and Development, Economic Analysis and Statistics Division, *Performance of* [illegible] *in OECD Countries* (Paris: OECD, forthcoming), p. 82, table 3 of pre-publication draft.

FIGURE 5-4: Geographical Distribution of Japan's Outward Direct Investment Flows, 1983-1992 (current dollars)



SOURCE: OTA, based on data from Ministry of Finance of Japan, Zaisei Kinyu *Tokei Geppo* vol. 452 26-29, vol. 476.30-35, and vol. 500 28-30

In absolute terms, U.S. affiliates in Japan employed fewer people in 1990 than their European counterparts. However, between 1980 and 1990 their portion of all manufacturing employment by foreign affiliates in Japan steadily increased, partly because U.S. affiliates shed jobs at a slower rate than did European affiliates.[8] Among all foreign affiliates in Japan, employment was reduced most dramatically in chemicals, the largest sector of employment for foreign investors, and in the auto industry, which experienced the greatest sectoral decline in employment by foreign investors in Japan.[9] Employment by U.S. affiliates in Japan fell in both of these sectors. The decrease in employment by foreign affiliates in Japan's automotive sector contrasts with the growth in employment by foreign affiliates in the U.S. automobile industry, which expanded from a nominal level to 53,000 in the same decade.

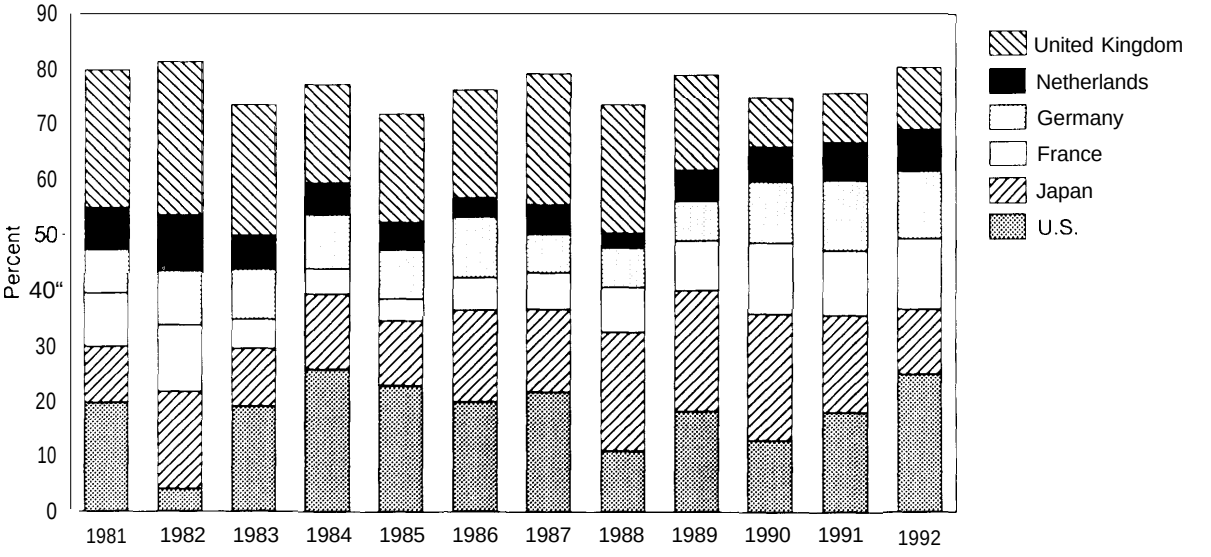
Although they started from a higher base, job losses among foreign investors in Germany were much larger than in Japan, with the loss of 162,000 manufacturing jobs. These losses were spread among a variety of sectors, with the heaviest in basic metals (53,000), chemicals (36,000) and electrical machinery and equipment (57,000)-all areas of traditional German industrial strength.

In terms of outward investment, the volume of FDI accelerated sharply after the 1985 Plaza Accord, which resulted in the appreciation of the yen. Japan's outward investment in the 1980s was almost the obverse of its inward investment. While Japan was the largest outward investor during this period, it received the smallest amount of inward investment. Japanese outward investment was distributed widely, with about half of the flow going to the United States, and smaller portions des-

[8] See "Japan: Employment of Foreign Subsidiaries by Origin Country or Area," in OECD op. cit., footnote 6, Table 7, p. 38

[9] Employment fell to less than three thousand. Ibid., p.38.

FIGURE 5-5: Outward Direct Investment Flows as Percent Share of OECD Total, 1981-1992 (current dollars)



NOTE: Reinvested earnings are not Included in some national data The source IS one of a series with similar appendix data fables

SOURCE Adapted from OECD, Reviews of *FDI*, p. 70 table 3

tined for Europe, Asia, and Oceana (see figure 5-4).

In 1992, the United States resumed its former position as the country with the largest flow of outward direct investment. Figure 5-5 shows the largest six direct investors' shares of total OECD outward investment from 1981 to 1992. Since the late 1980s, the share of OECD outward investment increased for the United States, France, Germany, and the Netherlands, while it decreased for Japan and the United Kingdom.

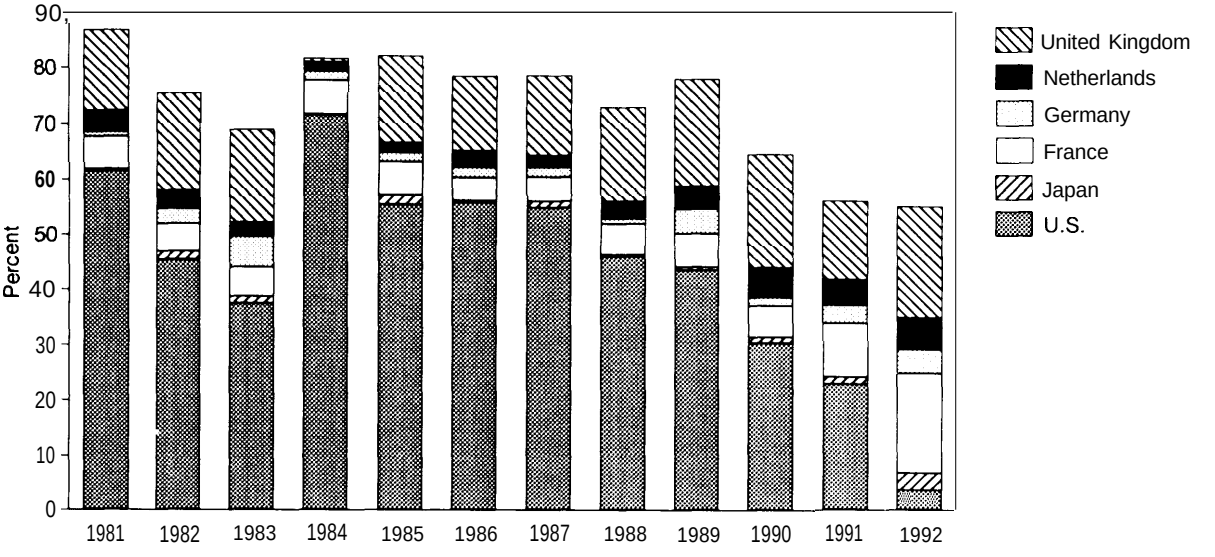
Figure 5-6 shows the share of OECD inward investment flows for the same six countries. For nearly the entire period, the United States, United Kingdom, and France received over 50 percent of the total OECD direct investment flows. However, the U.S. share has declined dramatically since its peak in 1984. The share of inward investment has increased for the United Kingdom, France, and the Netherlands, while it has fluctuated at a comparative] y low level for Germany and Japan.

While the recession slowed global foreign investment during the early 1990s, U.S. MNEs sustained their regional distribution of investment. As of 1993, Europe accounted for 49.1 percent of all U.S. direct investment abroad (USDIA), Latin America 18.6 percent, Canada 12.8 percent, and Japan 5.7 percent.[10] The proportions for USDIA in manufacturing differed little, at 48.5 percent for Europe, 14.8 percent for Latin America, 17.1 percent for Canada, and 6.8 percent for Japan.[11] However, the destination of this investment is increasingly to Asia (excluding Japan). In 1993, Asia and the Pacific, minus Japan, accounted for

10 U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis, *United States Department of Commerce News* (Washington, DC: June 28, 1994), table 2. All figures are on a historical cost basis at year end.

11 Ibid.

FIGURE 5-6: Inward Direct Investment Flows as Percent Share of OECD Total, 1981-1992 (current dollars)



NOTE: Reinvested earnings are not Included in some national data The source IS one of a series with similar appendix data tables

SOURCE Adapted from OECD, Reviews of FDI, p. 68, table 1

$60.9 billion or 11.1 percent of all USDIA, and $22.2 billion or 11.1 percent of all USDIA in manufacturing. [12]

EXPLAINING RECENT SHIFTS IN GLOBAL FDI

The majority of Japanese and EU outward investment between 1985 and 1989 went to the United States, which received more than 50 percent of all OECD investment. In the early 1990s, however, FDIUS slowed considerably due to the change in the value of the yen, the European need to finance Eastern European reconstruction, and a global recession. A number of European countries, especially Belgium, Portugal, Spain, Sweden, and the United Kingdom, had higher FDI growth rates than the United States in the early 1990s. East Asia also had a higher rate. '3

It could be that the United States is experiencing a cyclical decline in FDIUS. After a period of phenomenal growth, recessionary trends in the U.S. economy--combined with capital scarcity abroad--could have led foreign investors to limit or even reduce their investments in the United States. Different economies might operate on different recessionary and investment cycles. If this is the case, renewed economic growth should produce a return to vibrant growth rates in FDIUS.

Alternatively, the United States may be experiencing the effects of a structural change in the character of global FDI. The pressures of globalization may be forcing lasting shifts in the global distribution of FDI, since the imperatives of reducing labor costs and market customization require increased investment outside of the Triad. OTA interviews revealed a new emphasis on Asia

12 Ibid. Total USDIA in the *Asia* and *pacific* region *in* 1993 was *$92.3* billion. Japan accounted for 34 percent, Australia for 20.0, Hong Kong for 11.3, and Singapore for 9.5 percent. Together, these four countries accounted for 74.9 percent of all USDIA to the region.

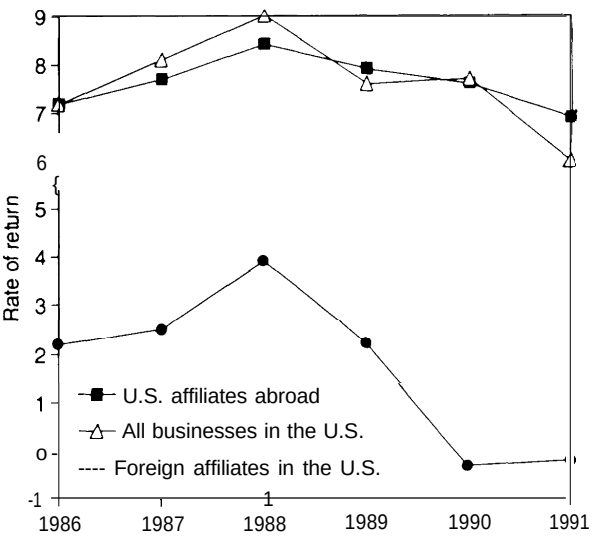
13 OECD, op. cit., footnote 3, p. 19.

and Latin America as destinations for FDI by many of the world's leading corporations. This trend is corroborated by the figures on USDIA cited above, which continued to grow despite the U.S. recession of the early 1990s, as U.S. investors sought higher returns abroad. Investors based outside the United States are behaving in a similar fashion. For example, in 1988,67 percent of new Japanese direct investment went to the United States, but by 1992 that figure had fallen to 42 percent, as Japanese investors increasingly focused on Asian investments. [14]

A combination of economic and political pressures have encouraged MNEs from Germany, Japan, and the United States to pursue investment strategies that increasingly emphasize regions peripheral to the OECD. Investment is moving toward East Asia, Eastern Europe, and Latin America. There are several reasons for this shift:

1. *Changes in the rate of return on investment. The* United States has become an increasingly mature market for foreign investors. When measured in terms of rate of return on investment, during the late 1980s the United States became less attractive for both existing and prospective foreign investors (see figure 5-7).
2. *Regional economic trends.* In Europe, the trade-expansion promise of the EU 1992 Initiative prompted increased direct investment in Europe during the late 1980s and early 1990s. In Asia, rapid national growth rates and increasing market liberalization also attracted FDI.
3. *Wage costs at home.* Growing labor costs have induced MNEs to move more production offshore, including the manufacture of high value-added components. Doing so requires firms to seek locations with a relatively well-educated but lower-cost work force. This process is especially difficult for Japan and Germany, which now have the highest labor costs in the world. Japanese employers repeatedly told OTA that they were hesitant to reduce their labor force, despite the fact that only a small percentage of workers benefit from Japan's lifetime employment system. Although German employers are more willing to cut their labor force, they expressed both hesitancy to do so and an awareness that the comprehensive German welfare state system could not support higher unemployment at the present level of benefits. Executives in both countries expressed concern about the social effects of investing abroad, but noted that increased competition has heightened the pressure to reduce wages and benefits, which in turn has made regional investment more attractive. For example, Japanese manag-

FIGURE 5-7: Rate of Return for U.S. Direct Investment Abroad, Foreign Direct Investment in the United States, and All U.S. Businesses, 1986-1991



NOTE: Rate of return on USDIA and FDIUS based on market value Rate of return for all U S businesses based on a weighted average of stock earnings and corporate bond yields

SOURCE U S Department of Commerce, Bureau of Economic Analysis, Survey of *Current Business* 72(8) 79, table 1, August 1992 (hereafter cited as BEA, SCB)

[14] See article by Customs Bureau Staff, Japanese Ministry of Finance, "Changes in Japan's Trade Structure and Foreign Direct Investments," translated and reprinted in FBIS-EAS-94-021-A, Feb. 1, 1994, p. 6.

ers in the consumer electronics industry pointed to strong competitive pressures to move production facilities offshore, much as U.S. manufacturers did in the 1970s and early 1980s.

4. *The need for customization.* While mature OECD markets have experienced a sustained recession, there have been high growth rates and a strong demand for capital in East Asia and China, and to a much lesser extent in Eastern Europe and Latin America. The increased complexity of these markets, coupled with different standards and regulatory regimes in Asia, Europe, and North America, have created distinct regional markets.

   Local rules, combined with increasingly diverse consumer demands in both intermediate and finished products, have promoted customization and local production. Executives across three continents repeatedly told OTA that "you have to be there, design there, and produce there to sell there." This is especially important for industries such as pharmaceuticals and information technology, where speed to market is a crucial aspect of competitiveness and proximity to consumers is often vital in order to meet their specific needs. [15] Indeed, most of the R&D conducted by foreign affiliates focuses on customizing products to meet local market conditions. [16]

   At the same time, however, the regionalization of markets can lead to informal barriers. For example, representatives of one French electronics firm noted that varying regional standards required them to construct their products differently in some Asian markets. They felt that this problem created an informal market barrier and weakened their competiveness. They also expressed concern that the widespread adoption of Japanese standards throughout Asia could effectively exclude them from that regional market.

5. *The gradual diffusion of technological capabilities.* Cutting-edge technological capabilities tend to remain concentrated in the major industrialized countries, while process technologies that serve the needs of most manufacturing industries have spread more widely. Nevertheless, there are now substantial software development facilities in Pakistan and India, and fabrication plants for sophisticated semiconductor components throughout Southeast Asia. Once the infrastructure for high technology development exists, it can become a magnet for additional investment.
6. *Seeking political stability abroad.* Many corporate officials suggested in interviews that they were encouraged to invest in order to promote political stability in neighboring areas. For instance, one executive stated that some German firms had come under ● 'moral and political pressure from their government" to invest in Eastern Europe and Russia. While official figures issued by the Ministry for Export and Investment show that the amount of German investment in Eastern Europe has been relatively small and contracting, several German executives suggested that these figures did not reveal the full extent of the commitment of German MNEs in Eastern Europe because so many investors were either asked to pay only a nominal price for existing facilities or those facilities were given to them.

   This focus on political stability was much less evident in the case of Japanese and U.S. firms. However, some Japanese business leaders expressed concern that their foreign investments might lead to accusations of predatory behavior and, perhaps, generate a backlash against them. And some in the U.S. have argued that U.S. investment in Mexico should be encouraged partly because it could help reduce illegal immigration.

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15 See OECD, op. cit., footnote 3, p. 28.

16 See chapter 4 for a discussion of R&D within multinational firms.

In addition to directing new investment to non-OECD countries, MNEs based in the Triad have begun to emphasize strategic alliances and joint ventures rather than rely on traditional investments.

MERGERS AND ACQUISITIONS, STRATEGIC ALLIANCES, AND JOINT VENTURES

After a sustained rise throughout the 1980s, the global trend toward increasing international mergers and acquisitions (M&As) fell in 1990 and 1991. In 1989, the global flow of M&A investment was $130.6 billion; in 1990 the flow fell to $117.8 billion before more than halving in 1991 to $51.9 billion. The greatest percentage decline was in North America, where the dollar value of M&As for 1991 fell to just over one-third of the amount for 1990. For the first time in many years, the value of M&As in the European Union exceeded those in North America (by $10 billion in 1990 and $21 billion in 1991).[17] In 1990, both the United Kingdom and France spent more on cross-border acquisitions than did the United States as they sought to expand from being national players to being European or global players through a strategy of foreign investment.

In the early 1990s, strategic alliances and joint ventures became relatively more popular than M&As as an investment strategy among MNEs. There appear to be four primary reasons for this change:

1. *Global recession.* Much of the downturn in demand for M&As was prompted by a global recession that reduced the financial abilities of firms to invest directly. The recession instead encouraged participation in strategic alliances and joint ventures, which are less expensive in terms of immediate capital requirements and allow for greater flexibility, although perhaps at a cost to corporate autonomy. Thus while international M&As fell by 37 percent in 1991, the number of joint-ventures fell by only 20 percent.[18] As one report suggested, "acquisition is increasingly seen as only necessary when it relates to a core part of the business and it is essential to have outright control. Outright acquisition is very expensive and there are situations in which companies no longer see it as viable."[19]
2. *Prohibitions against M&As.* Financial pressures may not be the only reason to favor joint ventures. In interviews with OTA, U.S. and European investors repeatedly stressed that joint ventures were preferred because takeovers may be precluded through national laws and practices.[20] Investors associated this problem most closely with Japan and Germany, two countries where the dominant form of corporate governance differs from the United States and the United Kingdom. Other studies corroborate this view. For instance, one analysis of M&As in Europe states that "many contested takeovers do not take place for the simple rea-

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[17] See Commission of the European communities, *Panorama of EC Industry /993* (Luxembourg: Office for Official Publications of the European Comunities, 1993) p. 49.

[18] Ibid., p. 51.

[19] KPMG report cited in Ibid.,p.51. An example of how the lack of finance has influenced global strategy and encouraged strategic alliances is discussed in the case of alliances between Japanese semiconductor firms and European partners. See Y. Kimura, "Japanese Direct Investment in the European Semiconductor Industry," in M. Mason and D. Encarnation (eds.), *Does Ownership Matter? Japanese Multinationals in Europe,* (Oxford, UK: Clarendon Press, forthcoming 1994), pp. 314-3 15 (pre-publication copy).

[20] Stephen Thomsen suggests, in relation to foreign direct investment regulations, that "non-EC firms face national restrictions within the Community even though the EC has no community-wide restrictions on the establishment of foreign companies through greenfield investment or acquisition. To suggest that the absence of restrictive Community policies makes the EC more open than the U.S.A. is clearly far-fetched. Each and every Member State in the Community has potentially more restrictive policies toward investors than does the U.S.A. under the Exon-Florio amendment."' S. Thomsen, "Comment," in Mason and Encarnation (eds.), op. cit., footnote 19, p. 203.

son that nobody really believes that they can happen"; for example, the unsuccessful hostile bid by Italy's Pirelli for Germany's Continental tire company in 1991 may have "confirmed the view that German companies are impregnable for as long as they have the support of the big German banks."[21]

A 1990 report identifies two types of barriers to takeovers of public companies in the European Union. The first is "structural''--e.g. impediments that arise from the ownership structure and the cultural characteristics of individual markets. For example:

> In Italy . . . only eight out of over 200 listed companies have issued more than 50 percent of their shares to the public. That means that they remain tightly controlled by small cabals of like-minded industrialists and financiers who are not minded to give up control .22

The study found structural barriers in the major European economies to be strongest in France, Germany, Italy, and Switzerland.

The second impediment to acquisitions identified by the report was a series of technical barriers that inhibit or prevent the transfer of control by contested takeover. For example, in Germany, Switzerland, and the Netherlands, companies often restrict the voting rights of ordinary shareholders and instead concentrate voting power in the hands of shareholder groups that are friendly to management. Among EU members, the United Kingdom has relatively weak structural and technical barriers. As a result, management in the United Kingdom is much more likely to be responsive to shareholders' short-term interests. In addition, the value and number of cross border acquisitions in the United Kingdom often exceed those found in the rest of the European Union.[23]

With respect to Japan, OTA was told repeatedly that unsolicited acquisitions of Japanese firms by foreign MNEs were virtually impossible due to numerous formal and informal barriers. These investment and market access restrictions discouraged foreign acquisitions even in sectors where domestic Japanese firms are weaker than their international competitors and where the rules of competition appear most liberalized, such as in pharmaceuticals.

3. *Market access. The* liberalization of European trade law and the lack of legal restrictions to investment have reduced the problem of market access in all but a few exceptional cases within the European Union. For example, the initial problems experienced by Japanese financial institutions in trying to gain access to the European market through joint ventures or direct investment seem to have been overcome in the 1990s, with two notable exceptions. The first is in Germany, where the universal banking system allows banks to take the initiative in adopting protective measures against foreign intrusion. The second is in France, where national regulation constrains market entry.[24] OTA interviews with banking officials in both countries corroborate this claim, as company officials suggested that formal and informal barriers have been effective in constraining market entry.

In the case of Japan, corporate officials in North America and Europe reported that establishing a joint venture is the preferred method of gaining access to Japanese markets. Most

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21 Commission of the European Communities, op. Cit., footnote 17, p. 51.

22 Study by Coopers and Lybrand, as cited in ibid., p. 51. This image of Italy is consistent with broader data On inward FDI flows, which remain small and relatively volatile. while the stock of investment grew in the late 1980s and early 1990s, the flow was uneven, peaking in 1988 and 1990 and dropping substantially in subsequent years. For further discussion and data on FDI flows in and out of Italy, see ibid., p.61, table 14.

23 Ibid., pp. *5 I -52.*

24 See G. Hawawini *and* M. Schill, "The Japanese Financial Presence in the European Financial Services Sector," in Mason and Encarnation (eds.), op. cit., footnote 19, pp. 243-247. See also chapter 8 in this report.

companies interviewed by OTA considered other strategies, such as establishing wholly-owned subsidiaries, to be too difficult. Company officials across the United States and Europe repeatedly stressed that public and private sector limitations effectively deterred investment in Japan. These managers cited problems with the distribution system, access to local suppliers, reduced probability for public procurement, and the exceptionally high initial costs of starting up a business in Japan. Several senior executives of European firms stated that they instituted joint-venture agreements with Japanese firms in Japan because they believed it was the only means of securing business from Japanese transplants in North America. Officials of a German auto supplier, for example, claimed that they swapped technology for market access to the Japanese market—which they defined as both firms in Japan and Japanese companies located in North America. A joint venture was necessary to enter a keiretsu, they suggested, wherever it was located. If these claims are true, and do not represent isolated cases, then some Japanese MNEs may be extending restrictive practices common in Japan to other countries.

Most joint ventures between Japanese and foreign firms in Japan result in the Japanese firm being the majority partner. This has major repercussions on trade patterns, because it can preclude foreign firms from using their Japanese-based subs i diaries as a conduit for trade .[25] Unlike Japanese affiliates in the United States, which often are either wholly-owned or majority-owned subsidiaries of the Japanese parents, U.S.-based subsidiaries in Japan often face regulatory and informal limits to market penetration. In addition, minority partners are often precluded from advantageous transfer pricing practices, which limits their ability to control foreign exchange risks and tax liabilities.[26]

4. *Increased cost of technology.* Many firms reported that the soaring costs of developing the next stage of technology in their particular field, coupled with enhanced competitive pressures to innovate, have forced them to pursue strategic alliances and joint ventures.

   For example, even the wealthiest of companies are often unable or unwilling to invest alone in billion dollar fabrication plants for the production of next-generation DRAM chips. The profitability of commodity semiconductor products has declined, and as product and process technology advance many MNEs have turned to cooperative development and production strategies. The location of research and production facilities is increasingly determined by technological resources rather than market considerations or broader national interests. Even Japanese firms now tend to favor alliances with foreign enterprises in North America and Europe, rather than foreign direct investment .27

   The results of these tendencies have significant implications for the U.S. technology base. For example, the next generation of computer technology will rely on flat panel displays. But IBM's decision to locate co-production of flat panel displays with Toshiba in Japan was determined, according to company officials, by the lack of suitable technological infrastructure to support such a plant in the United States, where

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25 This issue is comprehensively addressed in D. Encarnation, *Rivals Beyond Trade: America Versus Japan in Global Competition* (Ithaca, NY. Cornell University Press, 1992).

26 P. Buckley, "Comment" in Mason and Encarnation (eds.), op. cit., footnote 19, pp. 229-230.

27 Article by Customs Bureau Staff, Japanese Ministry of Finance, op. cit., footnote 14, p. 6.

TABLE 5-2: Breakdown of the Stock of Foreign Direct Investment in the United States (percent of total FDIUS)

	Total Industry		Manufacturing		Wholesale Trade	
Country	1985	1993	1985	1993	1985	1993
Canada	9.3	8 9	7,7	10.0	5.3	2.6
Other Americas	9.1	4.6	8.7	3.1	5.7	3.4
Europe	65.8	60.8	76.9	73,5	47.4	40,2
France	3 6	5.7	9.6	10,2	1.5	2.7
Germany	8.0	6.6	10.1	10.7	152	10.5
Netherlands	20.1	14,7	22,4	13.7	7,4	11.1
U K	236	20,0	19,6	57.2	139	9.9
Japan	10.5	21,6	4.6	10,6	40,6	49,8
Other	5.4	4,2	2.1	2.6	1,0	3.1
Total (in billions)	$1846	$445.3	$596	$1667	$291	$69.7

NOTE: Totals are given in current dollars, 1993 data is preliminary, columns may not add to 100 percent due to rounding

SOURCE: OTA, based on data in U S Department of Commerce, BEA, Foreign *Direct Investment* in *the United States Preliminary 1992 Estimates,* (Washington, DC forthcoming 1994), table 3, and BEA, *SCB,* August 1987, table 10, p 90

to date there is no high volume commercial producer of flat panel displays.[28] This pattern may be self-reinforcing: despite the appreciation of the yen against the dollar, the IBM-Toshiba joint venture is planning to increase production capacity only in Japan .29

Furthermore, Japanese-based MNEs frequently use joint ventures with U.S. firms to benefit from U.S. technological capabilities. Where Japanese-based MNEs are advanced technologically, they tend to maintain investments at home or establish majority-owned subsidiaries abroad. But they do invest in joint ventures and strategic alliances where their U.S. partner is more technologically advanced than they are.[30]

THE DYNAMIC CHARACTER OF FDI IN THE UNITED STATES

Throughout the 1980s and into the early 1990s, the United States received more than half of all OECD FDI flows.[31] By 1993, the British were overtaken by the Japanese as the largest investors in the United States (see table 5-2). Japanese investment in the United States grew at an average

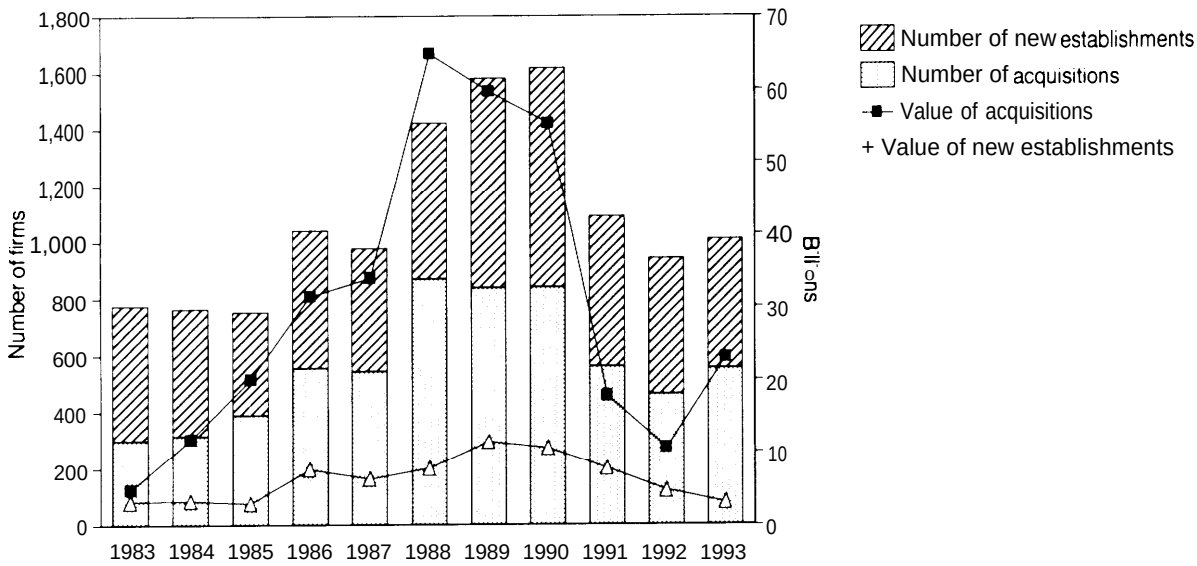
[28] OTA interview at IBM-Japan, Sept. 30, 1993. Note, with regard to this issue, the Department of Defense's proposal to offer matching grants totalling $1 billion to U.S. firms that are prepared to develop and produce flat panel display computer screens in the United States. See "U.S. to Aid Industry in Computer Battle With the Japanese," New York *Times,* p. Al, Apr. 27, 1994.

[29] See "IBM Japan, Toshiba Venture to Double its Display Capacity," *The Wall Street Journal,* p. B8, July 6, 1994.

[30] See B Kogut and S.J. Chang, "Technological Capabilities and Japanese Foreign Direct Investment in the United States," The *Review of Economics and Statistics* 73(3): 401-413, Aug. 1991.

[31] See figure 5-1. For a discussion of the factors that have stimulated foreign investment in the United States, see the first report of this assessment: U.S. Congress, Office of Technology Assessment, op. cit., footnote 1, pp. 57-62.

FIGURE 5-8: Foreign Acquisitions and New Establishment Investments in the United States, 1983-1993 (current dollars)



SOURCE: BEA, SCB 70(5) 23, table 1 May 1990, 71 (5) 30, table 1, May 1991, 71 (5) 133, table 1, May 1993, and 74(5) 50, table 1, May 1994

rate of 34 percent a year in the 1980s, which represents a seventeen-fold increase in Japan's stock of investment in the United States over the decade .32 By 1993, Japanese investors accounted for 23.6 percent of all industry investment, including nearly 50 percent of investment in wholesale trade.

Most FDIUS is comprised of acquisitions, not new establishment (or "greenfield") investment. During the 1980s, acquisitions accounted for 85 percent of all FDIUS, compared to 60 percent of FDI in the EU.[33] Figure 5-8 shows the difference in number and value of foreign acquisitions versus new establishment investment in the United States from 1983 to 1993.

Of all acquisitions in the United States between 1981 and 1987, those by foreign individuals accounted for 8 percent of the transactions and 14 percent of the total value. These acquisitions were facilitated by U.S. deregulation and the emergence of new financial instruments such as junk bonds, which often required the issuers to sell their assets rapidly in order to meet their financial obligations .34

Although lower than acquisitions, the value of new establishment investment also grew steadily during the mid to late 1980s, from $3.2 billion in 1983 to a high of $11.5 billion in 1989. Foreign firms established new facilities in the United States for a variety of reasons specific to individual sectors, as well as to develop a mechanism to hedge against exchange rate variations. In some cases, the particular location of greenfield investment within the United States may have been affected by state and local incentive packages, although it is unlikely that these incentives af-

[32] The Impact of Foreign Investment on Domestic Economies of OECD Countries, op. cit., "ootnote[2]1 pp" 87 and [91]"

[33] OECD, op. cit., footnote 3, p. 20.

[34] OECD, op. cit., footnote 6, p. 88.

BOX 5-1: The Role of the States in FDIUS

The lack of U.S. regulation of foreign investment has created both advantages and disadvantages. Perhaps the most contested issue has been the activities of individual U.S. states. They have created a race to attract foreign investors that critics claim has reached unprecedented proportions, repeatedly entering into competition with each other to secure investment by foreigners, particularly in the manufacturing sector. The states have effectively pursued their own industrial policies in this regard, offering lucrative tax, infrastructural, and loan incentives to foreign MNEs in order to secure plant location in their states.[1]

In several cases reported to OTA, a competitive bidding situation emerged in which units of state or local government bid against one another, raising the costs to the taxpayer and decreasing the overall benefit of the investment for the state. Some analysts contend that the same options are available to U.S. firms, but they concede that U.S. firms face more constraints (such as existing plant and equipment and labor contracts) than do foreign investors. Most economists argue that this kind of behavior distorts markets in ways that create advantages for particular firms.

The cost of attracting major investments has risen. The state of Ohio, for example, paid $16 million in direct incentives to Honda to secure the Marysville plant in 1982. By 1988 Kentucky had spent at least $125 million in incentives to convince Toyota to locate its plant there.[2] And in 1993 Alabama negotiated a $300 million incentive package with Daimler-Benz. Critics question whether state competition for FDIUS is in the nation's interest, and indeed, whether this escalation has now reached a stage where its costs substantially mitigate the benefits at even a local level. As one analyst recently noted:

> States and cities still spend significant amounts of money on industrial recruitment which does nothing to improve U.S. economic competitiveness. . . .In fact, some of [the incentive packages] actually hurt U.S. competitiveness, as was the case when states and cities gave large amounts of money to foreign firms that were already planning to locate in the U.S.

[1] Indeed, Volkswagen's termination of its venture in Pennsylvania did nothing to dissuade state officials of the correctness of this approach, despite the cost of the incentives to the state's taxpayers. State officials subsequently offered an equally lucrative deal to Sony to use Volkswagen's plant for the production of televisions.

[2] T.D. Mason and F.M. Howell, "Japanese Investment in the United States: A Study of Trends and Site Selection Behavior," a paper presented at the Annual Meeting of the International Studies Association, Atlanta, Georgia, Mar. 30-Apr. 4, 1992, pp. 4-5.

fected foreign firms' strategic decisions to establish new facilities in the United States (see box 5-1). The net effect of greenfield and acquisition investment was to boost the share of foreign affiliates as a percentage of U.S. manufacturing output into the 10-20 percent range, a level comparable to Germany. 35

In 1990, about 25 percent of total U.S. domestic demand was met by foreign firms through a combination of imports and local production. By comparison, foreign firms account for 9 percent of total domestic demand in Japan-of which 6 percent is imports, mostly of low technology products, and 3 percent is concentrated in chemicals, pharmaceuticals, basic metals, and food products, most of which are manufactured locally. Comparable figures for Europe are much higher, largely

[35] OECD op. cit. footnote 3, p. 20. In the United Kingdom and France, foreign affiliates account for 20-30 percent of manufacturing output, while in Japan foreign affiliates account for less than 10 percent.

BOX 5-1 continued: The Role of the States in FDIUS

States and cities have given over $1 billion to foreign automobile firms between 1978 and 1992. These subsidies did little, other than to provide a windfall subsidy to our foreign competitors at the expense of U.S. firms and to erode the tax base of many local communities. The incentives did not induce the firms to invest in the United States since that decision had already been made. Nor did they benefit seriously economically depressed communities since, for the most part, Japanese auto plants located in generally prosperous areas.[3]

Analysts contend that even in the recent period of fiscal constraint by the states, Daimler-Benz's recent decision to locate a plant in Alabama illustrates the problems besetting state policies and how they adversely affect the U.S. economy, and often the states.[4] OTA was repeatedly told by foreign investors that their first decision was always whether they were going to invest in the United States, and that their plant location was influenced more by market and sourcing concerns than by state incentives. In at least one case, the foreign company chose the state location first, and then began negotiations with several states over incentives. State incentives were just extra benefits, having little effect on the final decision on where to invest. One MNE held that, were they to make the same choices again, they would not have pushed so hard on the issue of state incentives, in order to avoid resentment.

Proponents of state incentives to FDI contend that cases of inflated and seemingly unjustified spending by states are the exception rather than the norm. Unfortunately, there is no systematic and widely accepted evaluation of state and local incentive programs. Under these circumstances, proponents tend to advocate the status quo, while critics suggest that Congress should contemplate legislation to curtail the most excessive forms of state spending, which to them seems to be motivated more by political than economic goals.

[3] See R.D. Atkinson, "The Next Wave in Economic Development," *Commentary*, spring 1993, pp. 12-18.

[4] "States' Bidding War over Mercedes Plant Made for Costly," *Wall Street Journal*, p. A1, Nov. 24, 1993.

due to the integrating effects of the 1992 EU initiative.[36]

Among foreign investors in the United States, only the Japanese preferred establishing new firms to acquiring existing ones.[37] For example, table 5-3 shows that, of the 631 Japanese affiliates operating in the United States and Europe as of 1990, 78 percent were established by greenfield investment and 22 percent by acquisition and capital investment. Of acquisition and capital investment, 86 percent is accounted for by Japanese chemical, iron and steel, non-ferrous metals, and non-electrical machinery firms. These are primarily slow growth industries, and have attracted foreign firms that are seeking either to diversify or to enhance their sectoral competitiveness by purchasing U.S. firms (as is the case for Japanese chemical firms in the United States).[38]

The United States has also attracted Japanese investment in relatively high-growth, R&D-intensive industries such as electrical machinery. The United States is not the only location for this type of investment. Japanese FDI in Europe, for example, has included significant investment in high-wage, technologically sophisticated German

[36] OECD, op. cit., footnote 6, p. 7.

[37] Ibid., p. 88.

[38] See H. Yamawaki, "Entry patterns of Japanese Multinationals in U.S. and European Manufacturing," in Mason and Encarnation (d.), op. cit., footnote 19, pp. 98, 101, 108-110 and 118.

TABLE 5-3: Means of Establishment and Diversity of Japanese Manufacturing Affiliates in the United States and Europe

	Japanese affiliates			
	in the U.S.		in Europe	
	number	percent	number	percent
Total number of affiliates	631	10070	336	1 00%
New Establishments	489	77.5% (loo%)	258	76 8% (100%)
Horizontal firms	430	68.2% (87.9%)	234	69,6% (90.7%)
Diversified firms	59	9.4% (12.1%)	24	7.1% (9.3%)
Acquisition and capital participation	142	22.5% (100%)	78	23,2% (100%)
Horizontal firms	105	16.6% (73.9%)	74	22,0% (94.9%)
Diversified firms	37	5.9% (26.1 %)	4	1 .2% (5.1%)

NOTE: Numbers may not sum to 100 percent due to roundlng. Data describe Japanese manufacturing affiliates operating in Europe and the United Stales as of 1990

SOURCE: Hideki Yamawaki, "Entry Patterns of Japanese Multinationals in U S and European Manufacturing, " Mark Mason and Dennis Encarnation, eds. *Does Ownership Matter? Japanese Multinationals in Europe* (forthcoming from Claredon Press), p 97, table33

industries.[39] Such manufacturing investments should not obscure, however, the tendency of Japanese FDIUS to focus on services and wholesale trade.[40]

INVESTMENT BALANCES ACROSS THE TRIAD

The rapid growth of FDI over the last decade has expanded the ownership and control of large industrial enterprises across national borders. By 1992, the global stock of foreign direct investment reached approximately $2.0 trillion.[41] This surge of investment, often identified with the globalization of business, has transformed the world economy and stimulated local and international commerce in many sectors. But it has not done so evenly.

U.S. direct investment with Europe and Japan tripled over the past decade to reach more than $665 billion by 1993. As shown in figure 5-9, the bulk of that investment, some $540 billion, was split between U.S. FDI in Europe ($269 billion) and European FDI in the United States ($271 billion). The remainder, approximately $128 billion, is divided unevenly between U.S. FDI in Japan ($31 billion) and Japanese FDI in the United States ($96 billion). Figure 5-9 shows the expansion and distribution of foreign direct investment between the United States and its major trading partners.

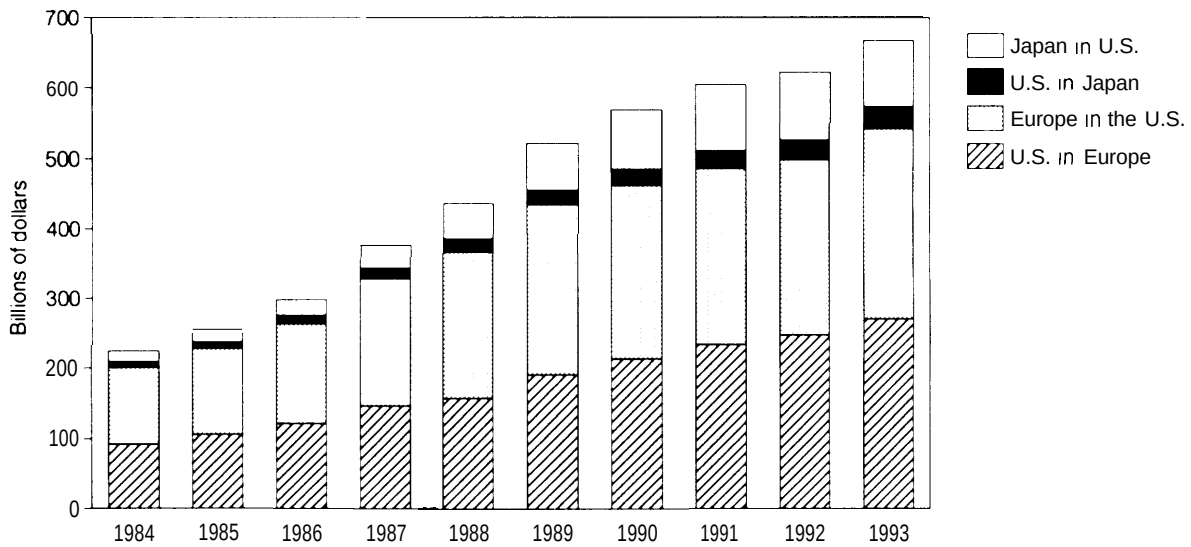
As figure 5-9 indicates, from a macro perspective U.S.-European FDI has been relatively well balanced over time, although during 1988-89 European investment in the United States exceeded

39 H. Yamawaki, "Location Decisions of Japanese Multinational Firms in European Manufacturing Industries" in K. Hughes, (cd.), *European Competitiveness* (Cambridge, MA: Cambridge University Press, 1992).

40 See H. Yamawaki, "Exports and Foreign Distributional Activities: Evidence on Japanese Firms in the United States," *Review of Economics and Statistics*, *73(2):294-300,* May 1991. See also figure 5-14 and accompanying text in this chapter.

41 United Nations, *World Investment Report 1993 0p. cit.* footnote 2, p. 1.

FIGURE 5-9: Direct Investment Positions: United States-Europe and United States-Japan, 1984-1993 (historical cost)



SOURCE: Adapted from BEA, SCB 73(7) 65-67, 97-100 July 1993, 71 (8) 51-54, 86-88, August 1991, 69(8) 52-53, 67-69, August 1989, and 67(8) 63-65,90, August 1987 "U S Department of Commerce News, " press release June 28, 1994, tables 2 and 3 (hereafter cited as USDOC press release)

U.S. investment in Europe by approximately $50 billion (or 12 percent of all FDI between the United States and Europe). The U.S. investment relationship with Japan, on the other hand, is far less balanced. Japanese investment in the United States now exceeds U.S. investment in Japan by a factor of 3.1, with the imbalance totalling $65 billion in 1993 (or51 percent of all FDI between the United States and Japan). Moreover, the Japanese economy is roughly half the size of the U.S. or European economies, but, at $128 billion, U.S.-Japanese investment is less than one-fourth the size of U.S.-European investment.

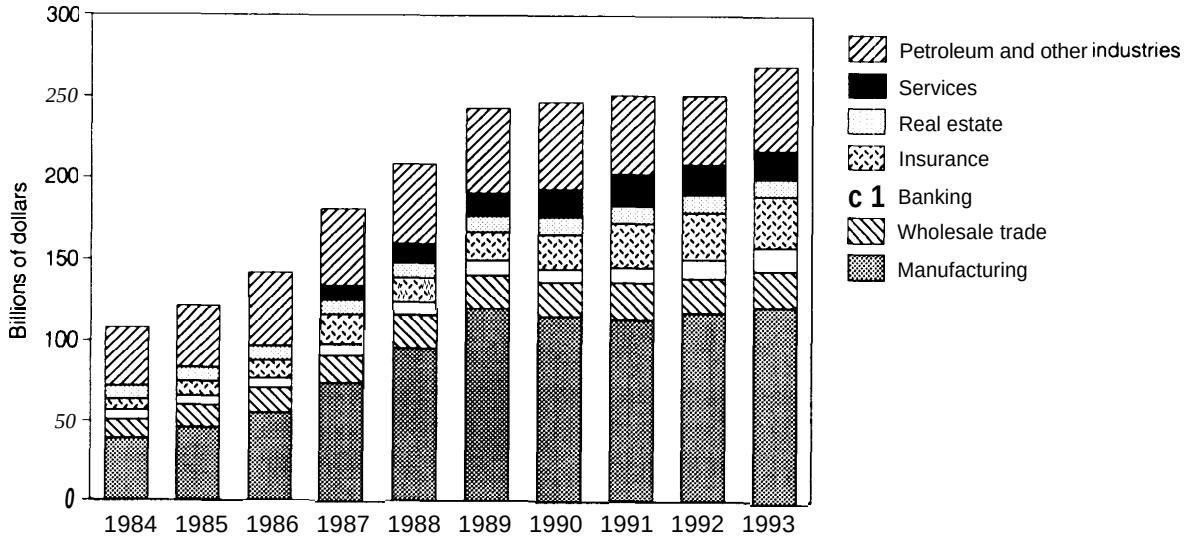
There are notable differences across the Triad in the composition of investment. About half of all FDIUS is in manufacturing and wholesale trade, the two components of FDI that are most closely associated with merchandise trade, while the other half of FDI is in a mixture of services, real estate, insurance, banking, finance, and other sectors. However, the proportion of FDI directed to each of these sectors varies across the Triad.

As figures 5-10 and 5-11 indicate, the composition of FDI between the United States and Europe appears reasonably well matched. Approximate y $100 billion is directed to manufacturing in each direction, while much smaller but comparable levels of FDI are directed to wholesale trade operations.

The similarity in the composition of U.S.-European FDI is reflected in U.S.-German direct investment, as demonstrated by figures 5-12 and 5-13. In each direction, manufacturing accounts for the largest percentage of direct investment. In wholesale trade, Germany directs a proportionately larger amount of investment to the United States than does the United States to Germany, while the reverse pattern holds for services.

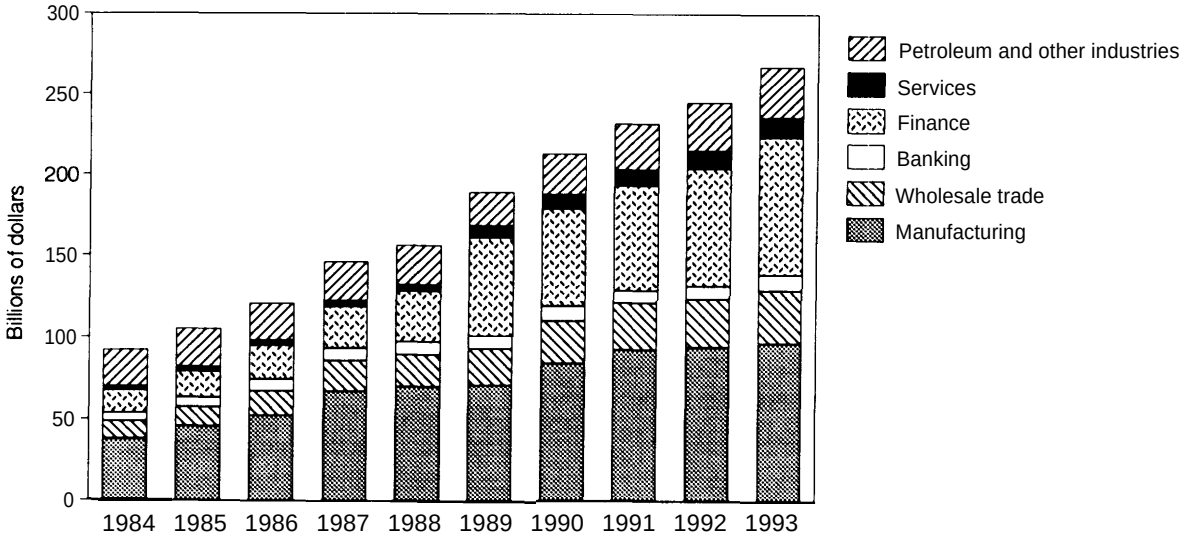
No such similarity in composition or level exists in the U.S.-Japan investment relationship. As can be seen by comparing figures 5-14 and 5-15, Japanese FDI in U.S. manufacturing and wholesale trade reached $50 billion in 1992, three times that of similar U.S. investments in Japan. In addi-

FIGURE 5-10: Europe's Direct Investment Position in the United States by Sector, 1984-1993 (historical cost)



NOTE BEA statistics on FDI Include data on services only since 1987

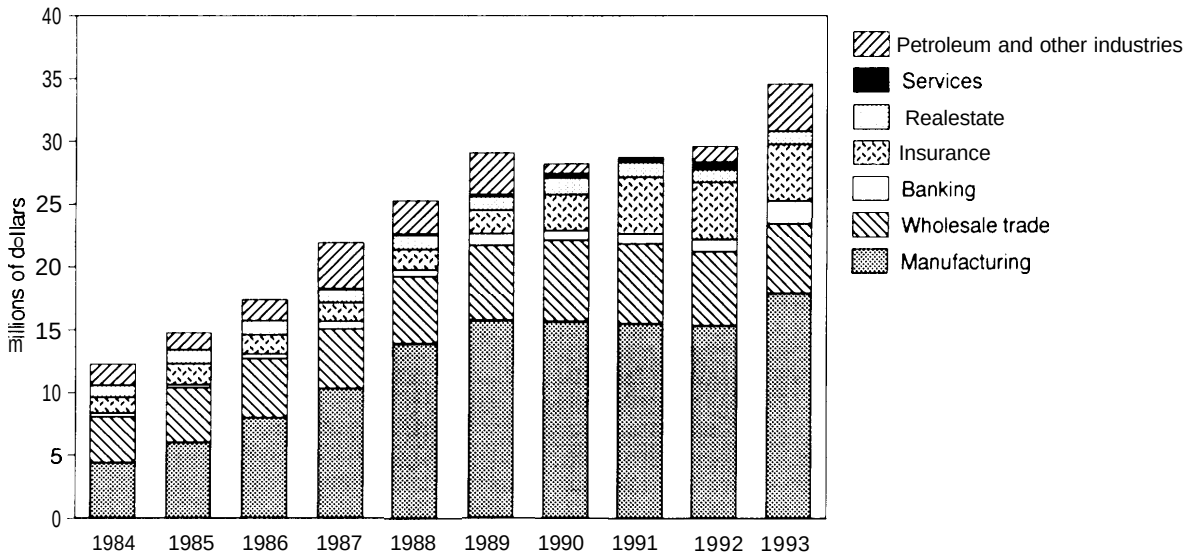
SOURCE BEA, *SCB* 73(7) 65-67, July 1993,71 (8) 51-54, August 1991, 69(8) 52-53, August 1989, and 67(8):90, August 1987, USDOC press release, June 28, 1994, table 3



NOTE BEA statistics on FDI position Include figures for services only since 1987

SOURCE BEA, *SCB* 73(7) 97-100, July 1993, 71 (8) 86-88, August 1991, 69(8) 67-69, August 1989, and 67(8) 63-65, August 1987; USDOC press release, June 28, 1994, table 2

FIGURE 5-12: Germany's Direct Investment Position in the United States by Sector, 1984-1993 (historical cost)



NOTE: BEA statistics on FDI include data on services only since 1987

SOURCE: BEA, *SCB* 73(7) 65-67, July 1993,71 (8) 51-54, August 1991 69(8) 52-53, August 1989, and 67(8): 90 August 1987: USDOC press release June 28, 1994, table 3

tion, while U.S. investment in Japan was heavily weighted toward manufacturing, Japanese FDI in the United States was concentrated in wholesale and distribution operations.[42]

As one recent study noted, of the 3,282 Japanese-affiliated subsidiaries in the United States, less than 33 percent (1,054) are in manufacturing, the remainder being in non-manufacturing sectors.[43] According to a MITI survey, there are 2,399 Japanese affiliates in North America, of which 35.2 percent (845) are in manufacturing industries.[44] Similarly, of 1,785 Japanese affiliates in Europe, just under 30 percent (530) are in manufacturing.[45] In the United States, Europe, and elsewhere, the bulk of Japanese investment is in wholesaling and retailing, services, finance, and real estate.

These differences in the composition of FDI are important because, in effect, the largest portion of Japanese FDI has been in U.S. distribution facilities, which receive imports from Japan destined for retail sale in the United States. The impact of FDI devoted to wholesale operations, and the general significance of variations in both the composition and scale of FDI across the Triad, are analyzed in chapter 6.

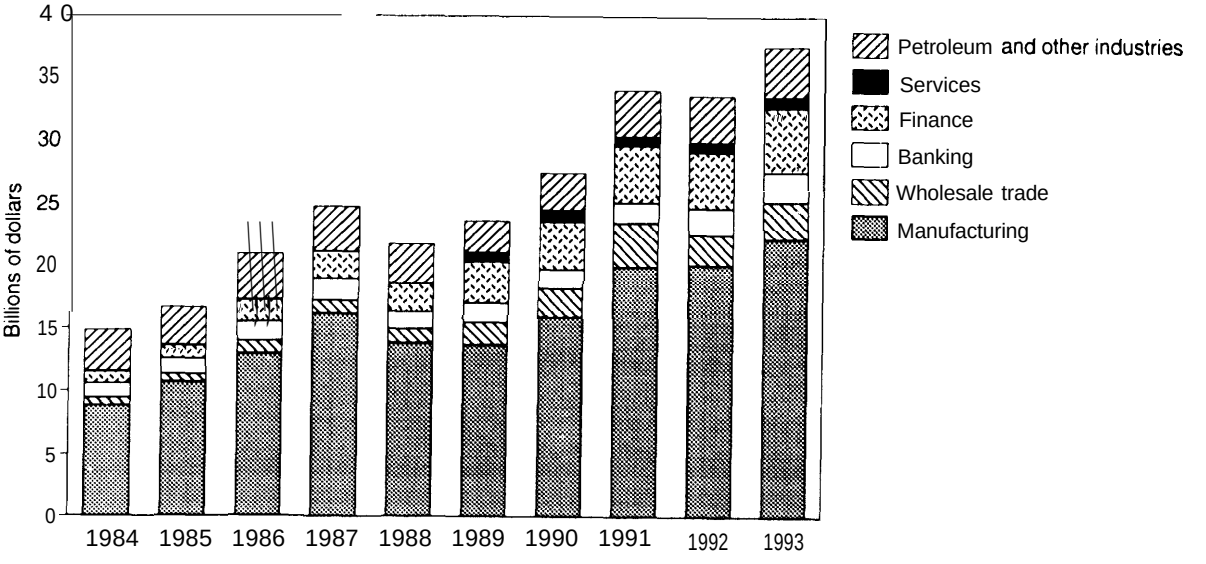
[42] For corroboration see L.A. Davis, "U.S. Foreign Trade in Merchandise and Services by Foreign-Owned U.S. Firms" in U.S. Department of Commerce, *Foreign Direct Investment in the United States: An Update* (Washington, DC: U.S. Government Printing Office, June 1993) p. 81.

[43] Yamawaki, op. cit., footnote 39, p. 93. These figures are taken from listings in the Toyo Keizai survey.

[44] See M] T], "Dai 22 kai - Wagakun i Kigyo no Kaigai Jigyo Katsudo," *The 22nd Survey—Overseas Business Activities of Japanese Enterprises,* July 30, 1993, p. I I, table 5.

[45] OECD, op, cit., footnote 6, p. 21.

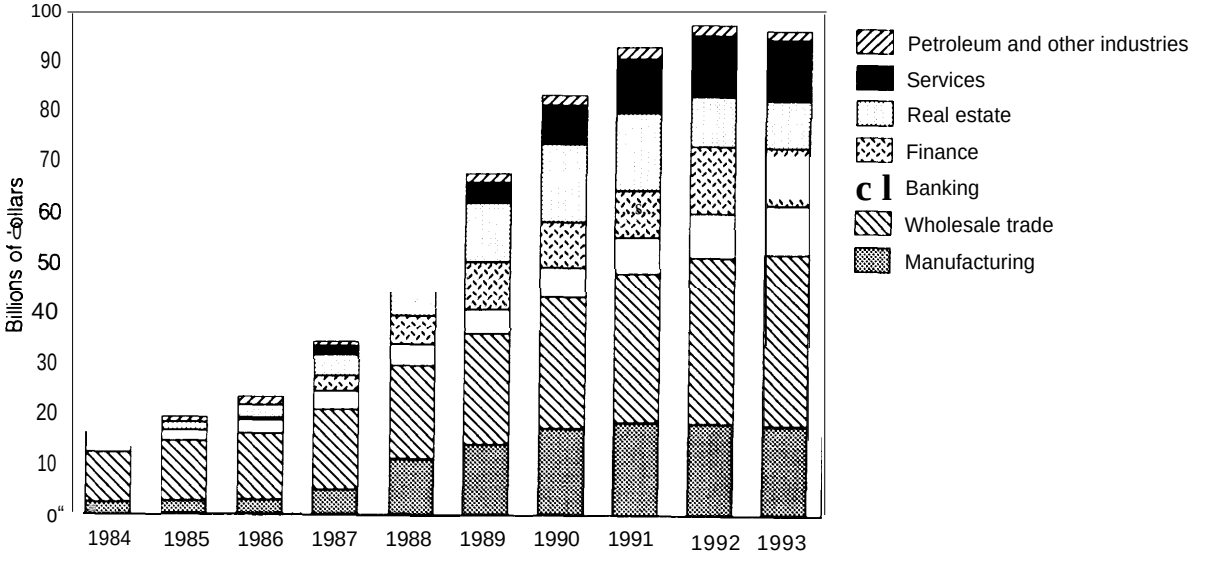
FIGURE 5-13: U.S. Direct Investment Position in Germany by Sector, 1984-1993 (historical cost)



NOTE BEA statistics on FDI position include figures for services only since 1987

SOURCE BEA, *SCB* 73(7) 97-100 July 1993, 71 (8) 86-88, August 1991, 69(8) 67-69, August 1989, and 67(8) 63-65, August 1987, USDOC press release, June 28, 1994, table 2

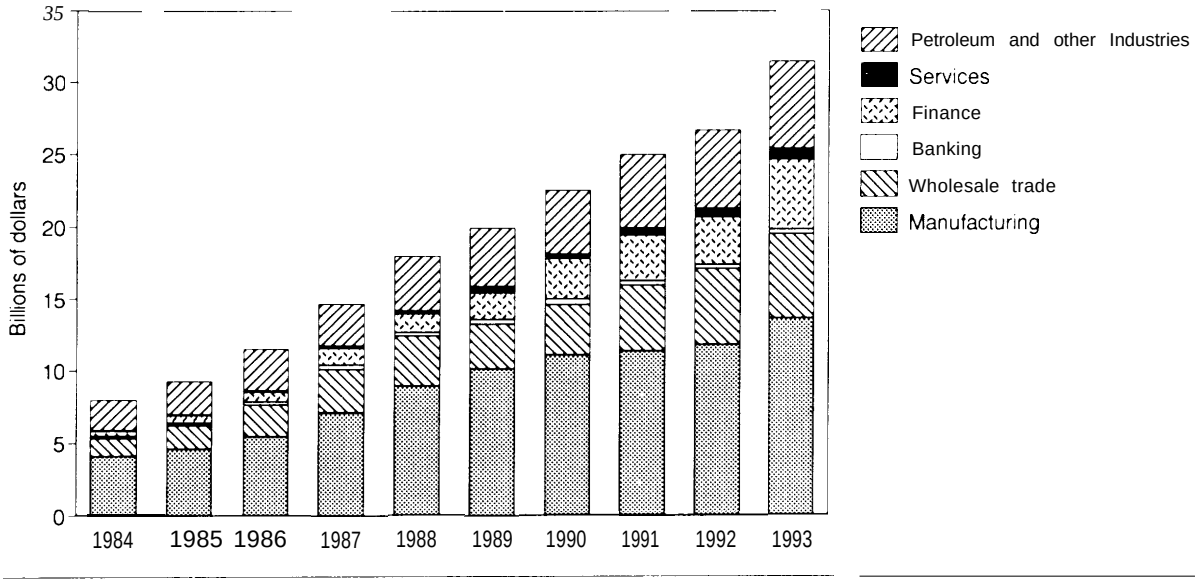
FIGURE 5-14: Japan's Direct Investment Position in the United States by Sector, 1984-1993 (historical cost)



NOTE BEA statistics on FDI include data on services only since 1987

SOURCE BEA, *SCB* 73(7) 65-67, July 1993, 71 (8) 51-54, August 1991, 69(8) 52-53, August 1989 and 67(8) 90, August 1987, USDOC press release, June 28, 1994, table 3

FIGURE 5-15: U.S. Direct Investment Position in Japan by Sector, 1984-1993 (historical cost)



NOTE: BEA statistics on FDI position include figures for services only since 1987

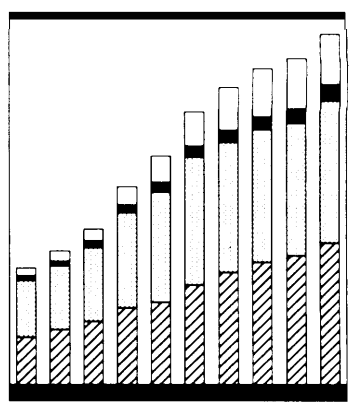
SOURCE BEA *SCB* 73(7) 97-100 July 1993 71 (8) 86-88 August 1991 69(8) 67-69 August 1989 and 67(8! 63-65 August 1987 USDOC press release June 28 1994 table 2

Multinational Firms and International Trade

6

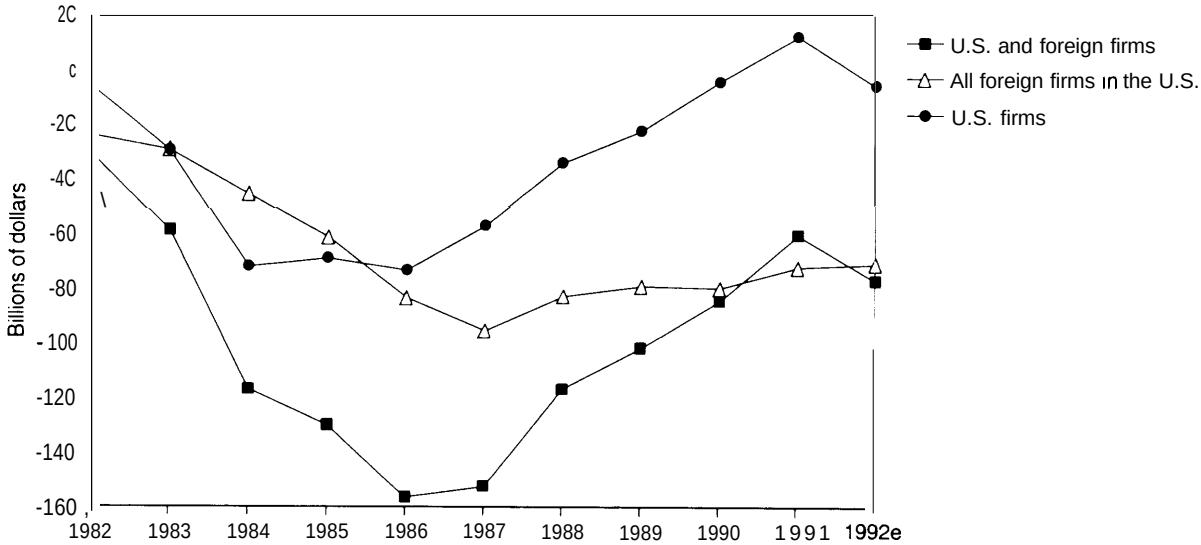
When multinational businesses first gained broad public attention in the late 1960s, many analysts believed that foreign direct investment (FDI) would effectively displace trade because foreign affiliates would supply local markets not with exports but with locally produced goods. Multinational enterprises (MNEs) were expected to replicate the production process globally, producing and selling in local markets instead of exporting from the domestic market. Historically, this form of FDI has been most commonly associated with U.S. firms investing abroad. Ford's investment in integrated production plants in Europe is a classic example of what one analyst has called "trade-destroying" FDI. [1]

However, the expectation that FDI would supplant trade has not always been borne out. Instead of investing in fully integrated manufacturing facilities and producing goods abroad, many MNEs have established foreign manufacturing operations that import a high percentage of intermediate components; others have set up wholesaling and service facilities that import both intermediate goods and finished products. Rather than replacing trade, these investments encourage trade—that is, they are trade-creating. To the extent that FDI promotes trade, aggregate trade flows will tend to mirror aggregate investment flows.



[1] For a discussion of this view of FDI see: R. Gilpin, citing the work of Koyoshi Kojima, in 'Where Does Japan Fit In'?', *Millennium: Journal of International Studies*, 18(3). 337, 1989. on Ford's style of FDI, see M. Wilkins and F.E. Hill, *American Business Abroad: Ford On Six Con/] ents* (Detroit, MI: Wayne State University Press, 1964).

FIGURE 6-1: U.S. Merchandise Trade Balance, 1982-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary

SOURCE: OTA, based on data in U S Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business* 73(1 O) 54, table 1, October 1993, 73(3) 90-91, table 2, March 1993, and 74(3) 68-69, table 2, March 1994 (hereafter cited as BEA, SCB), U S Department of Commerce, Bureau of Economic Analysis, *Foreign Direct Investment* in *the United States Operations of U S Affiliates of Foreign Companies* revised 1983-1991 estimates and preliminary 1992 estimates, (Washington, DC U S Government Printing Off Ice, 1986-1994), table G-3 (1982-1 986) and table G-1 (1987-1 992) (hereafter cited as BEA, *FDIUS)*

THE TRADE AND INVESTMENT NEXUS

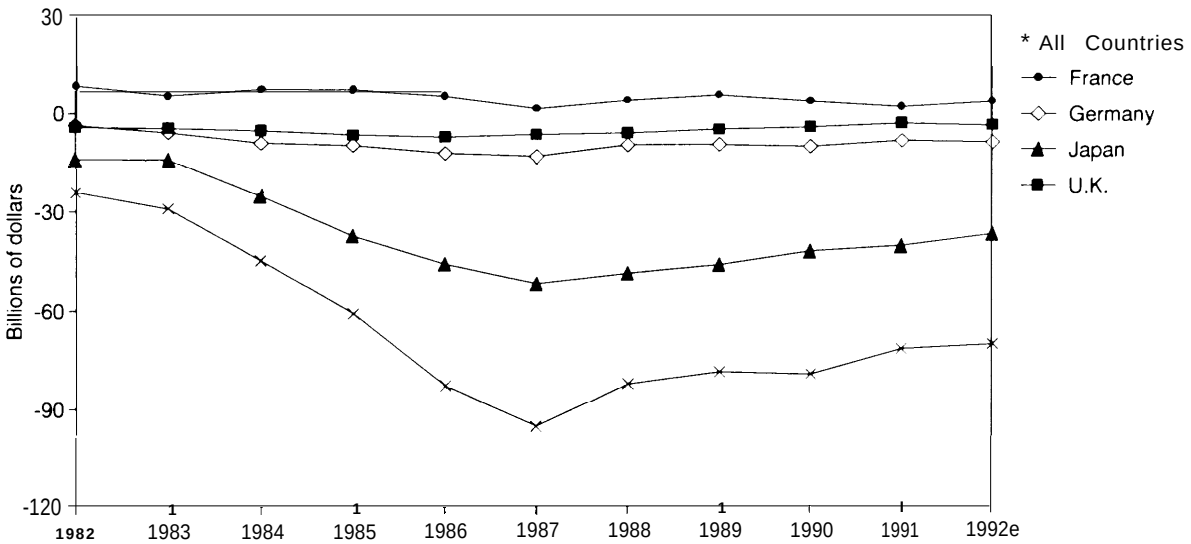
In the United States, foreign affiliates consistently have imported far more than they have exported. In 1991 their ratio of imports to exports was 1.83: 1, after having peaked at 2.98:1 in 1987.[2] Except for 1984 and 1985, in each year between 1977 and 1992 the trade deficit run by foreign affiliates has amounted to more than half of the entire U.S. merchandise trade deficit. As U.S. businesses improved their trade performance after the post- 1985 depreciation of the dollar, foreign affiliates in the United States accounted for an increasing share of the total trade deficit. In 1987, the trade deficit of all foreign affiliates in the United States was equivalent to 53 percent of the total trade deficit; that level rose steadily to peak at 120 percent in 1991. In 1992, foreign affiliates ran a trade deficit of $70.7 billion in real terms, compared to a deficit of $6.1 billion run by U.S. firms (see figure **6-1).**

This pattern does not mean that foreign affiliates in the United States are wholly responsible for the trade deficit. That deficit is affected by a broad range of factors, including exchange rates, variations in national growth and productivity rates, and different rates of domestic savings and investment. In addition, some of what foreign affiliates import is used to produce goods that might otherwise have been produced entirely abroad. Even if foreign affiliates were not present, much of what they import would be brought into the United States through other channels.

Nevertheless, the trading activity of foreign affiliates clearly represents an important component of foreign direct investment in the United States.

[2] U.S. Department of Commerce, BEA, Survey *of Current Business* (Washington, DC: October 1993), table 1, p. 54.

FIGURE 6-2: Trade Balances of Foreign Subsidiaries in the United States by Nationality of Ownership, 1982-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary.

SOURCE: BEA, SCB 73(10) 57, table 3, October 1993, BEA,*FDIUS,* table G-2 (1991 -1 992)

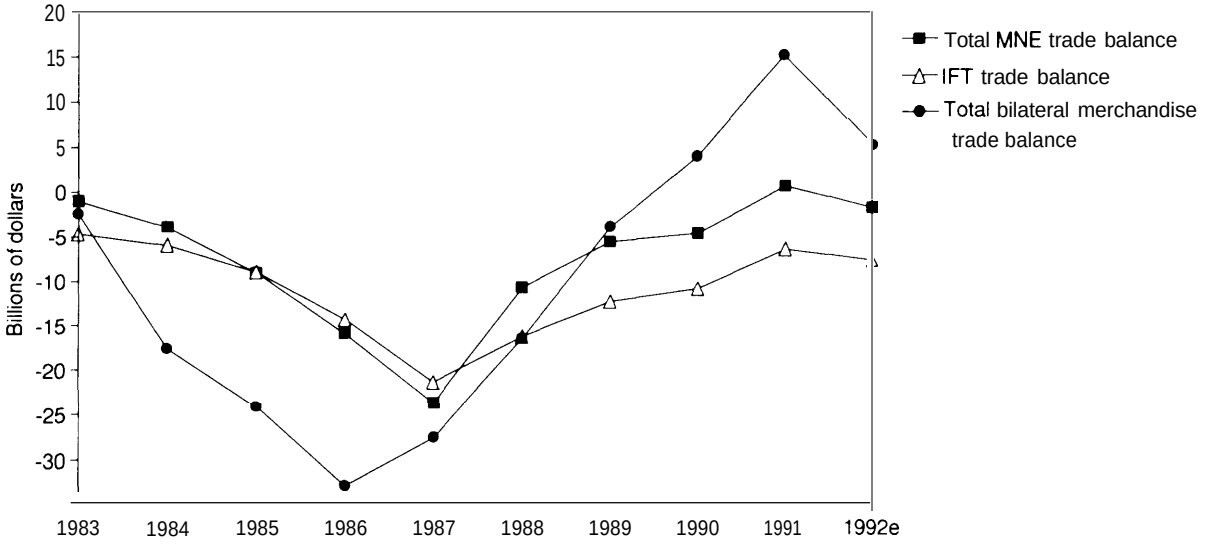
Moreover, the trading behavior of foreign affiliates varies by national origin. Japanese affiliates in the United States consistent y have run the largest trade deficit-$37.4 billion in 1992, equivalent to 49 percent of the total merchandise trade deficit that year. German and U.K. affiliates also have run deficits, although considerably smaller at $9.6 and $4.1 billion, respectively, in 1992. French affiliates tend to run small trade surpluses, amounting to $3.1 billion in 1992 (see figure **6-2).**

The following analysis demonstrates that variances in the trading tendencies of foreign affiliates, including variances in the trading relationship between affiliates and their parent firms, are closely associated with the distribution and composition of FDI. They may also be associated with the timing of FDI.

Merchandise Trade and the Distribution of FDI

The last section of chapter five described the large asymmetry in two-way investment flows between the United States and Japan, compared to investment between the United States and Europe (see figure **5-9).** The difference between these two bilateral investment relationships is reflected in merchandise trade flows. As figure **6-3** illustrates, trade balances between the United States and Europe follow the same pattern as the bilateral investment relationship, which shifted from a balanced position in the early 1980s into a U.S. deficit in the mid- 1980s, and then returned to a relative balance by the early 1990s. Figure 6-4 illustrates the progression of the U.S. trade deficit with Japan, which also reflects the bilateral investment relationship. In 1980 investment was relatively balanced at about $5 billion in each direction, but since then Japanese investment in the United States has grown to reach $96 billion by 1993-over three times that of U.S. investment in Japan. In short, the U.S. trade balance with Europe tends to mirror the balance in direct investment, while the U.S. trade deficit with Japan tends to reflect the investment deficit.

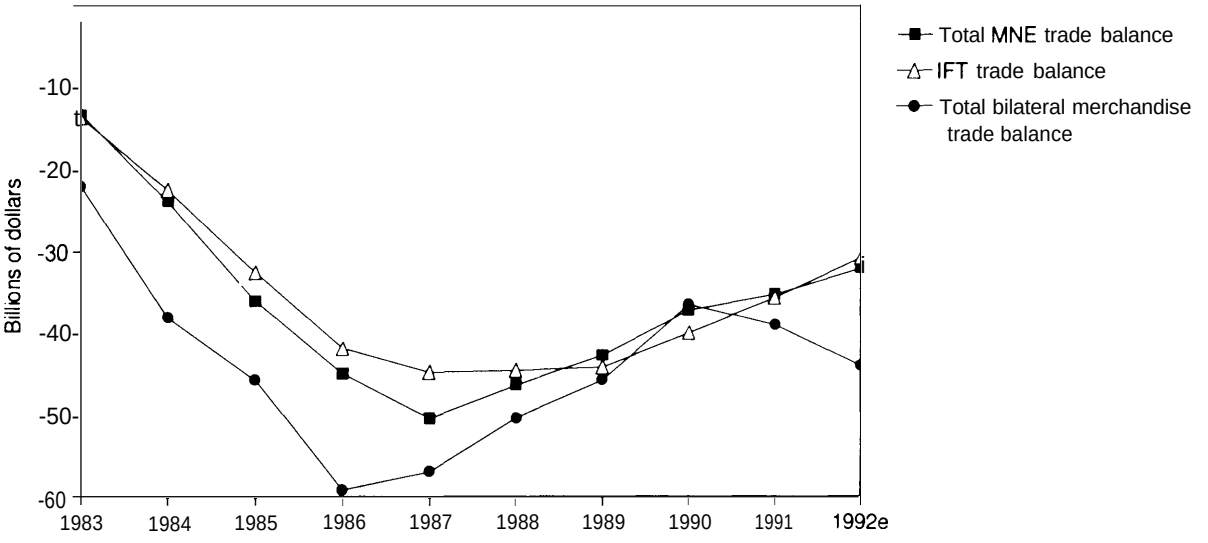
FIGURE 6-3: U.S. Merchandise Trade Balance with Europe, 1983-1992 (constant 1987 dollars)



NOTE 1992 data are preliminary

SOURCE OTA, based on data from BEA, *FDIUS*, table G-4 (1983-1986) and table G-2 (1987-1992), U S Department of Commerce, Bureau of Economic Analysis, *U S Direct Investment Abroad Operations of U S Parent Companies and their Foreign Affiliates* revised 1983-1991 estimates and preliminary 1992 estimates (Washington, DC U S Government Printing Office, 1986-1994), tables 50 (1983-1988) and III H I (1989-1992) (hereafter cited as BEA, *USDIA*); BEA SCt3 72(6) 88-90, table 2, June 1992; 73(3) 90-91, table 2, March 1993, 74(3) 68-69, table 2, March 1994

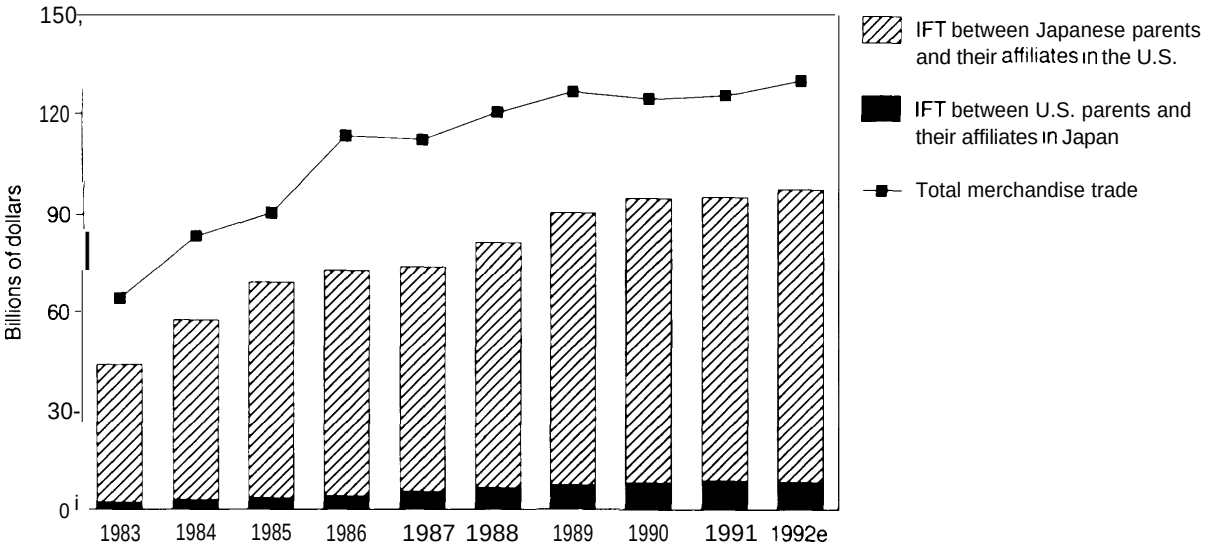
FIGURE 6-4: U.S. Merchandise Trade Balance with Japan, 1983-1992 (constant 1987 dollars)



NOTE 1992 data are preliminary

SOURCE OTA, based on data from BEA, *FDIUS*, table G-4 (1983-1986) and table G-2 (1987-1992), BEA, *USDIA*, table 50 (1983-1 988) and table III H I (1989-1992), BEA *SCB* 72(6) 88-90, table 2, June 1992, 73(3) 90-91 table 2, March 1993, 74(3) 68-69, table 2, March 1994

FIGURE 6-5: Total Merchandise and Intrafirm Trade: Japan and the United States, 1983-1992 (constant 1987 dollars)



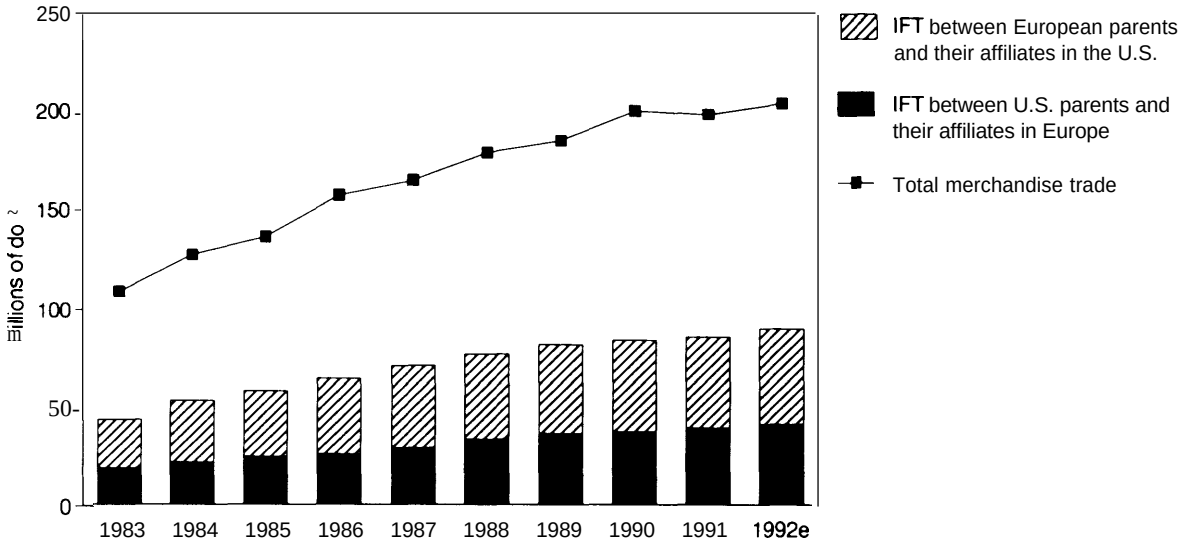
NOTE: 1992 data are preliminary.

SOURCE: OTA based on data from BEA, *FDIUS,* table G-3 (1983-1986) and table G-1 (1987-1 992) BEA, *USDIA,* table 50 (1 983-1 988) and table Ill H I (1989- 1992) BEA SCB 73(10) 54, table 1, October 1993, 73(3) 90-91, table 2, March 1993

Figures 6-3 and 6-4 also illustrate that total merchandise trade, total affiliated trade, and intrafirm trade (IFT) are much less closely related in U.S.-European trade than in U.S.-Japanese trade. Total affiliated trade measures the balance of exports and imports by both U.S.-based MNE parent groups and foreign affiliates in the United States, whether those goods are exchanged within or outside of the MNE network. IFT measures the balance of trade within MNE networks only. Consequently, figures 6-3 and 6-4 indicate that, over time, trade between the United States and Japan centers more on MNEs than is the case with trade between the United States and Europe.

Figures 6-5 and 6-6 look more closely at the relationship between MNEs and total merchandise trade by examining IFT, which represents trade flows within MNE networks. Together, the figures illustrate two important patterns. First, IFT is much more significant in U.S.-Japanese merchandise trade than in U.S.-European merchandise trade. On average between 1983 and 1992, IFT has accounted for 70 percent of all U. S.-Japanese merchandise trade, compared to 43 percent of all U.S.-European merchandise trade. Moreover, the volume of intrafirm trade between the United States and Japan is greater than that between the United States and all of Europe. In 1992, U.S.-Japan IFT totalled $97.0 billion, compared to $90.4 billion for U.S.-Europe IFT. Second, the figures illustrate that IFTbetween the United States and Japan is dominated by Japanese MNEs, while IFT between the United States and Europe is more evenly divided between MNEs based in each region. Between 1983 and 1992, Japanese MNEs on average accounted for 93 percent of all bilateral intrafirm trade with the United States, while European MNEs accounted for 58 percent of U.S.-European IFT. In terms of volume, in 1992 Japan-based MNEs accounted for $88.5 billion of a total $97.0 billion in IFT with the United States, while Europe-based MNEs accounted for $49.3 billion of a total $90.4 billion in IFT with the United States. These figures indicate

FIGURE 6-6: Total Merchandise and Intrafirm Trade: Europe and the United States, 1983-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary.

SOURCE: OTA, based on data from BEA, *FDIUS,* table G-3 (1983-1986) and table G-1 (1987-1992), BEA, *USDIA,* table 50 (1983-1988) and table III.H.I (1989-1992), BEA SCB 73(10) 54, table 1, October 1993, 73(3) 90-91, table 2, March 1993

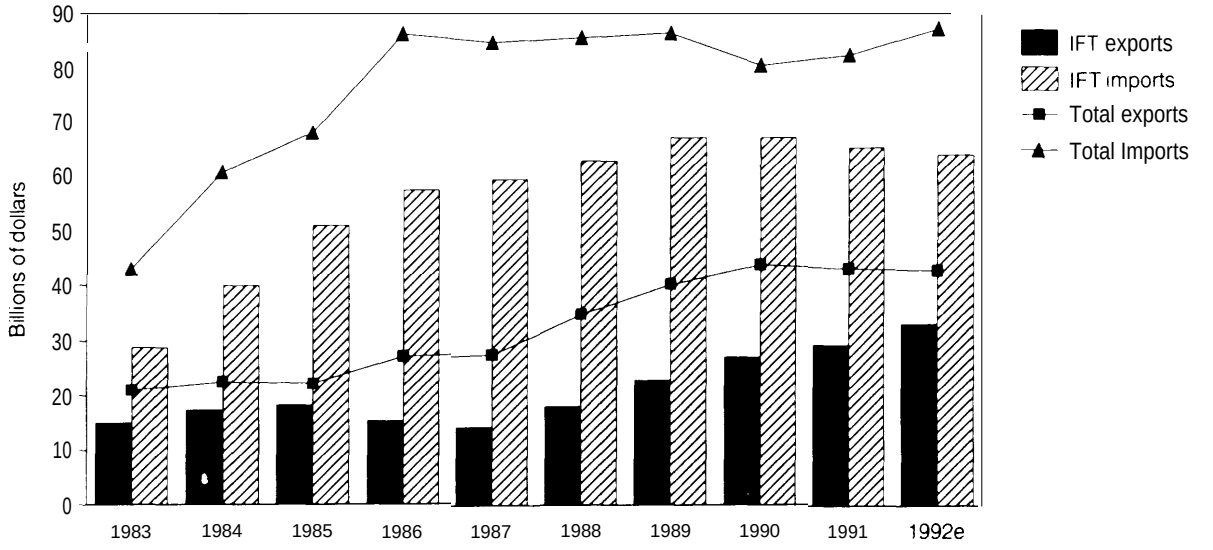
that the U.S.-Japanese trading relationship is heavily weighted toward Japanese MNEs, and that the U.S. relationship with Europe is more diversified across corporate structures and national ownership-a pattern that again reflects the distribution of FDI in each relationship.

The data considered in figures 6-3 through 6-6 illustrate a consistent correlation between bilateral investment balances and bilateral trade balances. Of course, investment flows do not determine trade flows per se. Trade is affected by a broad range of factors, including exchange rates, variations in national growth rates and productivity levels, and different rates of domestic savings and investment. Nevertheless, greater levels of FDI can promote trade through the import and export activities of foreign affiliates, including intrafirm trade. As a result, trade balances among the advanced industrial states often are associated with investment balances. To the extent that this relationship holds, the U.S. trade deficit with Japan may now be structurally linked to the U.S.-Japan imbalance in direct investment. Since intrafirm trade accounts for the majority of trade between the United States and Japan, it is unlikely that bilateral trade flows will equilibrate as long as the bilateral investment relationship remains heavily imbalance.

National Variations in Intrafirm Trade

In the U.S. trade accounts, intrafirm trade consists of all exports and imports exchanged between (1) U.S. MNE parents and their afiliates abroad, and (2) foreign MNEs parents and their affiliates in the United States. Relative to total merchandise exports and imports, IFT accounts for a huger percentage of both exports and imports in U.S.-Japan trade than in U.S.-European trade (see figures 6-7 and **6-8).** From 1983 to 1992, IFT accounted for an average of 66 percent of the merchandise exports and 73 percent of the merchandise imports in

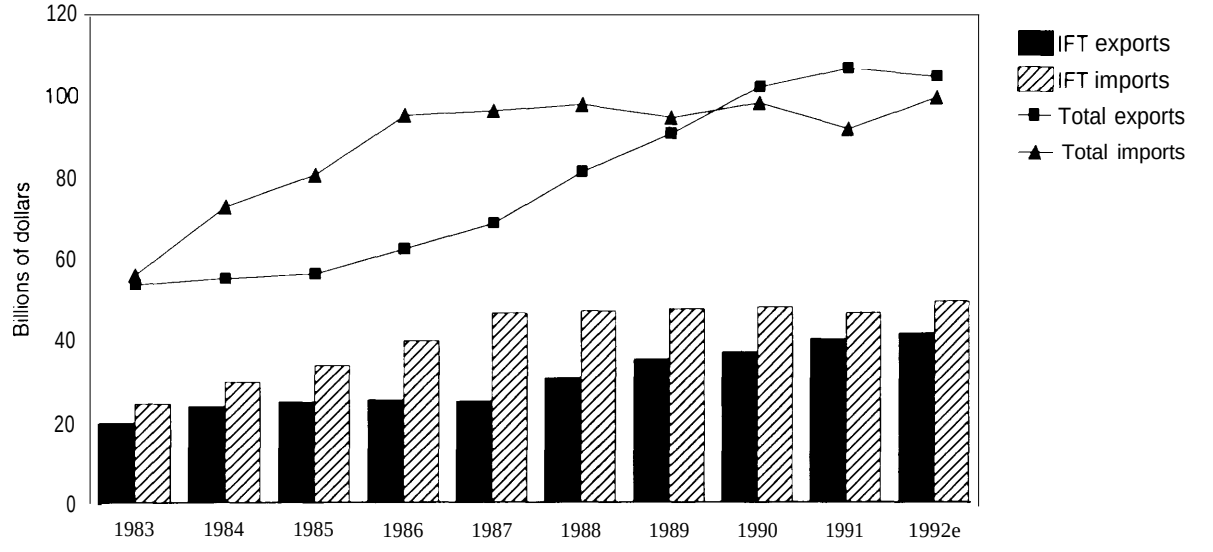
FIGURE 6-7: Total Merchandise and Intrafirm Exports and Imports: Japan and the United States, 1983-1992 (constant 1987 dollars)



NOTE 1992 data are preliminary

SOURCE OTA, based on data from BEA *FDIUS*, table G-3 (1 983-1986) and table G-1 (1987-1 992) BEA *USDIA*, table 50 (1983-1988) and table III H I (1 989-1 992) BEA *SCB* 73(10) 54, table 1 October 1993 73(3) 90-91, table 2, March 1993

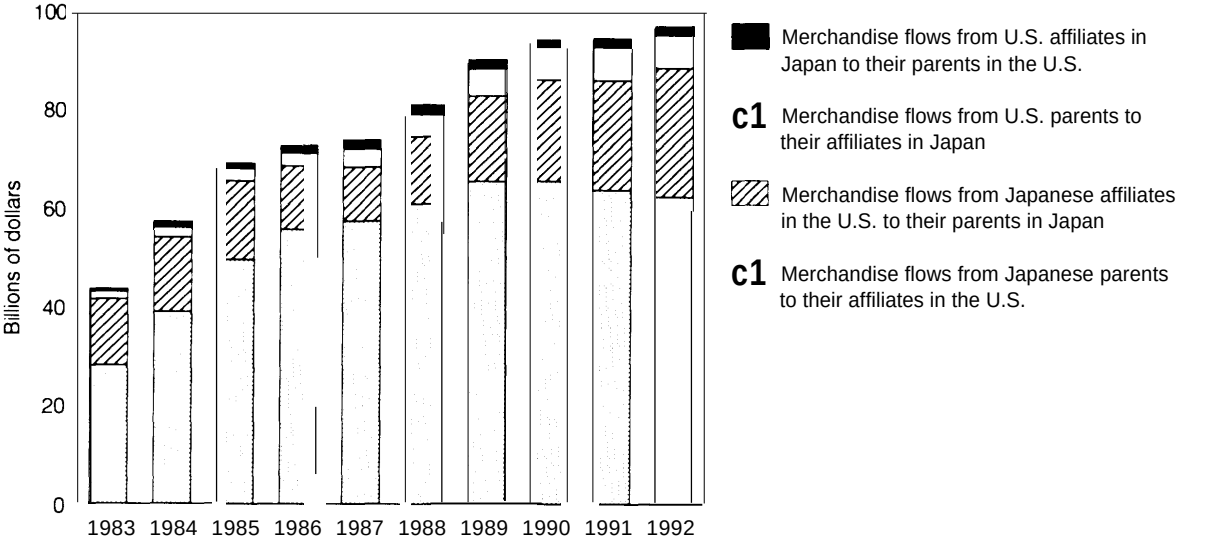
FIGURE 6-8: Total Merchandise and Intrafirm Exports and Imports: Europe and the United States, 1983-1992 (constant 1987 dollars)



NOTE 1992 data are preliminary

SOURCE OTA based on data from BEA. *FDIUS*. table G-3 (1983-1986) and table G-1 (1987-1992) BEA *USDIA* table 50 *1983-1 988)* and table III H I (1989-1992) BEA *SCB* 73(10) 54 table 1 October 1993 73(3) 90-91, table 2, March 1993

FIGURE 6-9: Volume and Direction of U.S.-Japanese Intrafirm Trade, 1983-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary.

SOURCE: OTA, based on data from BEA, *FDIUS* table G-4 (1983-1986) and table G-2 (1987-1992), BEA, USDIA, table 50 (1983-1988) and table III H 1 (1989-1 992), BEA, *SCB* 73(6) 78, table 2, June 1993

U.S.-Japanese trade, compared to 39 and 46 percent respectively in U.S.-European trade.[3]

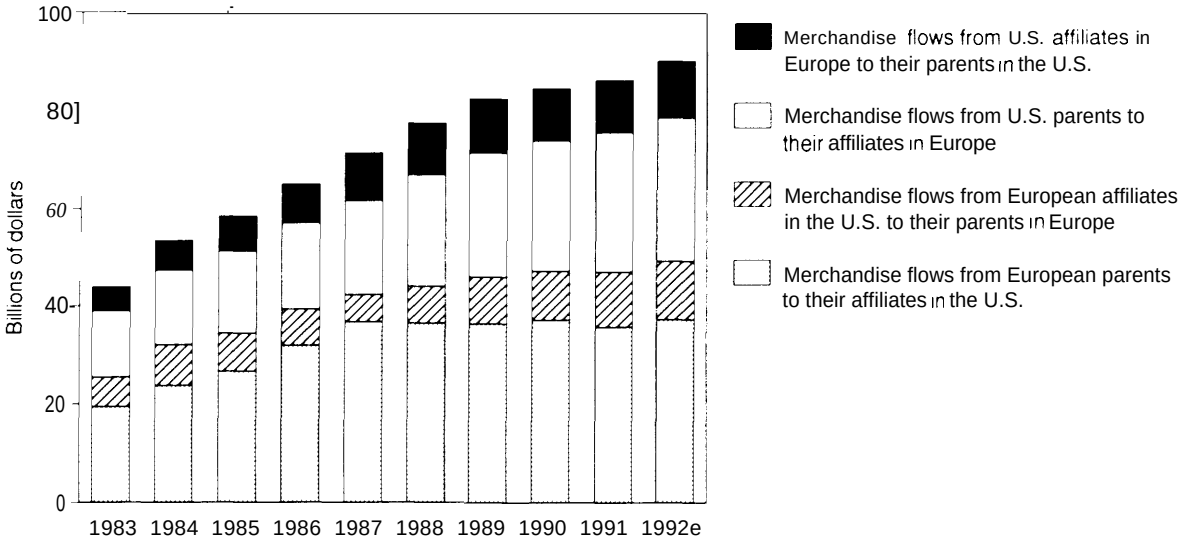
When bilateral IFT is disaggregate to show the volume and direction of trade within MNE networks, two important patterns emerge (see figures 6-9 and 6-10). First, in terms of direction, considerably more I IT flows from parents to affiliates than vice versa. This pattern holds across the advanced industrial nations, with ratios ranging from a minimum of 2.4:1 for Japanese parents and their affiliates in the United States to 3.8:1 for U.S. parents and their affiliates in Japan.[4] Second, in terms of volume, IFT imports by Japanese affiliates in the United States far outweigh both IFT imports by all European affiliates as well as IFT exports by U.S. MNEs to their affiliates in Japan. In 1992, Japanese affiliates in the United States imported $62.2 billion from their parent firms, while U.S. MNEs exported $6.8 billion to their affiliates in Japan. By comparison, European affiliates in the United States imported $41.9 billion from their parent firms, while U.S. MNEs exported $32.2 billion to their affiliates in Europe.

Variations in the volume and direction of bilateral IFT are consistent with variations in the distribution of FDI. Simply put, IFT imports by Japanese affiliates in the United States dominate bilateral IFT flows, reflecting the fact that the vol-

[3]IFT data from U.S. Department of Commerce, BEA surveys of *Foreign Direct Investment in the United States* and *U.S. Direct Investment Abroad* (Washington, DC: 1983-1991 issues, and 1992 estimates). Total merchandise trade flows from U.S. Department of Commerce, BEA, *Survey of Current Business* (Washington, DC: June 1992), table 2, p. 90; and *Survey of Current Business* (Washington, DC: June 1993), table 2, p. 78.

[4]These ratios measure [he]992 merchandise flows of parents to affiliates over those from affiliates to parents, in constant dollars. In the case of U.S. parents and their affiliates in Europe, the ratio is 2.5: I; for European parents and their affiliates in the United States, it is 3. 1: 1. Based on data in U.S. Department of Commerce, annual BEA surveys, op. cit. footnote 3.

FIGURE 6-10: Volume and Direction of U.S.-European Intrafirm Trade, 1983-1992 (constant 1987 dollars)



NOTE: 1992 data are preliminary.

SOURCE: OTA based on data from BEA*FDIUS* table G-4 (1983-1 986) and table G-2 (1987-1 992) BEA*USDIA* tables 50 (1983-1 988) and III H 1 (1989-1991) BEA SCB 73(6): 78 table 2 June 1993

ume of Japanese direct investment in the United States far exceeds U.S. direct investment in Japan. Likewise, the similarity in IFT flows between the United States and Europe reflects the relative balance of FDI between the two regions.

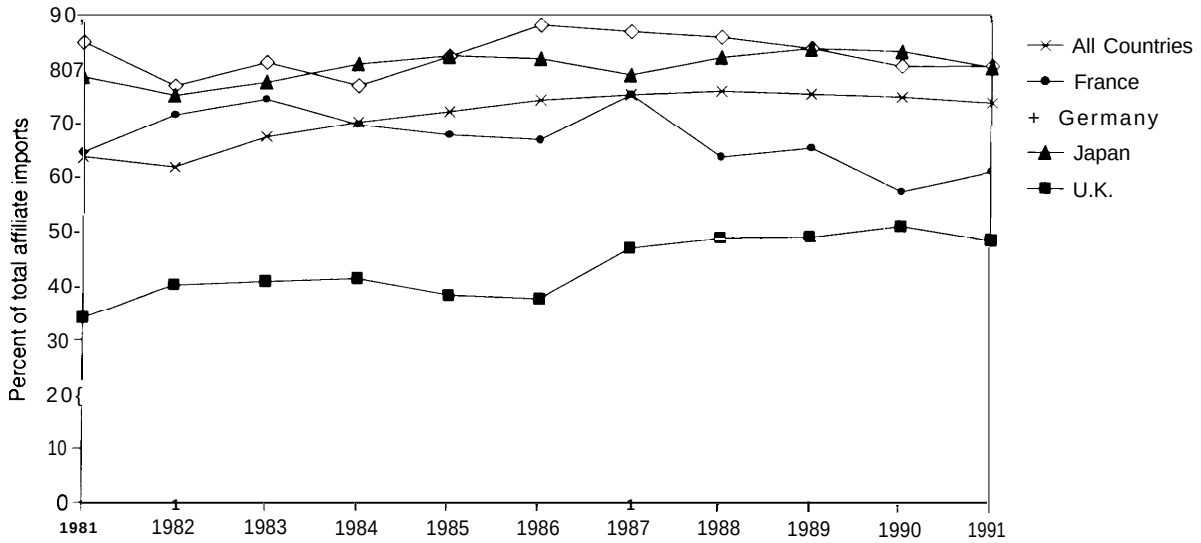
In addition, variations in the proportion of IFT to total trade may indicate that Japanese affiliates in the United States have a stronger propensity to trade through IFT channels than their European counterparts. As figure **6-11** demonstrates, German and Japanese affiliates have a stronger than average tendency to import from their parent groups, their respective IFT imports averaging 82.6 and 80.5 percent of total imports from 1981 to 1991. French and U.K. affiliates import noticeably less from their parent groups, averaging 67.1 and 43.2 percent respectively over the same time period.

Since IFT trade flows primarily from parents to affiliates, one would expect affiliates' I IT propensity to be weaker for exports than for imports. Figure 6-12 indicates that this is indeed the case. From 1981 to 1991, the average IFT export propensity for all foreign affiliates in the United States was 42 percent, comparedto71 percent for imports. The figure also shows a slightly different cross-national pattern. As with import propensity, France and the U.K. have the lowest export propensity; however, unlike import propensity, Germany's export propensity also has been below average for most of the decade, while Japan remains above average throughout, at61 percent for the entire period.

Together, figures 6-11 and 6-12 indicate that Japanese affiliates consistently have demonstrated a strong tendency to trade within MNE networks.[5] German affiliates have had a higher propensity to import than to export within MNE

[5] OECD data also indicates that U.S.-based affiliates of Japanese MNEs use FDIUS as a conduit for trade to a greater degree than do U.S. firms in all foreign markets. See OECD, Directorate for Science, Technology and Industry, *Globalisation of Industrial Activities: Background Synthesis Report* (Paris, France: OECD, prepublication draft dated Nov. 26, 1993), p.16.

FIGURE 6-11: Intrafirm Imports as a Percentage of Total Imports by Foreign Affiliates in the United States 1981-1991



SOURCE: BEA, *SCB* 73(10) 57, table 3, October 1993

networks, while French and British affiliates consistently have had a lower than average propensity. The figures also show that IFT imports have increased as a percentage of all trade by affiliates, from 63.5 percent in 1981 to 74.1 percent in 1991. By contrast, IFT exports have fluctuated slightly but increased little over the decade, from 42.0 percent of all trade in 1981 to 42.3 percent in 1991.

Some analyses suggest that the gradual rise in IFT imports is due mostly to the increased wholesale trading activity of Japanese and Korean affiliates in the United States, primarily in the automotive sector.[6] Accordingly, variations in IFT observed above may be due not only to the differences in the bilateral volume of FDI but also to the sectoral composition of foreign direct investment in the United States (FDIUS). Other analysts maintain that the trading behavior of foreign affiliates changes over time, as they become more deeply integrated with the local economy. These different explanations of the relationship between trade, IFT, and investment are analyzed in the following section.

Explaining National Variations in Intrafirm Trade

The data presented in figures 6-7 through 6-12 portray three principal variations in IFT. First, IFT accounts for a larger percentage of both exports and imports in U.S.-Japan trade than in U.S.-European trade. Second, IFT between the United States and Japan is skewed toward imports by the U.S. affiliates of Japanese firms, while IFW between the United States and Europe is more symmetrical. Moreover, because IFT is a large percentage of U.S.-Japan trade, the volume of IFT imports by Japanese affiliates in the United States far outweighs that by European affiliates-$62.2 billion and $41.9 billion, respectively, in 1992.

[6] Ibid.

FIGURE 6-12: Intrafirm Exports as a Percentage of Total Exports by Foreign Affiliates in the United States 1981-1991

SOURCE: BEA, SCB 73(10) 57, table 3, October 1993

Third, Japanese affiliates tend to import and export within MNE networks, while German affiliates have a strong IFT import propensity only and both French and U.K. affiliates have a weaker tendency in both directions.

As suggested above, variations in the volume and direction of bilateral IFT conform to variations in the distribution of FDI. The similarity in IFT between the United States and Europe reflects a relatively equal distribution of FDI, while the asymmetry in IFT between the United States and Japan reflects an unequal distribution of FDI. However, variations in the propensity of foreign affiliates to import-and in particular to use IFT channels-could be explained by two additional factors: the sectoral composition of FDI, and the relative age of FDI.

Variations in the Sectoral Composition of FDI

One of the principal determinants of the trading behavior of foreign affiliates is the sector in which they are located. The wholesale trade sector is most closely associated with total trade as well as IFT, because many wholesaling operations function primarily as distribution channels for components or finished products imported from their parent companies. Since 1985, wholesaling affiliates in the United States have imported twice as much as they have exported. In 1991, the ratio of imports to exports for wholesale trade affiliates in the United States was 2.2: 1, compared to 1.2: 1 for affiliates in the manufacturing sector and 1.8:1 for all industries.' In 1991, foreign wholesaling affiliates in the United States ran a trade deficitof$51

[7]U.S. Department of Commerce, BEA, op. cit. footnote 2, table 2 p.54. The foreign wholesale trade affiliates of U.S. companies follow the same pattern; over the past decade they have imported more than triple the value of their exports.

billion, compared to $7.3 billion for manufacturing affiliates (the total trade deficit for all afiliates that year was $72.2 billion). Over the last decade, wholesaling operations accounted for over 70 percent of the total trade deficit run by all foreign affiliates in the United States.[8]

IFT comprises the majority of imports by wholesale trade affiliates. In each year from 1985 to 1991, approximately 80 percent of all imports by wholesale trade affiliates came from their foreign parent groups.[9] Moreover, like most wholesalers, wholesale trade affiliates simply resell the goods they import. According to the most recent benchmark survey by the Bureau of Economic Analysis (BEA), more than 90 percent of the imports by wholesale trade affiliates were goods that required no additional processing, assembly, or manufacturing.[10]

These characteristics of wholesale trade affiliates, combined with the sectoral composition of FDI, partly explain the unusually prominent role of IFT imports by Japanese affiliates in the U. S.-Japan trading relationship (see figure **6-5).** Japanese FDIUS is more concentrated in wholesale trade than is either European FDIUS or U.S. direct investment in either Japan or Europe (as seen in figures 5-10 to 5-15 in chapter 5). Consequently, U.S.-Japanese trade bears the hallmark of wholesale trade affiliates-a high import propensity, most of which flows from parent firms in Japan to their affiliates in the United States.[11] Through the mid-1980s, wholesale trade affiliates accounted for over 95 percent of all imports and exports by Japanese affiliates in the United States. Although the proportion declined somewhat since then, by 1991 they still accounted for 84 percent of all trade by Japanese affiliates in the United States. In 1991, Japanese wholesale trade affiliates alone accounted for 42 percent ($67.7 billion) of the imports and 35 percent ($31.8 billion) of the exports of all foreign affiliates in the United States.

Wholesale trade affiliates account for far less of all trade by European afiliates in the United States, as is consistent with the more balanced composition of European FDIUS. In most cases, wholesale trade affiliates account for less than one-third of all exports and imports by European affiliates in the United States. One notable exception is imports by German affiliates, 57 percent of which were imported by wholesale trade affiliates, mostly in automobiles.[13]

Compared to the wholesale trade sector, foreign affiliates in U.S. manufacturing industries have a much lower import propensity and consequently have accounted for less than one-eighth of the total trade deficit of foreign affiliates in the United States. '4 However, their share of the total affiliated trade deficit has grown rapidly since the mid-1980s, partly reflecting the rapid growth of foreign investment in manufacturing during that period. Between 1985 and 1990, the sales of for-

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[8] Ibid. See figure *6-1* for the total merchandise trade deficit of foreign affiliates in the United States since 1982.

[9] Ibid., p. 54.

[10] Ibid. The BEA's last benchmark survey covers data for 1987. The forthcoming 1992 benchmark survey is scheduled to be released after this report has gone to press.

[11] For a statistical analysis of this relationship, see H. Yamawaki, "Exports and Foreign Distributional Activities: Evidence on Japanese Firms in the United States," *Review of Economics and Statistics* 73(2):294-300, May 1991.

[12] U.S. Department of Commerce, BEA, op. cit., footnote 3, p. 56 and table 4, p. 58. Among Japanese affiliates in the United States in 1991, wholesale trade affiliates imported $67.7 billion of a total $80.6 billion, and exported $31.8 billion of a total $37.6 billion (in constant 1987 dollars).

[13] Ibid., p. 58. There is one other exception to the generally moderate proportion of wholesale trade to total trade among European affiliates: 50 percent of the exports by French affiliates were shipped by wholesale trade affiliates in 1991; most were in in farm-product raw materials.

[14] ibid., p. 56.

TABLE 6-1: Foreign Content of Intermediate Goods Purchased by Foreign Affiliates in the United States, by Sector and Country, 1990 and 1991

	All countries		France		Germany		Japan		United Kingdom	
	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991
All Industries	194	196	12.1	107	21,6	199	30.2	317	9.6	9.2
All manufacturing	16.7	173	17.3	16.2	21.4	20.9	284	280	9.4	100
Chemicals and allied products	12.1	13.2	96	95	184	18.5	5.1	7,2	11.6	13.2
Primary and fabricated metals	140	14,1	73	69	200	214	6 6	5.9	7.2	73
Non-electrical machinery	310	304	n/a	20.3	25.9	255	485	453	129	9.5
Electric and electronic equipment	307	286	n/a	375	43,7	39,2	41 4	381	113	143
Motor vehicles and equipment	404	45.1	n/a	n/a	n/a	n/a	49.3	528	n/a	n/a
Wholesale trade	323	339	11,6	121	399	396	346	383	153	122

NOTES: Data for 1991 is preliminary n/a denotes unavailable data, suppressed to avoid disclosure of individual companies data.

SOURCE: Adapted from U S Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business* 73(10): 64, table 10, October 1993

eign manufacturing affiliates in the United States grew 78 percent (from $197 to $350 billion in constant 1987 dollars), while the sales of wholesale trade affiliates grew 24 percent (from $266 billion to $331 billion). [15]

Part of the reason manufacturing affiliates often run trade deficits is that they import intermediate goods used for production in the United States. [16] As shown in table 6-1, the foreign content of all intermediate goods purchased by manufacturing foreign affiliates in the United States averaged 17.3 percent in 1991. The foreign content among manufacturing affiliates varies significantly by sector, ranging from 13.2 percent in chemicals to 45.1 percent in autos.] [7] However, table 6-1 also shows considerable variation by country. For all foreign manufacturing affiliates in the United States, Japanese affiliates have the highest foreign content at 28.0 percent in 1991; German affiliates have the second highest foreign content at 20.9 percent, while French and British affiliates have considerably lower foreign shares at 16.2 and 10.0 respectively. Across sectors, Japanese affiliates have the highest foreign content in the non-electrical machinery and motor vehicles and equipment sectors, while German affiliates have the highest foreign shares in chemicals, electric and electronic equipment, and primary and fabricated metals. The substantial variations in foreign content across sectors indicate that Japanese affiliates in the United States rely more on foreign suppliers than do European affiliates. French and British affiliates import a relatively low percentage of intermediate goods, while Ger-

15 Ibid.

16 Another reason for trade deficits among manufacturing affiliates is that many of them also have wholesale trade operations. Since the BEA collects data on an enterprise basis, the entire trade account of individual affiliates is recorded under their primary business activity. Many affiliates that are primarily manufacturing operations also conduct secondary wholesale trade activities.

17 Table 6.1 shows only selected manufacturing industries. In general, foreign content is highest in industries that purchase a lot of manufactured intermediate goods, such as the machinery and transportation equipment industries. Foreign content is generally the lowest in industries that use raw materials subject to high transportation costs, such as beverages, primary ferrous metals, and stone, clay, and glass products. U.S. Department of Commerce, BEA, op. cit., footnote 2, pp. 64-65.

TABLE 6-2: Sectoral Variances in Intrafirm Trade

Industries	Intrafirm trade as percent of total industry trade
Science-based	
Pharmaceuticals	70
Computers	50-80
Semiconductors	70
Scale-intensive, high product differentiation	
Motor vehicles	50-80
Consumer electronics	30-50
Resource and labor-intensive	
Nonferrous metals	30
Steel	5-1o
Clothing	5-10

SOURCE Adapted from Organisation for Economic Co-operation and Development, Directorate for Science, Technology, and Industry, Glob-*alization of Industrial Activities Background Synthesis Report* (Paris OECD, 1993), p 66, table 21

man affiliates import substantial percentages of intermediate goods across several manufacturing sectors.

The higher reliance of Japanese manufacturing affiliates in the United States on imported intermediate goods helps to explain their high ratio of imports to exports. In 1991, the average ratio for all foreign manufacturing affiliates was 1 .22:1, while the ratio for Japanese manufacturing affiliates was 2.29: 1, indicating that they imported more than twice as much as they exported. By comparison, German manufacturing affiliates imported only slightly more than they exported, while French and British manufacturing affiliates actually ran trade surpluses. [18]

Moreover, a large portion of the imported intermediate goods shown in table 6-1 represents IFT. Across countries, IFT is most common in both science-based industries and scale-intensive industries that have highly differentiated products (table 6-2). Science-based industries, such as pharmaceuticals, computers, and semiconductors, are characterized by high R&D costs, low transport costs, and relatively high profit margins. Consequently, foreign affiliates have a strong incentive to import intermediate goods from their parent firm. Scale-intensive industries with highly differentiated products, such as motor vehicles and consumer electronics, typically produce complex consumer goods that use large quantities of manufactured parts, components, and subassemblies. In these industries, firms frequently source components from within their MNE networks. By contrast, IFT is usually quite low in resource and labor-intensive industries, such as nonferrous metals, steel, and textiles. These sectors are characterized by high transportation costs and lower levels of manufactured intermediate goods. Consequently, IFT tends to be quite low.[19] In essence, the more technologically sophisticated the sector and the individual product, and the higher the value added, the more likely intermediate goods will be produced in the MNE's home country and then shipped to foreign affiliates for final assembly.

Together, the concentration of Japanese FDIUS in wholesale trade, plus the high foreign content of intermediate inputs used by Japanese manufacturing affiliates—particularly in high-technology and complex, scale-intensive industries[20]—help to explain why IFT is much more prominent in U.S.-Japan trade than in U.S.-European trade. Available evidence from Japan's Ministry of International Trade and Industry (MITI) indicates

[18] Ibid., table 4, p. 58.

[19] Organization for Economic Co-operation and Development (OECD), Directorate for Science, Technology, and Industry, *Globalisation of Industrial Activities: Background Synthesis Report* (Paris, France: OECD, 1993), pp. 7,28.

[20] Several studies suggest that Japanese firms focus their U.S. manufacturing investments in R&D-intensive industries. See B. Kogut and S. J. Chang, "Technological Capabilities and Japanese Foreign Direct Investment in the United States," *The Review of Economies and Statistics* 73(3):408, Aug. 1991; and T. Drake and R. Caves, "Changing Determinants of Japan's Foreign Direct Investment in the United States," Discussion Paper 1483 (Cambridge, MA: Harvard Institute of Economic Research, May 1990).

TABLE 6-3: Value of Exports and Share of Intrafirm Trade of Japanese MNE Parent Companies by Sector, 1988 and 1991 (in billions of nominal yen and percent)

	1988		1991	
Industry	Exports	*IFT* as a percent of exports	Exports	IFT as a percent of exports
All Industries	46,6942	355	52,586.3	275
All manufacturing	28,907.8	42.0	32,7826	402
Chemicals	1,454.6	27,7	1,512,2	187
Nonferrous metals	328.1	230	2592	210
Machinery	2,307.5	31,5	1,528.5	34.7
Electric machinery	9,550.9	46,0	10,705,7	455
Transport equipment	9,5652	48.4	13,0789	41 3
Commerce	17,099.5	25,6	18,772,5	6 4

NOTES: Commerce Includes wholesale and retail trade to distributors and dealers.

SOURCE: Ministry of International Trade and Industry, Industrial Policy Bureau, International Business Affairs Division Kaigai Toshi *Tokei Soran: Dai 3-kai Kaigai Jigyo Katsudo Kihon Chosa* (Tokyo MITI, 1989), tables 1-19,20,23, and 24 and *Kaigai Toshi Tokei Soran: Dai 4-kal Kaigai Jigyo Katsudo Kihon Chosa* (Tokyo: MITI, 1991), tables 1-22,23, 25, 26, and 27

that Japan's 117 pattern with the United States is consistent with Japan's worldwide trade (see table 6-3), although it appears to play a larger role in Japan's trade with North America than in Japan's trade with Europe (see tables 6-4 and 6-5).[2]

In short, national differences in both the tendency to trade within MNE networks and the overall import propensity of foreign affiliates are related to differences in the sectoral composition of FDI. Where FDI is concentrated in wholesale trade, and where manufacturing FDI is concentrated in R&D and complex, scale-intensive industries, both the IFT propensity and the total import propensity of foreign affiliates is likely to be high. Japanese affiliates in the United States are more concentrated in sectors characterized by high IFT than are European affiliates, which helps to explain the greater significance of IFT in U. S.-Japan trade than in U.S.-European trade.

However, other important variations cannot be explained by the composition of FDI. In particular, the substantial variations in foreign content seen in table 6-1 indicate that Japanese affiliates in the United States rely much more heavily on foreign suppliers than do most European affiliates in the same industry. Some analysts argue that this difference is consistent with the relative age of FDI. The more recent the FDI, they argue, the less likely that firms will be deeply integrated in local economies and, consequently, they will be more likely to source from the home market (and often from the parent firm).

[2] MITI data presented in tables 6-8 through 6-10 cannot be precisely compared to U.S. data presented in table 6- I (or U.S. sectoral data elsewhere), since each country uses a different industrial classification system.

TABLE 6-4: Value of Exports and Share of Intrafirm Trade of Japanese MNE Parent Companies to North America by Sector, 1986 and 1989 (in billions of nominal yen and percent)

	1986		1989	
Industry	Exports	IFT as a percent of exports	Exports	IFT as a percent of exports
All industries	17,626,6	21.2	17,026.4	52.2
All manufacturing	10,374,0	25.6	9,1900	63,4
Chemicals	83.3	3.8	223.9	48,8
Nonferrous metals	41.9	2.0	90.7	29.2
Machinery	452.4	18.6	443,2	67,2
Electric machinery	2,811,7	25.7	3,126.9	65.5
Transport equipment	5,971.6	32.7	4,020,9	64.6
Commerce	7,396,6	162	7,509,3	34,6

NOTES: Commerce includes wholesale and retail trade to distributors and dealers.

SOURCE: Ministry of International Trade and Industry, Industrial Policy Bureau, International Business Affairs Division, *Kagai Toshi Tokei Soran: Dai* 3-kai *Kaigai Jigyo Katsudo Kihon Chosa* (Tokyo: MITI, 1989), tables 1-19,20,23, and 24, and Kaigai Toshi Tokei *Soran: Dai 4-kai Kaigai Jigyo Katsudo Kihon Chosa*(Tokyo: MITI, 1991), tables 1-22, 23, 25, 26, and 27

The FDI Life Cycle Theory

In theory, the FDI life cycle is quite straightforward.[22] When MNEs establish affiliates in a foreign country, the new firms tend to import intermediate goods, since they have more developed business relations, established standards and certification procedures, and secure sources in the home market. Foreign affiliates can be expected to increase their local sourcing over time, as they become more deeply integrated into the local economy and consequently can realize the efficiencies of local sourcing. By this explanation, Japanese affiliates in the United States have different sourcing patterns than their European counterparts because Japanese investment in the United States is relatively new. Over time, the theory predicts, the volume of Japanese intrafirm trade will decrease and local content will increase as Japanese affiliates become more deeply embedded in the U.S. economy.

In practice, however, it is difficult to observe the FDI life cycle. There is no standard expectation regarding the amount of time that firms need to operate in local markets before it is reasonable to expect high degrees of local content. In addition, data limitations make it very difficult to measure local content, particularly in industries that produce products with large numbers of complex manufactured parts and components. Furthermore, it can become unwieldy to define local con-

22 One of the earliest formulations of the FDI]ife cycle theory was put forth by John Dunning as the "eclectic theory" of FDI; see J. H. Dunning, "Trade, Location of Economic Activity and MNE: A Search for an Eclectic Approach," in B. Ohlin, P. Hesselborn and P. Wilkman (eds.), *The International Allocation of Economic Activity* (London, UK: Macmillan, 1977), pp. 395-418. *See* also J. H. Dunning, Japanese Participation in British *Industry* (London, UK; Dover, NH: Croom Helm, 1986); J. H. Dunning, *Multinational Enterprises and the Global Economy* (Reading, MA: Addison-Wesley, 1993); and J. Hennert, *A Theory of Multinational Enterprise* (Ann Arbor, MI: University of Michigan Press, 1985).

TABLE 6-5: Value of Exports and Share of Intrafirm Trade of Japanese MNE Parent Companies to Europe by Sector, 1986 and 1989 (in billions of nominal yen and percent)

	1986		1989	
Industry	Exports	IFT as a percent of exports	Exports	IFT as a percent of exports
All industries	9,7126	360	12,0802	305
All manufacturing	5,618.2	434	5,4030	431
Chemicals	1280	140	2279	27.1
Nonferrous metals	487	124	374	201
Machinery	409.7	443	3573	478
Electric machinery	1,8852	506	2,1188	598
Transport equipment	1,6099	337	1,6916	232
Commerce	3,7482	24.4	7,0056	202

NOTES: The sources definition for commerce Includes wholesale and retail trade to distributors and dealers

SOURCE: Ministry of International Trade and Industry Industrial Policy Bureau International Business Affairs Division Kaigai Toshi Tokei *Soran: Dai 3-kai Kaigai Jigyo Katsudo Kihon Chosa* (Tokyo MITI, 1989) tables 1-19 20 23, and 24 and Kaigai Toshi *Tokei Soran: Dai 4-kai Kaigai Jigyo Katsudo Kihon Chosa* (Tokyo: MITI, 1991), tables 1-22 23 25 26 and 27

tent in industries that include a large number of foreign affiliates that produce intermediate goods locally.

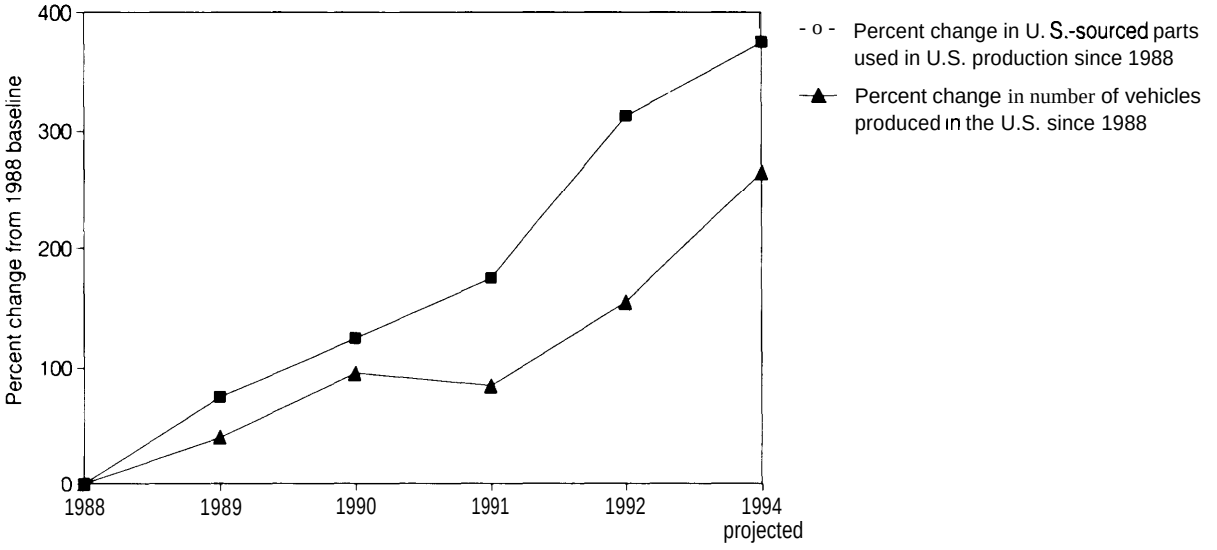
The difficulties of measuring local content can be seen in the U.S. automotive sector, which has attracted a great deal of Japanese investment since the mid- 1980s.23 As these affiliates have increased U.S. production capacity, they have also increased the volume of purchases from domestic parts suppliers. Data provided by the Toyota Motor Corporation, for example, indicate that Toyota will have increased its U.S. sourcing for local production from $800 million in 1988 to a projected $3.8 billion in 1994, as its U.S. production will have grown from 164,500 to 600,000 vehicles (see figure 6-13). These figures indicate that Toyota's U.S. sourcing has increased at a somewhat faster rate than its U.S. production, as would be expected by the life-cycle theory of FDI. According to Toyota, the local content rate for its U.S. production currently ranges from a high of 75 percent for the Camry to a low of 60 percent for the Hilux truck, based on EPA CAFE measurement standards .24

Some analysts note that Toyota's local content rates are relatively high given the difficulties new firms face in establishing local sources for parts and components. Switching from traditional to new suppliers can be costly and time-consuming. It requires new standards and certification procedures, creates uncertainties regarding the reliability and quality of supplies, often introduces new price differentials, and can damage existing relations with traditional suppliers. Over time these challenges may be overcome, but when affiliates

23 At present, the three largest foreign affiliates producing automobiles in the United States are Honda, Nissan, and Toyota. Mazda, Mitsubishi, and Subaru-Isuzu also have assembly facilities in the United States. BMW and Daimler-Benz are currently establishing U.S. plants, and should begin production in the near future.

24 Toyota Motor Corporation, press release, June 14, 1994, p.13.

FIGURE 6-13: Percent Change in Toyota's U.S. Sourcing and U.S. Production Since 1988



NOTE: Data points show total percentage change from a 1988 baseline of $08 billion in U.S.-sourced parts and 164,500 vehicles produced in the United Slates For 1994, Toyota projects $38 billion in U.S.-sourced parts and 600,000 vehicles, representing a 350 and 265 percent Increase, respectively since 1988

SOURCE: OTA, based on data in Toyota Motor Corp., "This is Toyota U S A 1993, " Corporate Brochure, 1993

are relatively new the disadvantages of local sourcing tend to outweigh the advantages, such as reduced foreign exchange risk, lower transportation costs, and greater operational flexibility.

Other analysts note that the significance of particular local content levels partly depends on the reference point. For instance, Toyota's domestic content is higher than average for all foreign affiliates in the U.S. automotive sector (55 percent in 1991), but it is lower than the average for all manufacturing affiliates (83 percent in 1991).

More importantly, local content estimates vary greatly, mostly due to difficulties in determining the national origin of complex components—many of which contain parts made in different countries. For instance, while Toyota and Honda claim domestic content levels of approximately 70 percent, the BEA estimates that Japanese affiliates in the automotive sector on average purchase about 50 percent of their inputs from domestic suppliers.[25] Although the apparent discrepancy in these figures could be due to very low local content levels by other Japanese affiliates, conflicting firm-level estimates suggest that part of the problem is due to different measurement techniques. For instance, a U.S. Customs Service audit of the Honda Corporation in 1990 concluded that its domestic content was considerably less than the company claimed.[26]

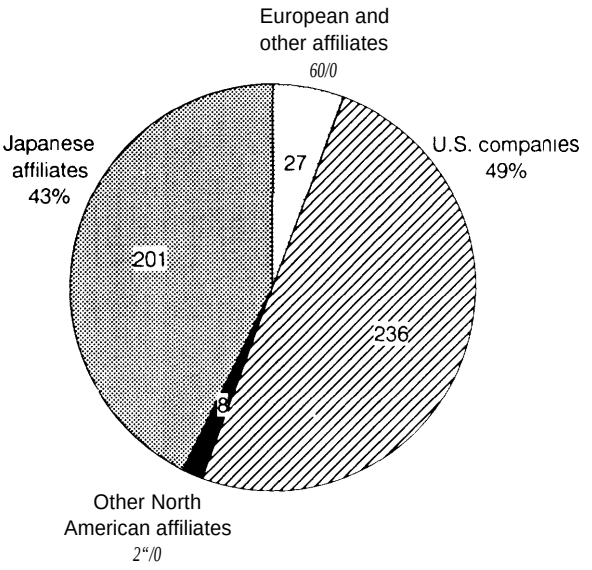
[25] In 1990, the local content for all Japanese automotive affiliates was 50.7 percent, in 1991 it was 47.2 percent. See Table 6-1.

[26] Local content estimates frequently diverge due to different techniques for classifying complex components that include both domestic and foreign value-added. Different depreciation allowances can also affect the results. For a discussion of the different estimates of Honda's local content, see U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest: Playing by Different Rules,* OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993), pp. 96-97. The enterprise-level data needed to completely assess tbe local content rates of individual firms is not publically available due to disclosure restrictions.

A further complicating factor is that 43 percent of all U.S. suppliers to the three major Japanese automobile transplant assemblers—Toyota, Honda, and Nissan—are themselves affiliates of Japanese-based MNEs (figure **6-14),** Moreover, 53 percent of those suppliers have an equity link with one or more of these three Japanese transplant assemblers in the United States.[27] In light of these facts, some analysts have noted that the Japanese transplant assemblers may be purchasing a large percent of their local parts and components from affiliates of Japanese supplier firms, often ones within the same keiretsu.[28] Indeed, the timing of direct investments in the United States by Japanese automotive suppliers suggests that there are close links between the transplant assemblers and their traditional supplier base. As figure 6-15 shows, most of the Japanese-affiliated suppliers in the United States were established between 1986 and 1992, in the wake of major investments by the three largest Japanese automotive assemblers—Honda began production in Ohio in 1982; Nissan began truck production in 1983 and automobile production in 1985 in Tennessee; and Toyota began automobile production in 1988 in Kentucky (after having established the NUMMI joint venture with GM).

In the context of these interfirm linkages, domestic content becomes increasingly difficult to measure and interpret. From one point of view, it is preferable that Japanese transplant assemblers source from firms located in the United States—regardless of national origin—rather than importing those goods. From another perspective, keiretsu relations are widely regarded as restrictive in Japan; if transferred to the United States or Europe, there is concern that they might convey unfair competitive advantages to Japanese automotive assemblers and suppliers.[29] Although the former point is certainly true, there is also evidence to support the latter. Several managers in the U.S. and European automotive industries told OTA that the primary sourcing decisions of Ja-

FIGURE 6-14: Suppliers to Japanese Automobile Transplants, by National Affiliation



NOTE: Number of firms given in chart, total number -472

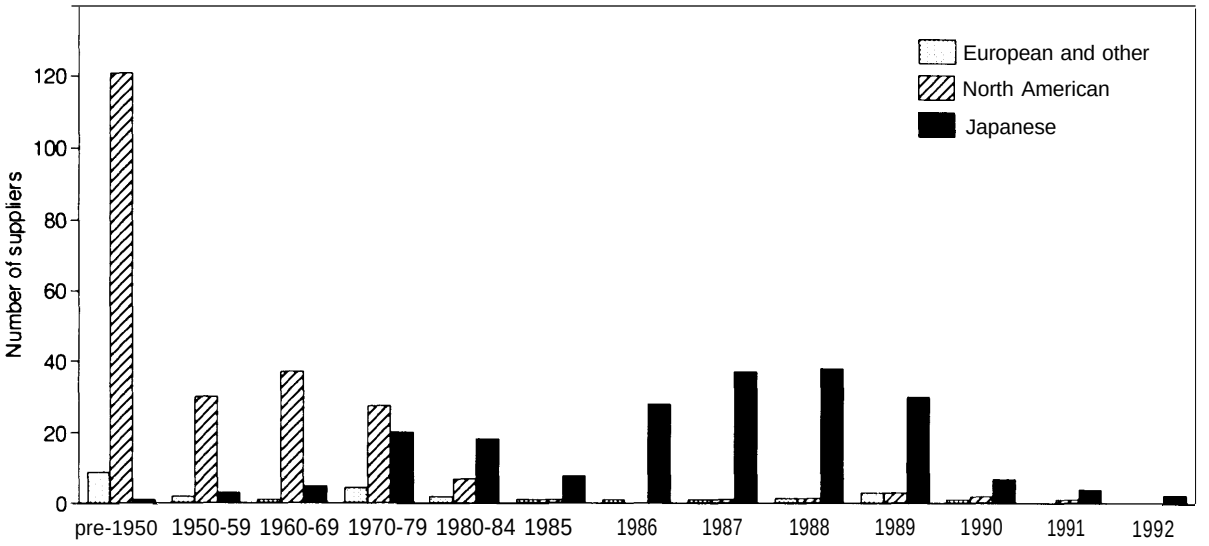
SOURCE: OTA, based on The *ELM Guide to U S Automotive Sourcing* (East Lansing, MI ELM International Inc., 1992), and The *ELM Guide to Japanese Affiliated Suppliers m North America* 4th ed. (East Lansing, MI ELM International Inc., 1993)

[27] OTA Auto Supplier Database, based on information from ELM International Inc., *The ELM Guide to U.S. Automotive Sourcing* (East Lansing, MI: ELM International Inc., 1992) and ELM International Inc., The *ELM* Chide *to Japanese Affiliated Suppliers in North America*, 4th ed. (East Lansing, MI: ELM International Inc., 1993).

[28] For example, see C. Howes, *Transplant.r and the U.S. Automobile Industry* (Washington, DC: Economic Policy Institute, 1993)

[29] There is little doubt that keiretsu relationships constitute an impediment to competition in the Japanese automotive industry. According to Jotaro Yabe of Japan Fair Trade Commission, "It makes economic sense for auto-makers to organize their distributors into keiretsu. For example, it contributes to maintaining after-sales service and to raising sales efficiency. On the other hand, it prevents the entry of foreign cars into the market, and is thus seen as a problem.. ..Business practices, however, restrict the freedom of dealers to handle other manufacturers cars, including foreign cars." See J. Yabe, "Freedom of Distributors Restricted: Problems including Rebates for Reaching Goals," *Nihon Keizai Shimbun*, p.14, 11 October 1993.

FIGURE 6-15: Suppliers to Japanese Automobile Transplants, by Year of Establishment



SOURCE: OTA, based on *The ELM Guide to U S Automotive Sourcing* and *The ELM Guide to Japanese Affiliated* Suppliers in *North America*

pan's U.S. transplant assemblers are made in Japan, and that outside firms face considerable difficulties breaking into Japanese supplier networks. When asked to confirm this, a representative of Toyota Motor Corporation told OTA that all sourcing and engineering decisions for U.S. production require the approval of the parent company. Many U.S. and European suppliers have pursued business with the Japanese transplant assemblers by establishing joint ventures with Japanese companies and opening technical facilities in Japan. They have done this because they believe that it will lead to business with the Japanese transplant assemblers in the United States.

Although sourcing relationships are very difficult to trace, some studies suggest that keiretsu-related sourcing patterns are not exclusive to Japanese affiliates in the U.S. automotive industry. For example, one recent study indicates that keiretsu linkages are common among Japanese affiliates in the European automotive and semiconductor sectors.[30] However, the great variety and complexity of manufactured inputs in modem industry, combined with the proprietary nature of the information, make systematic and comprehensive studies of international sourcing patterns difficult if not impossible.

Combined, the relatively recent presence of Japanese FDI, the complexity and uncertain origin of manufactured inputs, and the complex patterns of national affiliation among producers and their suppliers all make local content estimates inherently problematic. Consequently, the FDI life cycle theory is difficult to confirm by analyzing the sourcing behavior of foreign affiliates.

Indicators that focus on the output of affiliates also provide important but inconclusive evidence. For instance, the FDI life cycle theory predicts that foreign affiliates will shift over time from purely domestic to more internationally diversified sales. In the case of Japanese manufacturing

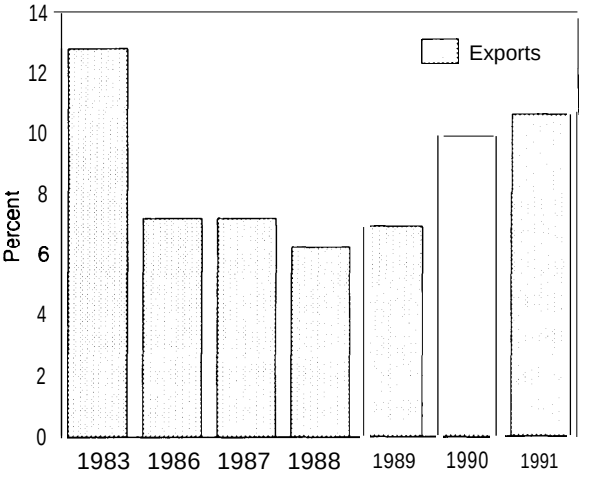
30 M. Mason and D. Encarnation (eds.), *Does Ownership Matter? Japanese Multinationals in Europe* (Oxford, UK: Clarendon press, forthcoming 1994), pre-publication copy, pp. 147, *156,* and 314.

affiliates in North America, exports have increased as a percentage of all sales since the late 1980s, yet they were the highest in 1983 at 12.8 percent and actually decreased from then until 1988, when they hit a low of 6.2 percent (see figure **6- 16).**

Although individual MNEs may conform to a FDI life-cycle pattern, aggregate data on the sourcing and sales behavior of Japanese affiliates in the United States and Europe do not provide conclusive evidence. Japanese affiliates in the United States clearly import more of their production inputs than do their European counterparts (see table 6-1). It remains to be seen whether this pattern will change over time. Japanese affiliates may also begin to export a larger percentage of their sales as they become more embedded in foreign markets and become more fully integrated and independent production facilities. To date, however, there is insufficient evidence to determine whether Japanese affiliates will indeed become more deep] y rooted in the U.S. economy and exhibit production and trade tendencies similar to most European affiliates.[31] Akio Morita may be correct in observing that Japanese MNEs have institutional characteristics that encourage them to behave differently than their European and U.S.-based counterparts.[32]

In sum, the bilateral distribution of FDI clearly affects the relative symmetry of bilateral trade flows. This is most evident in the U.S.-Japan economic relationship, where significant asymmetries in investment have contributed to an imbalance trading relationship marked by consistent Japanese trade surpluses, most of which can be associated with flows of merchandise from Japanese MNE parents to their affiliates in the United States.

FIGURE 6-16: Exports of Japanese Manufacturing Affiliates in North America as a Percent of Total Sales, 1983-1992



SOURCE: Adapted from Ministry of International Trade and Industry Industrial Policy Bureau, International Business Affairs Division *Dai* 18/19 *kai Wagakuni Kigyo no Kaigai Jigyo Katsudo* (Tokyo: Okura-sho Inasatsuyoku, 1991), p 18, table 11, and *Dai* 22 *kai Wagakuni Kigyo no Kaigai Jigyo Katsudo* ((Tokyo: Okura-sho Inasatsuyoku, 1993), p 22, table 2-16

The composition of investment also has a significant effect on trading patterns. An important factor is whether FDI is concentrated in manufacturing or wholesale trade. The concentration of Japanese FDIUS on wholesale trade shows up clearly in the aggregate trade data of Japanese affiliates in the United States. Since the mid- 1980s, Japanese affiliates consistently have accounted

[31] This process may be taking place within individual Japanese firms that have been in the U.S. economy for some time. For instance, Honda—which began U.S. production in 1983—recently announced plans to expand its North American car and engine manufacturing facilities, use the increased capacity to boost exports from (he region from 43,000 to 150,000 units by the end of the decade, and generally accord the region greater independence within Honda's global business. J. Griffiths, "Honda to spend $3 10m on bolstering US plants," *Financial Times*, p. 1, July 201994.

[32] See A. Morita, 'Nihon-gata Keiei ga abunai', *Bungei Shinju*, pp.94-103, February 1992.

for 40 percent of the exports and 50 percent of the imports of all foreign affiliates in the United States. All but a small share of their trade has been by wholesale trade affiliates.[33]

Much of the merchandise trade of affiliates is IFT, especially on the import side. Wholesale trade affiliates have particularly strong tendencies toward I IT, reflecting their role as distributors for their parent's products. Although at lower levels than in wholesale trade, affiliates in manufacturing industries also have high import tendencies, largely due to IFT imports of parts, components, and subassemblies. The considerable differences in IFT tendencies across firms may partly be explained by the relative age of FDI, although there is insufficient data to determine if most affiliates routinely increase local sourcing and diversify trading over time. Evidence to date indicates that foreign affiliates integrate with local economies to different degrees and through different channels, only some of which can be explained by the relative age of FDI.

In addition to their immediate effect on trade flows, cross-national differences in the distribution and composition of FDI have important implications for the U.S. technology base. As the above analysis indicates, FDI can be concentrated in different sectors and deployed to very different effects. Consequently, different forms of FDI can and do have different implications for the U.S. technology base.

FORMS OF FDI-CONTRIBUTIONS TO THE U.S. TECHNOLOGY BASE

FDI can take many forms, some of which are more likely to result in technology development in the United States. Five basic types of FDI are listed below, in ascending order of their contribution to the U.S. technology base:

1. distribution facilities for imported products;
2. final assembly facilities for imported components;
3. manufacturing facilities that use a mix of imported and locally manufactured components;
4. integrated design, engineering, and manufacturing facilities that provide customized products for the local market; and
5. fully integrated research and production facilities that are a strategic component of a firm's global R&D, sourcing, and manufacturing operations.

By this ranking, FDI that is concentrated in wholesale trade makes a relatively limited contribution to the U.S. technology base, since wholesale trade affiliates are principally distribution or final assembly facilities for imported goods. Manufacturing FDI contributes substantially more, although the level of contribution varies with the degree of local content. In general, the higher the local content, the greater the demand for high value-added components produced by domestic suppliers, and the greater the liklihood that advanced manufacturing process technology will be transferred to or developed in the United States. Manufacturing FDI that includes an R&D element provides a strong contribution to the U.S. technology base because it creates avenues both for importing and developing technology. It may also employ and train U.S. scientific and technological personnel. Facilities that only include design and customization research can also provide important contributions to the U.S. technology base, although not as extensively as fully integrated manufacturing facilities that include independent product and process-oriented research.

Consequently, national variations in the composition of FDIUS are associated with differences in the contribution that foreign affiliates make to the U.S. technology base. The data are consistent with this expectation. German affiliates in the aggregate have the highest R&D intensity of all foreign afiliates in the United States, which reflects both the concentration of German FDIUS in R&D-intensive industrial sectors such as chemi-

[33] U.S. Department of Commerce, BEA, op. cit., footnote 2, p.53.

cals and pharmaceuticals, and the willingness of German-based MNEs to develop or purchase technology assets in the United States. U.K. and French affiliates have nearly average R&D intensities, which reflects the dispersion of each country's investment across a range of industries with different R&D requirements. Japanese affiliates have a very low R&D intensity, which reflects both the high percentage of Japanese FDIUS in the wholesale trade sector, and the reluctance of Japanese-based MNEs to conduct technology development abroad.[34]

As discussed in chapter 4, R&D by foreign affiliates in the United States is relatively small but is growing rapidly. It can play a large role in individual sectors. European affiliates, for example, exhibit very high R&D intensities and contribute substantially to technology development in the U.S. pharmaceutical and chemical sectors. However, in the aggregate, most R&D conducted overseas by foreign affiliates is devoted to product customization for local markets or, at best, to the support of local production facilities. Fully integrated affiliates that conduct independent product R&D are relatively rare, in part because overseas R&D facilities are comparatively difficult to establish. In many industries, foreign plants can be constructed quickly or moved on the basis of changes in factor costs. R&D facilities, by contrast, take a long time to set up and are difficult to move.[35]

Apart from conducting R&D overseas, MNEs can transfer process and product technology abroad through FDI and local production. Indeed, technological leadership often stimulates FDI. Technological advantages and ancillary capabilities such as marketing know-how frequently outweigh the disadvantages of operating in unfamiliar markets, and can encourage firms to pursue market advantages on a global basis.[36]

In addition, MNEs can also use FDI as a means of keeping abreast of technological developments in foreign markets. In a globalizing economy, where markets are liberalizing, technology is diffusing, and customization is increasingly important, firms must constantly upgrade and expand their technological capabilities. Doing so often requires access to technological developments on a global basis, wherever they emerge. Some analysts believe that there is no systematic evidence that foreign firms use merger and acquisition strategies to obtain U.S.-developed technology. Others suggest that MNEs often enter into joint ventures and other foreign investment arrangements to establish a listening post for overseas technological developments.[37]

Among the major industrialized economies, Japanese' firms are most widely known for using FDI as a means of acquiring foreign technology. For example, U.S. investments by Japanese-based MNEs in R&D-intensive, high-technology industries are frequently motivated by a desire to gain

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34 See table 4-2 and figure 4-5 in chapter 4.

35 See chapter 4 for a discussion of R&D within MNE networks.

36 For example, Japanese FDI in certain segments Of the semiconductor industry has been ascribed to leadership in MOS memory and bipolar logic technologies. See Y. Kimura, "Japanese Direct Investment in the European Semiconductor Industry," in Mason and Incarnation (eds.), op. cit., footnote 29, p.300.

37 A Department of Commerce study concluded that foreign investors were not disproportionately interested in targeting high technology acquisitions in the United States. See S.0. McGuire and D. Dalton, "Influence of Foreign Direct Investment on the Development and Transfer of U.S. Technology," in U.S. Department of Commerce, Economics and Statistics Administration, *Foreign Direct Investment in the United Stales: An Update (* Washington, DC: June 1993), p.62. At the same time, MNEs frequently point to foreign technological capabilities as an important motive for FD1. For instance, in a survey conducted by Japan's Science and Technology Agency, Japanese MNEs cited the search for new technologies as the second most important motive for investing in Europe and the United States (the first being to meet local market needs). See OECD, Economic Analysis and Statistics Division, Directorate for Science, Technology and Industry, *Performance of Foreign Affiliates in OECD Countries* (Paris, France: OECD, forthcoming), diagram 19p. 53. This motive was mentioned frequently in OTA interviews with MNEs in Europe and Japan.

TABLE 6-6: Number of High-Technology Firm Acquisitions and Establishments by Selected Countries, 1987-1990

Industry	All countries	Germany	U.K.	Japan
Industrial chemicals	75	9	23	7
Drugs	26	2	6	7
Engines and turbines	7	1	1	1
Other transportation	21	1	10	1
Computers and equipment	77	6	19	20
Communications equipment	31	1	12	6
Electronic components	154	6	42	48
Instruments	131	10	46	27
Computer and data processing services	72	1	19	11
Engineering and architectural services	39	3	12	5
R&D and testing services	30	5	4	12

SOURCE: Adapted from Organisation for Economic Co-operation and Development, Economic Analysis and Statistics Division, *Performance of Foreign Affiliates* in *OECD Countries* (Paris: OECD, forthcoming), p 91, table 5 of pre-publication draft.

access to U.S. technological capabilities, often through cooperative agreements.[38] In many occasions these agreements resulted in the acquisition of the U.S. company by the Japanese investor. One report on foreign investment in U.S. high technology companies found that, between 1988 and 1993, Japanese companies accounted for 57 percent of all identified cases, having acquired or invested in 438 U.S. firms. Half of these acquisitions were in information technologies, primarily computers, semiconductors, and electronics. U.K. firms accounted for the second largest percentage of acquisitions, at 13 percent; they focused on computers, electronics, and advanced materials .39

Foreign acquisitions in the United States were particularly common in the late 1980s.[40] During this period, MNEs based in Japan and the United Kingdom acquired or established the largest number of U.S. high-technology firms (see table 6-6).[41] Despite this similarity, Japanese and British FDIUS differed in two important respects. First, Japanese investment in the United States expanded rapidly while U.K. investment grew by smaller increments. In just over a decade, Japanese investment overtook U.K. investment that had taken centuries to establish. Second, U.K. investment tended to be scattered over a variety of unrelated sectors, ranging from publishing to precision instruments. By comparison, Japanese investment was concentrated in a set of vertically integrated sectors, primarily electrical equipment, primary metals, and motor vehicles.[42] Third, U.K.

38 See B. K_ogut and S.J. Chang, op. cit., footnote 20, p. 411. See also Drake and Caves, Op. cit., footnote 20; and H. Yamawaki, "Entry Patterns of Japanese Multinationals in U.S. and European Manufacturing," in Mason and Encarnation (eds.), op. cit., footnote 29, p. I I.

39 See L.M. Spencer, *Foreign* Acquisitions *of U.S. High Technology Companies: Database Report* (Washington DC: ESI, March 1994), pp. 1,2 and 5.

40 See figure 5-8 in chapter 5.

41 See also Spencer, op. cit. footnote 38.

42 See Figure 3-4 in U.S. Congrees, OTA, OP. cit., footnote 25, p. 58.

affiliates spend more on R&D in the United States than do Japanese affiliates. Finally, unlike the U.S.-U.K. trade relationship, Japanese investment in the 1980s coincided with a record bilateral trade deficit and a particularly high merchandise trade deficit for affiliates.

Although Japanese MNEs appear to use FDI as a strategic channel for acquiring foreign technology more frequently than others, the need to do so is not exclusive. MNEs throughout the advanced industrial economies increasingly require access to foreign technological developments, particularly in R&D-intensive and technologically complex industries. Executives of numerous MNEs told OTA that technological capabilities have become much more dispersed than in the past, and that they need to maintain a global technological horizon to remain competitive. Moreover, the high costs of maintaining technological leadership have been pressuring them to focus on developing their core technological competencies, while licensing or subcontracting subsidiary technologies to other firms.

In this context, barriers to overseas investment may exert a significant effect on the U.S. technology base, perhaps comparable to the technological activities of foreign affiliates in the United States. Ironically, the automotive industry illustrates this point from both perspectives. In recent years, Toyota, Nissan and Honda have transferred much of their manufacturing process technology and management techniques to their United States operations. Analysts widely conclude that diffusion of this knowledge has assisted the Big Three in improving their own performance, leading to rapid advances by the entire industry in assembly plant productivity and quality. However, one of the reasons that U.S. automobile manufacturers had become relatively uncompetitive in their manufacturing process technology is that, in the past, they experienced restrictions to investment in Japan and consequently lacked the vantage point to see important technological developments as they emerged.[43] In short, in highly internationalized industries, competitiveness requires constant exposure to new process and product technologies—wherever they develop. When FDI is restricted, whether through formal or informal barriers, firms can be excluded from important developments in product and process technologies, which can lead to considerable competitive disadvantages.

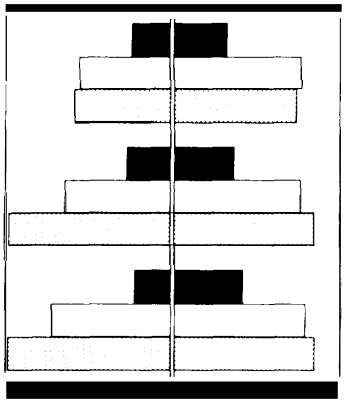
Across the United States, Europe, and Japan, legal barriers to investment are largely an anachronism. Nevertheless, as this and the preceding chapter illustrate, imbalances in investment flows remain. Although firm-level investment decisions are complex and affected by a wide range of macro- and macroeconomic factors, the aggregate distribution of investment across the Triad suggests that informal yet effective barriers to FDI persist. As Part IV demonstrates, part of this problem may be attributable to informal barriers that emerge from fundamental differences in the structure of corporate governance and finance across the United States, Europe, and Japan.

[43] Of course, the difficulties experienced by the Big Three have been due to a complex array of internal and external factors.

Part IV: Corporate Foundations of National Technology Systems

Despite the current blurring of national economic boundaries, the competitive strength of individual firms continues to be shaped by circumstances prevailing in their home countries. Those circumstances can provide firms with advantages, or they can create disadvantages. Perceptions of such advantages or disadvantages continue to influence the investment decisions of multinationals, especially regarding long-term investments in plant, equipment, research, and development—the wellsprings of future technological innovation.

Chapters 7 and 8 assess two principal asymmetries across national business environments, both of which are increasingly crucial to the investment patterns of American and foreign multinationals and hence to the health and relative position of the U.S. technology base.[1] Specifically, the chapters concentrate on key differences in internal corporate governance and in the corporate role of financial institutions across the Triad. The analysis focuses primarily on the United States, Japan, and Germany, due to the relative positions of these countries across a wide range of technologically intensive industries.[2] Moreover, the industrial structures of these three nations fundamentally influence evolving contemporary economic trends.



[1] On the concept Of "national asymmetries," see the first report of this assessment: U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest: Playing By Different Rules*, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993), ch. 2.

[2] For a broad overview, see U.S. Congress, General Accounting Office, *Competitiveness Issues: The Business Environment in the United States, Japan, and Germany*, GAO/GGD-93-124 (Washington, DC: August 1993).

In practice, corporate governance patterns and financial systems are often linked. They are also connected to idiosyncratic national accounting standards, tax policies, bankruptcy rules, competition policies, and other factors that affect the environment within which corporate strategies are set. Bearing these other factors in mind, the main purpose of chapters 7 and 8 is to provide an orientation to important policy issues that arise from persistent national differences in the ways multinational firms govern themselves internally and in the enduring character of their involvement with financial institutions.

Although the chapters highlight the strengths and weaknesses of the traditional systems of corporate governance and long-term corporate finance in the United States, Germany, and Japan, they do not assert the superiority of any one system. During the late 1980s, it became quite common in policy circles to find fault with corporate America and its financial underpinnings. In the midst of severe recession in both Japan and Germany during the early 1990s, it was just as easy to spot the flaws in the respective approaches of those countries. Such debates will continue. Chapters 7 and 8, however, assess the impact of national differences that cannot be expected to disappear in the near term. Such differences are reflected in the technology bases of the three countries, and will likely contribute to increasing political tensions in an era of heightened competition among multinationals.

The analysis presented in chapters 7 and 8 relies in part on extensive OTA interviews with executives of multinational enterprises (MNEs) and banks in the United States, Europe, and Japan. Business executives as well as policymakers readily convey the importance of corporate governance and financial systems to the business activities of MNEs and consequently to the economic strategies of nations. However, the subjects of corporate governance and finance are less amenable to aggregate, quantitative analysis than are the other areas covered by this assessment. Compared to R&D and FDI, there is little quantitative data available on the effects of differences in either corporate governance patterns or financial market structures per se, and there are few comparative empirical analyses in the open literature. Accordingly, the analysis presented here is necessarily more descriptive and less data-intensive than that contained in Parts II and III of this report.

FINDINGS

1. Critically important distinctions persist in the ways corporations govern themselves and raise long-term capital across the United States, Germany, and Japan. Expectations concerning the ultimate convergence of these systems should be kept modest. National patterns are embedded in deep social and cultural traditions, and they can be reinforced more than eroded by turbulence in the global economy.
2. In particular, distinctive systems of institutional cross-shareholding and corporate banking should continue underpinning Japanese MNEs and a widening array of European MNEs. Arguably, those systems can, in certain circumstances, slow down processes of technological innovation. They can also, however, provide stable financial foundations that help facilitate the commercial adaptation, incremental improvement, and optimal diffusion of new technologies
3. For the foreseeable future, it is likely that differences in national systems of corporate governance and corporate financing will be the source of increasing friction in the complex economic relationships evolving among the United States and several of its major trading and investing partners.
4. The ability to raise capital on competitive terms and to deploy it effectively is crucial both to the long-term success of particular MNEs and to the development of critical technologies for individual countries. Global financial integration continues apace, however, especially with regard to short-term

capital.[3] In partial response, many MNEs are redeploying corporate assets to take advantage of new financial opportunities and to hedge against heightened financial uncertainties. But long-term investment patterns continue to differ significantly across countries and sectors.

5. American capital markets are the largest, most decentralized, open, and transparent in the world. Japanese and German capital markets are changing, but they remain relatively concentrated and opaque. The providers of long-term capital, in particular, remain more patient in Germany and Japan than in the United States. Firms based outside the United States are able to enjoy full access to U.S. capital markets. Firms based outside Japan and Germany, on the other hand, are less able to benefit from the strengths inherent in those capital markets.
6. National asymmetries in corporate governance and corporate financing have important consequences for industry. Many other factors, of course, contribute to industrial success or failure. But solid financial foundations are critical. The fact that a number of premier American firms exited from the important and rapidly growing consumer electronics sector during the 1980s, for example, has been ascribed to myriad factors. But it is no coincidence that the Japanese and European MNEs that took their places were able to rely on more stable governance and financing structures.
7. Compared with Germany and Japan, the financial markets of the United States are more supportive of novel technological development. They therefore remain a source of considerable national strength. In the recent past, however, they have been less supportive of the kinds of medium- and long-term investment required to commercialize new products, such as building advanced manufacturing facilities that anticipate demand. Since the development of next-generation technologies often is associated with such facilities, this kind of short-term focus, even if a cyclical phenomenon, can have negative consequences for the national technology base.
8. Japanese and German patterns of corporate governance and corporate financing are often depicted as comparatively rigid and ill--adapted to the initial development of novel technologies. They can, however, be quite effective at marshaling the long-term financial resources needed to build advanced manufacturing facilities. Historically, they have encouraged the relative concentration of such facilities within national markets.
9. National financial asymmetries can skew competition among MNEs, especially if outright corporate failure is precluded or discouraged in some countries. Waiting for structural convergence provides an excuse to avoid reflecting on problems in the U.S. technology base. To be sure, in the mid-1990s that base looks relatively stronger in a number of sectors than it did a decade earlier. Moreover, many vulnerabilities, which came to the fore in the 1980s, reflect internal factors that have little to do with MNEs. Low national savings rates and problems in the U.S. educational system, for example, are frequently cited. The strategic investment behavior of MNEs, however, deserves to be assessed in this connection. MNEs make many of the long-term investment decisions that create new technologies, and they can determine where full development takes place. In this respect, however, all MNEs do not act alike.
10. Japanese and German systems of corporate governance and long-term corporate financing are adjusting somewhat as national and global market conditions change. Pessimistic forecasts concerning the technological futures of these systems are overdrawn. Each system remains quite capable of once again effectively raising considerable financial and

[3] OTA, *Multinationals and the National Interest*, op. cit., footnote 1, ch. 6.

managerial resources and focusing them on the development and commercialization of leading-edge technologies. The American counterparts to those structures, to be sure, have their strengths. But it is premature to conclude they have proven their superiority, especially when it comes to providing solid financial and social foundations for future technological development within the United States.

11. Japanese and German corporate governance and financing structures promote the creation of organized corporate networks. Such alliances, often centered on banks, provide financial stability and facilitate long-term planning. Although economic turbulence in the Japanese and German economies has reduced the level of intercorporate alliance activity, OTA interviews indicate that the core alliance structures of major MNEs are not breaking down. In the face of deep domestic and regional recessions, the value of these alliances to many Japanese and German MNEs has been reinforced. Without them, retooling and continuing investment in new technologies would pose greater challenges. The process of adjusting to a new competitive environment might also be more rapid and violent. In the view of a number of senior executives of Japanese and German MNEs, such a course would risk severe instability in the social bases within which their firms are and will remain embedded.

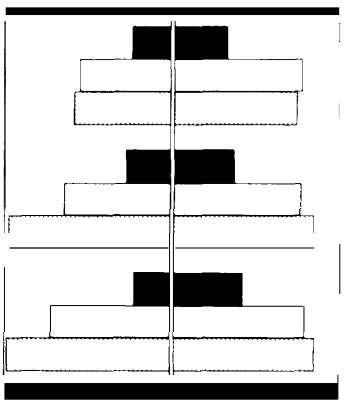
Corporate Governance and National Technology Systems

7

Policymakers and academic analysts have paid increasing attention to the ways in which different systems of internal corporate governance affect the long-term planning and investment decisions of corporations. [1] The issue is of direct relevance to this assessment, for these decisions constitute the fundamental building blocks for national technology systems. Since a strong technology base is crucial to national prosperity, such decisions have consequences that go far beyond the immediate interests of individual corporations.

The term "corporate governance" refers broadly to the rules and norms that guide the internal relationships among the various stakeholders in a business enterprise. These stakeholders typically include owners, directors, managers, creditors, suppliers. employees, and customers. The emphasis here is on the central relationships between the managers of a corporation and the owners of voting shares, whose interests are intermediated by boards of directors. Those relationships center on rights and obligations that are either specified in law or legitimated by long-standing custom and practice.

Since MNEs span a number of legal jurisdictions, their governance is more complicated than that of local firms. The core governance structures of almost all MNEs nevertheless are associated with prevailing norms in the jurisdiction within which their head



[1] For analy tical perspectives, see (). Williamson, "Corporate Finance and Corporate Governance," *The Journal of* Finance 43(3):567-591, July 1988; and M.J. Roe, "Some Differences in Corporate Structure in Germany, Japan, and the United States," with responses by J.M. Ramseyer and R. Romano, *Yale Law Journal 102(8) 1927-2037,* June 1993. Also see "Corporate Governance Watching the Boss," *The Economist* 330(7848)**SS3-SS5**, Jan, 29, 1994.

offices are incorporated.[2] Competition among MNEs therefore embodies the frictions that occur when distinctive national systems of corporate governance become ever more interlinked.[3] The following sections examine basic differences among the systems of corporate governance prevailing in the United States, Japan, and Germany.

CORPORATE GOVERNANCE IN THE UNITED STATES

In the United States, corporate governance, corporate investment, and the national technology base are intimately connected. Corporate governance for American-based MNEs, and publicly owned American firms in general, centers on legal relationships among shareholders, directors, and managers. Under the rubric of federalism, the foundations for those relationships are set primarily in state law, although various national laws, and American culture more broadly, influence that law.[4] It was once conventional to refer to the system as "shareholder capitalism."

In reality, the voice of individual shareholders in the United States has declined over time. With the rise of institutional investors and the increasing turnover of shareholders during recent decades, the links of accountability between owners and managers have weakened. A spectacular series of hostile corporate takeovers during the 1980s served not to redress the situation but to exacerbate it. The takeover movement, for example, soon set state legislatures and corporate managers to work building ever higher legal hurdles to stymie potential raiders. In such a context, the system seems more accurately labeled "competitive managerial capitalism."[5]

In the traditional terms of American liberalism, corporations exist mainly to create wealth for their owners. Owners delegate their right to oversee the corporation to a board of directors, and directors empower managers to run the corporation. In theory, owners have a stake in the long-term success of the corporation. Moreover, they may replace directors, and through them managers, if they perceive the actions of those managers to be compromising that success. In practice today, however, the owners of most American MNEs tend to be institutions that trade their shares frequently. In recent years, the fastest growing institutions have been mutual funds (see figure 7-1).

Indeed, for the 1,000 largest corporations in the United States, estimates of the percentage of voting shares held by mutual funds, pension funds, and other investment vehicles run as high as two-thirds.[6] In addition, except in atypical cases, neither the directors nor the managers of American MNEs are actually chosen by shareholders. Most directors on MNE boards are outsiders chosen by, and often beholden to, chief executive officers.

In the wake of subnational efforts to make 1980s-style hostile takeovers more difficult, the managers of many U. S-based MNEs have, in theory, gained a degree of operational autonomy. Whether this is a positive or negative develop-

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[2] For relevant debate, see R.B. Reich, "Who 1s *Us'?' ' Harvard Business Review* 68(*I*):53-64, January-February 1990; and L.D. Tyson, "They Are Not Us: Why American Ownership Still Matters," *The American Prospect* (4):37-49, Winter 1991.

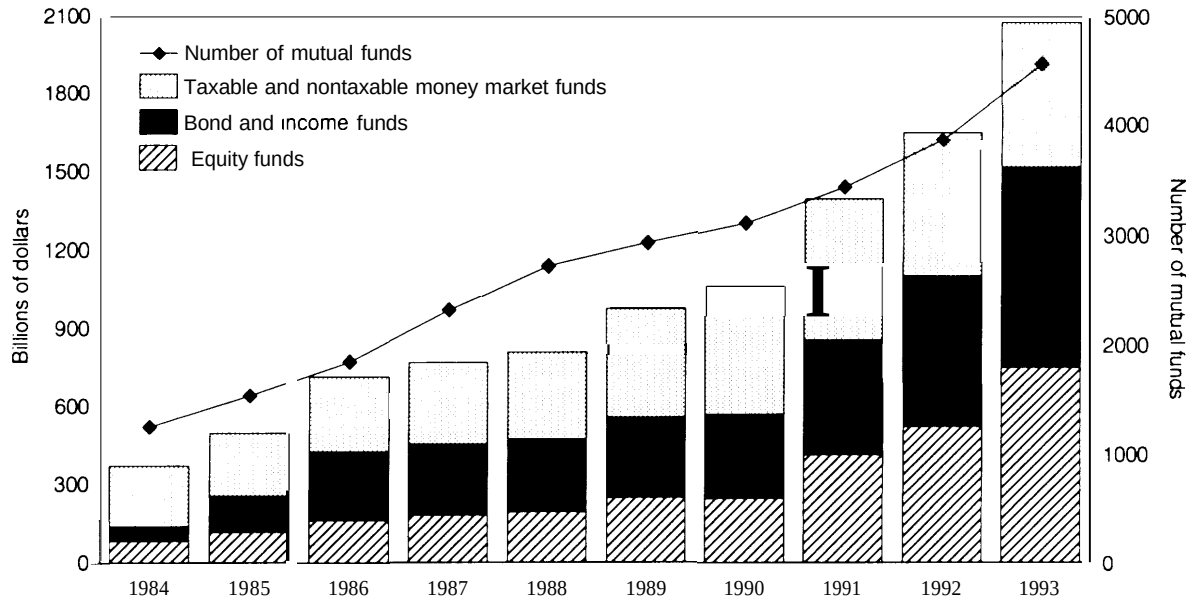
[3] on the notion of "system friction," see S. Ostry, *Governments and Corporations in a Shrinking World: Trade and Innovation Policies in (he United States, Europe and Japan (New* York: Council on Foreign Relations Press, 1990). Also see J.H. Dunning, "The Global Economy, Domestic Governance, Strategies and Transnational Corporations: Interactions and Policy Implications," *Transnational Corpora/ions I (3).7-45, 1992.*

[4] See M. J. Roe, "A Political Theory of American Corporate Finance," *Columbia Law Journal 91(1): 10-67,* January 1991.

[5] A. Chandler, Sea/e *and Scope* (Cambridge, MA: Harvard University Press, 1990), pp. *62* I -627.

[6] J.W. Lorsch and E. MacIver, "Corporate Governance and Investment Time Horizons," background paper prepared for M. Porter et al., *Capital Choices,* A Report to the Council on Competitiveness and co-sponsored by the Harvard Business School, June 1992. Note that of the 50 largest publicly held American companies, only seven have a shareholder with more than a 10 percent stake. Note also that the scale and rapidity of the turnover of shareholders has increased tremendously in recent decades. In the mid- 1960s, for example, large block trades represented around 3 percent of the annual volume of trading on the New York Stock Exchange. By the late 1980s, they exceeded 50 percent.

FIGURE 7-1: Growth in American Mutual Funds—Value of Assets and Number of Funds



SOURCE: Investment Company Institute, 1994 *Mutual Fund Fact Book,* 34th ed. (Washington, DC Investment Company Institute, 1994), pp. 98-99

ment is the subject of much debate. It should be noted, however, that the excesses of the 1980s have had more subtle effects. Many corporate boards, for example, have become more assertive in meeting their oversight responsibilities. This has been especially obvious in cases where corporations have come under severe financial pressure, and it has culminated in the recent ouster of the chief executive officers of several leading American MNEs, including IBM, Westinghouse, and Kodak, Behind this new assertiveness often lay the discontent of large institutional shareholders. This may be a cyclical phenomenon, or it could signal a revival of shareholder activism. In the course of OTA interviews for this assessment, several directors of American MNEs praised the heightened interest in monitoring corporate performance that has come from large institutional shareholders like the California public-employees' pension fund (Calpers) and various mutual funds. They noted, however, that it remained an open question as to whether a basic change in American corporate governance was afoot.

The American system still stresses indicators of short-term financial performance. Securities analysts evaluate firms largely on the basis of quarterly earnings reports, and their assessments exert far more influence over managerial decisions than do shareholders. Indeed, most American shareholders have little voice in day-to-day management, although they do have the option of exit. And they continue to exercise that option with much more vigor and regularity than do their counterparts abroad. For all the talk in business circles about the wisdom of the kind of long-term strategy associated with such investment firms as Berkshire Hathaway, the prospect of exiting quickly retains its attractiveness for most investors. This is especially true for mutual fund managers whose own performance (as agents for individual investors, not as direct owners) is measured on a rigorous comparative basis that emphasizes the short term.

Because of their reliance on open and active stock markets to raise new capital directly, as well as to provide indirect signals to lenders and other stakeholders, managers of American MNEs oper-

ate from abase that encourages them to emphasize short-term returns. With individual and institutional owners frequently changing, they actually have little direct influence on corporate decisions. The constant churning of the shares of large corporations does, however, get one message across: keep earnings rising on a steady track. The message is often strongly reinforced by the tying of personal compensation packages for senior executives to stock market performance. Two astute observers summarize the consequences:

> U.S. CEOs understand this message. When they issue their companies' quarterly earnings report and meet with security analysts, they believe they are being judged on a 90-day basis. If the verdict is not positive, many sell orders will be forthcoming with a commensurate decline in share prices. In an era when many CEOs have been seriously concerned about unfriendly takeovers, such a decline was an especially unpleasant prospect. But even in more halcyon times, CEOs feel the pressure to keep earnings up.[7]

As many business and academic observers point out, this obsession with the short run can seriously hamper the development of optimal corporate strategies, especially in sectors characterized by short product life cycles. The pressure to keep current earnings high and dividend payments stable can force firms to postpone the long-term investments and restructuring measures needed to stay competitive.[8] Delays or cuts in expensive investments in technology, or in the new plants from which new process technologies develop, can have a positive effect on current financial statements. In the long run, however, imprudent delays or cuts will have a negative impact on performance. Theoretically, this impact should be discounted in current stock prices. In practice, information flows imperfectly, and rarely are the motives for managerial decisions obvious. The perception that short-term thinking by corporate managers weakens the technology base of the country therefore has become more widespread.

Compounding the tendency to emphasize the short term in managerial decisionmaking are the vagaries of the U.S. corporate proxy voting system, which can make it difficult for shareholders to cooperate in disciplining entrenched managers. Working in the same direction are disclosure requirements and antitrust rules that preclude significant cross-shareholding by unrelated corporations. For example, under rules first specified in the 1934 Securities and Exchange Act, when an individual or related group seeks more than 5 percent of the shares of a corporation, public disclosure of plans, financing sources, and other information is required.[9] Securities and Exchange Commission (SEC) proxy rules can also come into play when a group seeking a controlling position is formed. Together with various impediments that have been put in place by state laws in the wake of the "takeover wars" of the 1980s, such rules have made both costly and risky the assemblage of large blocks of stock or significant cross-shareholdings.

Senior executives of several leading U. S.-based MNEs told OTA that their investment planning was frequently constrained by the need to satisfy the expectations of temporary shareholders as expressed in current stock prices. They admitted that their R&D budgets, in particular, suffered as a result. Several executives expressed concern that many of their foreign-based competitors faced a much less binding constraint and were therefore better able, for example, to maintain R&D expenditure levels over an entire economic cycle. More specifically, they suspected that differences in corporate governance helped to explain the maintenance, or at most the marginal

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[7] Ibid.

[8] See M.T. Jacobs, *Short-Term America: The Causes and Cures of Our Business Myopia,* (Boston, MA: Harvard Business School Press, 1991), chs. 2, 3.

[9] F.R. Edwards and R.A. Eisenbeis, "Financial Institutions and Corporate Investment Horizons: An International Perspective," background paper prepared for M. Porter et al., *Capital Choices,* op. cit., footnote 6.

trimming, of R&D spending by many Japanese MNEs even as their earnings came under severe pressure in the early 1990s.

CORPORATE GOVERNANCE IN JAPAN

The effort to understand how Japanese corporate governance differs from the American system has in itself become something of a growth industry. The once common view that Japanese MNEs represent the visible face of Japan Inc., with the implication that government really calls the shots, is now widely dismissed as simplistic. So too is the more recent characterization of those firms as run by and for a managerial elite, accountable to no one, including government or traditionally passive shareholders. Impressions garnered in OTA interviews in Japan with senior corporate executives, government officials, and others support a more complex view

The managers of Japanese MNEs do play the key role in a system of corporate governance that has evolved over time. [10] And, indeed, the system does free them from some of the pressures for short-term returns that their American counterparts face. Extensive institutional cross-shareholding arrangements, for example, can explain why real earnings might be allowed to fluctuate widely in order to keep R&D budgets stable. However, executives of Japanese MNEs, most of which are embedded in keiretsu networks, are accountable for their performance to a wide array of constituencies. Some of those constituencies may be represented on the board of directors, but most directors are in fact insiders.

The constituencies to which Japanese directors and managers must and do attend include employees, the MNE's lead bank, its other long-term creditors, corporations with which it is affiliated in keiretsu or other intercorporate groupings, suppliers, and important customers. These constituencies share certain basic interests in the firm beyond simple survival. Unlike the case of their American counterparts, however, it is impossible to agglomerate those interests under a single financial indicator, such as return on investment. Nevertheless, one interest has long been broadly shared by many constituencies: the need both to compensate for past technological weakness and to ensure technological parity or leadership in the future. Indeed, this theme was a common refrain throughout a series of OTA interviews with senior executives in Japan. The structure of corporate governance in contemporary Japan has evolved in light of that overriding interest.

In contrast to the legalistic, arm's-length, and often antagonistic relationships at the core of American corporate governance structures, the Japanese equivalent is a system of "networks" built upon relationships of trust, the reciprocal exchange of information, technology, and other benefits, and expectations of long-term endurance. Within a corporate network, managers often compete energetically, but they also cooperate to the extent required to maintain both the network and their place within it. During periods of crisis, this can entail direct support of one another's internal organizational affairs.

For most Japanese MNEs, internal network structures are linked to, and reinforced by, external linkages to financial institutions and other firms. [11] These tend to be stable and are often sealed by mutual cross-shareholdings. Individual

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[10] See U. Schaede, "understanding Corporate Governance in Japan: Do Classical Concepts Apply'?" *Industrial and Corporate Change 3(2):* forthcoming, 1994.

[11] See *M.* Orru, G.G. Hamilton, *and* M. Suzuki, *patterns of Inter-Firm Control in Japanese Business,* Papers in East Asian Business and Development, No. 7, Institute of Governmental Affairs, University of California, Davis, 1989.

TABLE 7-1: Major Members and Affiliates of the Mitsui Group

Financial Institutions	Percentage of firm's stock held by other group members or affiliated companies
Sakura Bank	15,98
Mitsui Trust & Banking	24.42
Mitsui Kaijo Kasai	28.90
Trading, Manufacturing, and Other	
Mitsui Bussan	*20,11*
Mitsui Mining	37.48
Mitsui Construction	41,96
Sanki Engineering	20.65
Nippon Flour MiIls	26.32
Toray Industries	16,45
Oji Paper	1211
Mitsui Toatsu Chemicals	18,65
Denki Kagaku Kogyo	17.56
Mitsui Petrochemical Industries	38.39
Onoda Cement	19,94
Japan Steel Works	19.56
Mitsui Mining & Smelting	12.70
Mitsui Engineering & Shipbuilding	1816
Mitsukoshi	14.39
Mitsui Real Estate Development	17,64
Mitsui O.S.K. Lines	21,60
Mitsui Warehouse	29,95
Toshiba	11.41
Ishikawajima Harima	10,72
Toyota Motor	10,30

NOTE: Data is for fiscal year 1992, ended March 31, 1993, and is drawn from a survey conducted by Toyo Keizai of 2,131 firms listed on Japanese stock exchanges

SOURCE: Kigyo Keiretsu *Soran* (Tokyo: Toyo Keizai Shinposha, 1994), pp. 44-45

shareholdings may be small, but their size is often not as significant as their existence, for they signi - fy valued and often enduring business relationships. [12] Reciprocal equity ownership comprises a critical element in a web-like system of corporate interdependence, especially obvious in the major bank-centered keiretsu (see tables 7-1 to 7-4). On al aggregate basis it can effectively close the market for corporate control, not only for new foreign entrants but also for potential domestic rivals.

12 For smaller Japanese companies that are not part of keiretsu networks, large shareholdings are more common and they can provide the key mechanism for exerting influence over management. See S. D. Prowse, "The Structure of Corporate Ownership in Japan," *The Journal of Finance 47(3): 1121-1140,* July 1992.

TABLE 7-2: Major Members and Affiliates of the Mitsubishi Group

Financial Institutions	Percentage of firm's stock held by other group members or affiliated companies
Mitsubishi Bank	2562
Mitsubishi Trust & Banking	17.35
Nihon Shintaku Ginko	13,59
Tokyo Marine & Fire Insurance	22.61
Trading, Manufacturing, and Other	
Mitsubishi Shoji	33.22
Kirin Brewery	1920
Mitsubishi Rayon	2285
Mitsubishi Paper Mills	3187
Mitsubishi Kasei	22.12
Mitsubishi Gas Chemical	2468
Mitsubishi Petrochemical	32.99
Mitsubishi Jushi	57.32
Mitsubishi 011	4460
Mitsubishi Steel Manufacturing	3718
Mitsubishi Materials	2490
Mitsubishi Shindo	53.27
Mitsubishi Cable Industries	4975
Mitsubishi Kakoki	3668
Mitsubishi Electric	1647
Mitsubishi Heavy Industries	19.93
Mitsubishi Motors	56.44
Mitsubishi Estate	2646
Nippon Yusen	26.07
Mitsubishi Warehouse	*42.57*
Asahi Glass	28.09
Nikon	27.88

NOTE: Data is for flscal year 1992, ended March 31, 1993, and is drawn from a survey conducted by Toyo Keizai of 2,1 31 firms listed on Japanese stock exchanges

SOURCE: Kigyo *Keiretsu Soran* (Tokyo: Toyo Keizai Shinposha, 1994), pp. 46-47

In the early 1990s, more than half of the outstanding shares of publicly listed Japanese corporations were held by Japanese financial institutions and other corporations. [13] The historically low dividend rates of most Japanese corpora(ions surely have something to do with this fact. With little fear that key shareholders will sell, managers can be conservative in their payouts. They can also compensate their main shareholders in other ways; for example, they can give their lead banks a right of first refusal when they have

13 W.C Kester, "Governance, contracting, and Investment Time Horizons," Working Paper 92-003, Harvard Business School, Division of Research, 1991. See also U. Schaede, op. cit., footnote 10, table 2.

TABLE 7-3: Major Members and Affiliates of the Sumitomo Group

Financial Institutions	Percentage of firm's stock held by other group members or affiliated companies
Sumitomo Bank	1932
Sumitomo Trust & Banking	26.64
Sumitomo Marine & Fire Insurance	26.62
Trading, Manufacturing, and Other	
Sumitomo Shoji	**33.08**
Sumitomo Coal Mining	**38.59**
Sumitomo Construction	30.44
Sumitomo Forestry	29.92
Sumitomo Chemical	23.11
Sumitomo Bakelite	47.40
Sumitomo Cement	32.34
Sumitomo Metal Industries	19,50
Sumitomo Metal Mining	29.87
Sumitomo Light Metal Industries	48.48
Sumitomo Electric Industries	20.84
Sumitomo Heavy Industries	28.38
Sumitomo Realty & Development	17,38
Sumitomo Warehouse	37.49
Nippon Sheet Glass	2534
NEC	27.10

NOTE: Data Is for fiscal year 1992, ended March 31,1993, and Is drawn from a survey conducted by Toyo Keizai of 2,131 firms listed on Japanese stock exchanges

SOURCE: Kigyo Keiretsu *Soran* (Tokyo: Toyo Keizai Shinposha, 1994), pp. 44-45.

external financing requirements, and they can direct other types of business to related companies.

Sectoral studies indicate a much wider set of reasons for reciprocal corporate shareholding. These include the desire to solidify a relationship with a leading supplier of vital technology. It is well known, for example, that Japanese automobile companies frequently push key engineering and design functions to their supplier companies. Cross-shareholding can seal the relationship of technological cooperation and mutual dependence that thereby results. [14]

Corporate interlocks can represent the legacy of divisions that were spun off as independent companies once they became strong enough. Cross-shareholding can represent the purchase of "insurance policies" from financial institutions. Both types of linkage yield a degree of protection in the event of a crisis, albeit at the possible price of having to allow the financial institutions to intervene directly in management. In addition, cross-shareholdings can create a kind of leverage that helps assure performance under other types of contractual or noncontractual business arrange-

14 For a defense of the system, see Y. Futasugi, "What Share Cross-Holdings Mean for Corporate Management," *Economic Eye* 11(1): 17-19, spring 1990.

TABLE 7-4: Major Members and Affiliates of the Fuyo Group

Financial Institutions	Percentage of firm's stock held by other group members or affiliated companies
Fuji Bank	26.28
Yasuda Trust & Banking	26.38
Yasuda Fire & Marine Insurance	18.16
Trading, Manufacturing, and Other	
Marubeni	19.05
Taisei	902
Nissin Flour Milling	941
Sapporo Breweries	2265
Nichirei	10.87
Nisshinbo Industries	1458
Toho Rayon	4330
Showa Denko	1957
Kureha Chemical Industry	2132
Nippon Oil & Fats	24.46
Tonen	1024
Nihon Cement	1995
NKK	1348
Kubota	1058
Nihon Seiko	227
Oki Electric Industry	2187
Yokogawa Electric	1098
Tokyo Tatemono	2748
Tobu Railway	638
Keihin Electric Express Railway	950
Showa Line	3552
Hitachi	507
Nissan Motor	1464
Canon	10.20

NOTE: Data is for fiscal year 1992 ended March 31 1993 and is drawn from a survey conducted by Toyo Keizai of 2,131 firms listed on Japanese stock exchanges

SOURCE: *Kigyo Keiretsu Soran* (Tokyo: Toyo Keizai Shinposha, 1994), pp. 48-49

ments. Therefore, it is not surprising that Japanese corporate managers "tend to view their proximate task as being the preservation and enhancement of these complex relationships rather than the immediate, direct pursuit of any one stakeholder's interests, such as that of exclusive equity owners."] [5]

Under the aegis of this system of corporate governance, Japan successfully built up its economy throughout the past few decades. Despite the effectiveness of this system, some observers have recently argued that it is now breaking down, as the inevitable consequence of both corporate ma-

[15] Kester, op. cit., footnote 12.

TABLE 7-5: Cross-Shareholdings Within Bank-Centered Japanese Keiretsu

	Mitsui	Mitsubishi	Sumitomo	Fuyo	Sanwa	DKB
1980	17.62	29,26	26.74	16,26	16,78	14.12
1985	17,87	25,18	25.01	15,79	16.84	13.33
1988	17.09	26.87	24.42	15,29	16,38	12.24
1991	16.58	26.37	24.67	15,62	16.67	12.16
1992	16,58	26.33	24.65	15.62	16,72	12.19

NOTE: Cross-shareholdings are the average of the ratios of stocks in one member company owned by other companies withln the group
SOURCE: Adapted from *Kigyo Keiretsu Soran* (Tokyo: Toyo Keizai Shinposha, 1987, 1990, and 1993)

turity and global financial integration. Despite some evidence of marginal changes in the system, OTA interviews and analysis indicate caution in the interpretation and projection of those changes.

To some extent, the weakening of equity ties between financial intermediaries and Japanese MNEs during the late 1980s and early 1990s reflected the unusual circumstances of Japan's financial bubble. Although the bubble weakened some cross-equity linkages, it actually reinforced others—particularly those of the older, core keiretsu. The bursting of the bubble encouraged a number of firms to repair their financial relationships, despite the fact that major banks were having severe difficulties. In this regard, the publicized instances of firms selling off their holdings in banks appear to be exceptions to the rule, especially in keiretsu networks.

Senior Japanese executives quite openly explained to OTA that selling member holdings risked retaliation. This is not to say that the system is inflexible. Many companies have rationalized their cross-shareholdings and reduced their volume. However, since the number of shares held is often unrelated to the degree of inter-corporate influence, neither development necessarily implies the unraveling of the cross-shareholding system.[16] Certainly within the major keiretsu, changes in the cross-shareholding system over the past decade show almost no decrease. Table 7-5 illustrates this pattern within six major keiretsu.

Within Japan's corporate networks, managers are frequently disciplined by their bankers or related companies for poor performance, although the system may also effectively allow them to defer painful decisions. Obviously weak firms, however, tend to be quickly and quietly liquidated or merged. Nissan, for example, effectively took over the management of Fuji Heavy Industries (manufacturers of the Subaru marque) in 1990. At the time, Nissan owned only 4 percent of Fuji's shares, but the two companies collaborated intensively and shared managerial staff. The de facto "takeover" occurred without any debt being restructured or any transfers of stock between Fuji major shareholders. The role of financial institutions is critical in such cases, and analysts have gone so far as to depict the direct discipline such institutions can exercise as the functional equivalent of a U.S.-style market for corporate takeovers. [7]

At certain points in Japanese history, government played the key role in nurturing this form of

16 One analysis of the issue, for example, found no evidence that the influence of financial institutions diminished during the booming 1980s. See F.R. Lichtenberg and G.M. Pushner, "Ownership Structure and Corporate Performance in Japan," Working Paper No. #4092, National Bureau of Economic Research, June 1992. On the lack of a direct relationship between ownership per se and effective influence, see Schaede, op. cit., footnote IO.

17 Ibid., and Kester, 0p. cit., footnote 12. This theme will be taken up again in ch. 8.

corporate governance. In addition to encouraging cross-shareholdings and carefully shaping the institutions that would manage corporate finance, it accepted cautious disclosure standards, and sometimes sanctioned cartel-like arrangements (especially in troubled industries) and other business practices that had the effect of restricting market access.[18] Certainly during the past two decades, the direct impact of government has been more subtle, but its residual influence is still important. As corporate officials repeatedly told OTA, even during a period of political instability, officials within the relevant ministries remain capable of dispensing "administrative guidance."[19]

In short, the Japanese system of corporate governance renders the managers of Japanese MNEs accountable to others, including a wide range of stakeholders as well as governmental authorities. But that same system has freed them from the need to focus their strategies rigidly on achieving high, direct, and near-term returns to shareholders.[20] This has enabled most Japanese MNEs to pursue the kinds of longer-term strategies required to develop and commercialize new technologies. The system has also provided those MNEs with implicit safety nets in the event of serious managerial mistakes or unanticipated market shocks. Among other things, the existence of such safety nets can explain why outright corporate bankruptcy in Japan appears to be less frequent among large firms and less costly than in the United States. It also accounts in part for the oft-noted ability of Japanese MNEs to downplay short-term calculations of return on investment for long periods of time while market shares abroad are established or defended. Finally, whether deliberately or not, the system has worked to discourage new entrants—both foreign and domestic—to Japanese markets, especially but not exclusively when entry has been sought by way of acquisition.

The relationships that underpin particular Japanese MNEs may shift overtime, but periods of turbulence often bring to light not the fragility but the durability of traditional patterns. In contrast to the American system, the Japanese system of corporate governance well deserves the label "alliance capital ism."[21] The system has commanded respect from outsiders, not in the least because of its apparent effects on long-term managerial thinking and investment in key technologies. While the system may be under unusual strain today, it is more difficult to imagine its demise than its adaptation to new circumstances.

CORPORATE GOVERNANCE IN GERMANY

Despite the economic troubles it encountered in the years following unification, German y remains the industrial leader of Europe.[22] The European technology base continues to be influenced more by German industry than by that of any other European country. To be sure, French, Dutch, U. K., and Swiss MNEs dominate particular industrial

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18 See J.A. Hart, *Rival Capitalists: International Competitiveness in the United States, Japan, and Western Europe* (Ithaca, NY: Cornell University Press, 1992), ch. 2; D.J. Encarnation, *Rivals Beyond Trade: American versus Japan in Global Competition* (Ithaca, NY Cornell University Press, I 992).

19 See also U. Schaede, "Change and Continuity in Japanese Regulation," Working Paper 66, Berkeley Roundtable on the International Economy, University of California, March 1994.

20 Compared to U.S. managers, the relative freedom of Japanese managers from immediate shareholder interests is Illustrated by the failed efforts of U.S. pension funds to influence the management decisions of several Japanese corporations at their 1993 annual meetings. See J. Sterngold, "Japanese Companies Rebuff Mighty U.S. Pension Funds," *The New York Times,* p. D], June 30, 1993.

21 M. Gerlach, *A//lance Capitalism: The Social Organization of Japanese Business* (Berkeley: University of California Press, 1992). See also Lichtenberg and Pushner, op. cit., footnote 15.

22 This leadership was underlined when profits began a sharp rebound in early *1994* in a number of core German industries. See K.L. Miller and D. Wise, "Slash and Earn on the Continent," *Business Week (3369). 45-46,* May 2, 1994.

sectors. But German MNEs continue to hold the key to the evolving integration and development of European industry in general.

Like American and Japanese MNEs, German MNEs are embedded in a distinctive system of corporate governance with deep roots. The system is distinguishable from that of France, and it differs quite markedly from that of the United Kingdom; in some ways, it is similar to that of Japan. Although currently under some stress, the German system comprised a critical component of the country's initial industrialization and of its recovery and growth after World War 11.[23]

Germany's corporate governance, together with the country's approach to regulating the broad framework within which government, corporations, and labor unions continually negotiate their respective adjustments to market conditions, produces an advantage in a number of industrial technologies.[24] Germany has been a leader, for example, in high-performance transportation systems, automotive components, inorganic chemicals, metals processing, and machine tools. While not known for the creation of startling new innovations in other sectors, Germany has been a world leader in effective technological diffusion.[25] It has excelled at refining new production and process technologies and spreading their effects across a broad industrial base.

By the early 1990s, German industry had confronted the challenge of adapting its traditional corporate governance system and technology base to a much more competitive global and regional environment.[26] Productivity levels had not kept up with world standards, and unit labor costs had swollen in relative terms. Successful adaptation was recognized as crucial to regaining the country's position across the industrial sectors in which it had long excelled. The challenge of broadening and diversifying its technology base appeared even more formidable, since fundamental changes might be needed to achieve such goals. Indeed, given the social and political difficulties associated with such changes, pessimism concerning the technological future of German industry has been in vogue. OTA analysis, however, supports a more balanced view. German industry is adjusting within the constraints posed by its traditional system of corporate governance. That system may be reshaped, but it will not likely be abandoned. Negotiated and incremental reform is probable.

Managers of American MNEs often remark on the ability of their German counterparts to operate with a high degree of apparent independence from shareholder pressures for immediate returns. The common view is that this independence has been crucial to the maintenance of stable levels of investment in the technologies at the center of leading German industries. There is an element of truth in this, but the ability of German industrial managers to plan with other than short-term profit-maximization goals in mind derives from the fact that German managers have been able to convince shareholders to take a long-term view. Moreover, German corporations typically rely on their bank relationships for long-term lending, and obtain a relatively small portion of the firm's finances through the stock market. In such a context, German managers have really not been more autonomous than American managers. They have

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23 See A. Gerschenkron, *Economic Backwardness in Historical Perspective* (Cambridge, MA: Belknap, 1962).

24 For background, see P.J. Katzenstein, *Politics and Policy in the Federal Republic of Germany: The Semi-Sovereign State* (Philadelphia, PA: Temple University Press, 1987); A.S. Markovitz, *The Politics of the West German Trade Unions* (Cambridge, UK: Cambridge University Press, 1986); and K. Thelen, *Union of Parts: Labor Politics in Postwar Germany* (Ithaca, NY: Cornell (University Press, 1991).

25 K. Wever and C.S. Allen, "The Financial System and Corporate Governance in Germany: institutions and the Diffusion Of Innovations," *Journal of Public Policy 13(2): 183-202,* April-June 1993.

26 See H. Giersch, K. paque, and H. Schieding, *The Fading Miracle: Four Decades of Market Economy in Germany* (Cambridge, UK: Cambridge University Press, 1992).

TABLE 7-6: Composition of the Supervisory Boards of the 100 Largest German Enterprises (in percent)

Individuals from	comprise
Private banks	7
Other banks	2 2
Insurance companies	1 6
Trade unions	12,4
Other employee representation	36.3
Industry representation	25,8
Other shareholder representation	10,2
Government (political parties and civil servants)	*4 5*

SOURCE: Federal Association of German Banks, cited in E.R. Schneider-Lenne (Deutsche Bank) The Role of German Capital Markets, the Universal Banks Supervisory Boards and Interlocking Directorships, " paper prepared for National Economic Development Off Ice Policy Seminar London, Nov. 21-22, 1991

simply been subject to different pressures, some of which can be quite severe.

German law distinguishes between two types of companies with limited liability: joint stock companies, which are publicly owned and listed (Aktiengesellschaft (AG)); and privately held, unlisted companies (Gesellschaft mit beschraenkten Haftung (GmbH)). German MNEs come in either form. Daimler-Benz, for example, falls in the former category, while Robert Bosch falls in the latter. Since most large German firms are joint stock companies, however, the emphasis in this assessment is on AG firms.

Under the terms of the 1976 Co-Determination Act, in a company with more than 2,000 employees, half of the supervisory board must comprise directors chosen by the shareholders and half by employees; one of the labor representatives must come from middle management or higher. Table 7-6 breaks down the composition of the boards in the 100 largest German enterprises. The chairman is elected by the shareholders' representatives, all of whom are outsiders, and has the ability to vote twice—and consequently break tie votes. The supervisory board appoints a management board, usually of 10 persons; by law, those managers are provided with a formal contract extending from one to five years.[27]

Although they have formal responsibilities for reviewing management contracts and providing general oversight, German supervisory boards have often been depicted as passive organs. In fact, the chairman in particular is usually involved in the most important strategic and financial decisions of a company. The boards also play a critical disciplinary role when the company gets into trouble. Their direct intervention in management, in such an event, serves a function akin to hostile takeovers in the American system. To participants and close observers, the German method of encouraging corporate restructuring when required has the notable advantage of precluding the asset-stripping, short-term planning, and social disruption characteristic of the American and British corporate takeover battles of the 1980s.[28]

Beyond the prominent role given to employee representatives, the most distinguishing characteristic of the German system is the critical role played by banks. The leading industrial banks, especially Deutsche Bank, Dresdner Bank, and Commerzbank, are "universal" banks. This means they are permitted to engage in a wide range of commercial and investment banking activities under one roof. Throughout modern German history, such powers have made them the key providers and organizers of capital for the establishment and growth of German corporations.

27 For a description of the board structure of German joint stock companies, see U. Schaede, "The Creation of a New System of Corporate Governance for the EC: An Integrative Model of the Anglo-American and Germanic Systems," Graduate School of International Relations and Pacific Studies, University of California, San Diego, June 1994, pp. *9-12.*

28 *See,* for example, E.R. Schneider-Lenné (Deutsche Bank), "The Role of German Capital Markets, the Universal Banks' Supervisory Boards, and interlocking Directorships," paper prepared for National Economic Development Office Policy Seminar, London, Nov. 21-22, 1991.

Without them, Germany's industrial and technology base would look quite different than it does today.

The role of the banks, which is discussed further in chapter 8, is reflected in Germany's corporate governance system. Bankers hold nearly 10 percent of all nonemployee seats on the supervisory boards of the 100 largest nonfinancial companies in Germany. Moreover, in the largest companies, the lead bank (Hausbank) often provides the chairman of the supervisory board. Given the fact that there are relatively few banks involved at the highest level of corporate finance in Germany, this means that many supervisory boards in Germany are interlocked.[29]

Underpinning such linkages, as in the case of Japan, are significant cross-shareholdings. It is not uncommon for a corporation's leading creditor to hold between 10 and 20 percent of its voting shares. [30] Combined with cross-shareholdings involving suppliers, major customers, and other firms, intercorporate shareholding frequently meets or exceeds half of the voting shares in many German firms. Even when that is not the case, however, the practicalities of Germany's depository voting system often enable the lead bank of a joint stock company to control well over 50 percent of its shares. Unlike in the U.S. system, shares are issued in bearer form, and the depository institution-most often a bank—has the right to vote on them without specific authority from the actual shareholders. [31]

The connection between owners, managers, and creditors is even more intimate in Germany's privately held companies, many of which now have operations on a global scale. The autoparts and equipment maker, Robert Bosch GmbH, provides an example. When the company's founder died 30 years ago, most of his shares were transferred to a foundation that bears his name. Among other things, the foundation now provides the bulk of the financial resources for a hospital located in the town where the company is headquartered. For dividends to flow to the hospital tax-free, however, voting rights connected with the shares were transferred to a supervisory board comprised first of seven and now nine members. Board members choose their own successors, typically including the retired chairmen of the company itself, its lead bank, other large corporations, and associated labor unions .32

In practice, the role of the supervisory board at Bosch is limited, and the company's managers enjoy a high degree of operational autonomy as long as the overall performance of the firm is satisfactory.[33] In practice, its managers have more than met that standard. As the company has grown, the shareholding structure, in particular, has enabled it to maintain stable and relatively low dividend payouts to the Bosch Foundation, while simultaneously building up substantial internal reserves. Those reserves, in turn, have allowed the company to invest continuously in the technological foundations upon which its high reputation and market advantages rest.

Beyond the legal features of Germany's shareholding system, commentators frequently note

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[29] For detailed analysis, see R. Ziegler, D. Bender, and H. B iehler, "Industry and Banking in the German Corporate Network," *Networks of Corporate Power*, F.N. Stokeman et al. (eds.) (Cambridge, UK: Polity, 1985).

[30] Under the terms of new legislation, public companies are required to disclose the identities of shareholders owning stakes of more than 5 percent. "German Corporate Goverance Stirring Things Up," The *Economist* 329(7842)72-73, Dec. 18, 1993.

[31] Formerly automatic and of indefinite duration, legal reforms now require the right of proxy voting to be reviewed by the true shareholders on a regular basis, and the banks must now solic it voting instructions. In practice, the banks retain a high degree of control. For additional discussion of Germany's depository voting system, see ch. 8.

[32] For U.S. tax purposes, the IRS considers the nine board members to be [he ultimate holding company. OTA interview, Germany, Nov. II, 1993.

[33] The supervi sow boards of privately held firms function very differently than those of joint stock companies. Board members of GmbH firms can sell their shares (rely in round lots, and must receive permission from the owner or the board to do so.

that the center of gravity in its corporate governance structure is in the reciprocal and enduring relationships that exist between the few individuals representing the various groups most involved in the life of a corporation. These relationships rest on a deep sense of mutual trust, which is reinforced by continual interaction. That trust tends to be backed up, however, by the certainty of severe, if informal, sanctions in the event of breaches. Although similar in nature to the ties that bind keiretsu and other intercorporate alliances in Japan, the relationships in Germany appear to be more broadly based, overlapping, and inclusive.

With the banker frequently playing a crucial coordinating role in the most prominent German MNEs, the system balances the interests of corporate stakeholders. To be sure, there are critics, some quite vocal, who would like to shift the balance toward noncorporate shareholders, as in the American system. Few objective observers, however, are predicting their imminent success. OTA interviews with the managers of important German MNEs support such a conclusion.

Although it is now conventional to depict Germany's recession and painful economic restructuring in the early 1990s as exposing cracks in its system of corporate governance, the causal arrows in such an argument probably should be reversed. The apparent efforts of some German companies (most notably Daimler Benz) to diversify their over-concentrated shareholder bases by issuing shares in the United States should not be misunderstood. Such tactical moves do not necessarily presage the dismantling of board interlocks or extensive corporate cross-shareholdings. As one senior executive from a leading German MNE told OTA, "The core of the German company remains in its financial structure and the associated mentality of its most senior managers. " The priority is to finance new acquisitions and diversification plans out of retained earnings and hidden reserves, thus avoiding the dilution of control that can occur when significant amounts of capital need to be raised externally. Having to raise external capital is widely seen as a sign of weakness. This view may be wrong, but it will likely take considerable time before it is revised.

German executives interviewed by OTA, in fact, suggested that Germany's current economic difficulties are reinforcing the traditional system of corporate governance rather than breaking it apart. Senior officials from one of Germany's leading universal banks, for example, were forthright in explaining that a number of clients, which had sought to loosen their ties with the bank during the booming 1980s, had abruptly reversed course in the 1990s. Accordingly, they expected the system to be deepened by the difficult restructuring process most German corporations must go through in the years ahead. Significantly, no corporate managers interviewed by OTA demurred from that opinion. At most, they expected a few large German MNEs to diversify their capital bases by bringing in new minority shareholders. Most saw Daimler Benz's recent foray into American capital markets in this light. Indeed, the consensus among the leaders of German banks and MN Es, if expressed frankly, would be that the loss of control to the capital markets, typically associated with American and British MN Es. was to be avoided at all costs.

Such a goal, of course, complicates the task of reshaping and reinvigorating Germany's industrial and technology base. In particular, the risk is that it will stunt the development of broad domestic capital markets and thus prevent small and medium-sized German companies from raising the financing that might support new technological innovation. On the other hand, assuming that large German companies regain their competitive edge (by, for example, scaling back their real wage costs and markedly increasing productivity), preserving the core of the traditional system of corporate governance could once again provide German MNEs with stabilizing financial advantages in the global marketplace. Assisting in this regard will be other aspects of the German industrial system. including its accounting rules (see box 7-1).

CONCLUSIONS

American, German, and Japanese MNEs differ in the relative priorities they assign to the maximization of shareholder value, the satisfaction of cus-

BOX 7-1: Corporate Governance and National Accounting Standards

Germany's Daimler-Benz began arranging in 1993 to list its shares on the New York Stock Exchange. A 3.2 percent stake in the corporation was to be offered for sale from shares held by Deutsche Bank. Daimler officials told OTA that the move comprised part of a larger effort to raise the firm's profile in the United States at a time when it was putting up a new plant in Tuscaloosa, Alabama, and otherwise trying to maintain and build its business in this country. Press reports indicated that another motivation came from Deutsche Bank, which wanted to reduce its 28.1 percent equity stake in Daimler. In order to conform to S.E.C. requirements, the firm agreed to translate its financial statements in accordance with generally accepted accounting principles in the United States. In December 1993, after a disastrous downturn in its core businesses, the company reported in Germany that it had lost DM181 million (or $105.4 million) during the previous nine months. Under American accounting rules, however, it had to report that loss as DM2.05 billion (or $1.19 billion).[1]

Differences in national accounting rules have long made life difficult for international bankers, stock market analysts, and investment fund managers. But do those differences affect basic business strategies and skew the terms of global competition? An expanding body of research suggests that the answer to that question is in the affirmative. As two leading commentators put it, "Accounting consequences [of business decisions] are especially relevant in matters of global competitiveness. Global businesses are helped or hindered, as the case may be, by national accounting rules."[2]

The case of Daimler's New York listing reminded market observers of the impact of one key rule difference, namely the existence of hidden reserves in German corporations, which are used in part to stabilize the historic path of reported earnings. Such reserves, the legacy of periods in German history when capital for industrial development or reconstruction was scarce and had to be raised quickly, can today be created in a number of ways. German firms, for example, frequently make large provisions out of current earnings for future contingencies. Governmental rules encourage such conservatism by allowing provisions to be added to corporate pension funds and other accounts before taxes are calculated. A relatively high marginal tax rate on reported profits, on the other hand, discourages firms from not making such provisions. Hidden reserves also can be created by the practice of carrying long-term investments on the balance sheet at historic book value, a practice common in both Germany and Japan.[3]

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[1] F. Protzman, "Daimler Benz Reports Sizable Loss," *The New York Times*, p. D5, Dec. 16, 1993; C. Parkes and D. Waller, "Daimler Plans Roadshow for U.S. Stock Offering: Innovations at Germany's Largest Industrial Group," *Financial Times*, p. 21, Dec. 16, 1993. For background, see W. Cooper, "Discovering the Foreign Investor," *Institutional Investor* 27(7):81-84, July 1993, pp. 81-84; also see G. C. Biddle and S.M. Saudagran, "Foreign Stock Listings: Benefits, Costs, and the Accounting Policy Dilemma," *Accounting Horizons* 5(3):69-80, September 1991.

[2] F.D.S. Choi and G.G. Mueller, *International Accounting* (Englewood Cliffs, NJ: Prentice-Hall, 1993), p. 81. Also see F.D.S. Choi and R.M. Levich, "Behavioral Effects of International Accounting Diversity," *Accounting Horizons* 5(2):1-13, June 1991, and by the same authors, *The Capital Market Effects of International Accounting Diversity* (New York: Dow Jones-Irwin, 1993).

[3] H.D. Lowe, "Shortcomings of Japanese Consolidated Financial Statements," *Accounting Horizons* 4(3):1-9, September 1990. On this and related dimensions, it is clear that accounting rules and tax policies need to be analyzed together. The international consequences of basic differences in approach are becoming much more important. For a comprehensive and policy-focused analysis, see G.C. Hufbauer, *U.S. Taxation of International Income: Blueprint for Reform* (Washington, DC: Institute for International Economics, 1992). Also see D.W. Jorgenson and R. Landau (eds.), *Tax Reform and the Cost of Capital* (Washington, DC: Brookings, 1993); Arthur Young & Company, *The Competitive Burden: Tax Treatment of U.S. Multinationals*, A Tax Foundation Special Report, Washington, DC, n.d.; A. Razin and J. Slimrod (eds.), *Taxation in the Global Economy* (Chicago: University of Chicago Press, 1990); D.J.S. Brean, "Policy Perspectives on International Taxation," *Key Issues in Tax Reform*, C. Sandford (ed.), (Bath, UK: Fiscal Publications, 1993); and R.M. Bird, "Shaping a New International Tax Order," *Bulletin-for-International-Fiscal-Documentation* 42(7):292-391, July 1988.

BOX 7-1 continued: Corporate Governance and National Accounting Standards

The lack of transparency with regard to hidden reserves is surely intentional. Such methods can help corporations cope with various sources of uncertainty in their markets. In addition, by smoothing out earnings, they can assist in maintaining the confidence of creditors and investors. Although the building of hidden reserves occurs in full conformity with tax rules, and indeed, to some extent is driven by those rules, it also provides corporations with strength when it comes to fundamental strategic and investment planning. Even the illusion of strength can translate into competitive advantage. For example, partners or competitors might draw comfort or discomfort, as the case may be, from the assumption that a firm has plentiful resources to be called upon to support the successful implementation of strategic plans. But a lack of transparency can have costs, especially when a firm under pressure needs to find new sources of financing.[4]

Accounting rule diversity reflects the fact that countries and companies have made different tradeoffs between debt and equity financing in their pursuit of industrial development. A culture of managerial conservatism, tax policies, preferences for indigenous control, and deeper historical and social factors influence such tradeoffs. It does not take a bold leap of imagination, for example, to make the connection between accounting rules that foster the husbanding of resources within a German corporation and the traditional German concept of a community (Gemeinschaft), which must look after its own needs in the context of a hostile external environment.

Beyond the issue of hidden reserves, major areas of differences in basic accounting principles across the industrial world arise on such items as research and development, fixed assets, inventory, leases, income taxes, foreign currency translation, mergers and acquisitions, and consolidation.[5] Japan, France, Switzerland, and a handful of other countries, for example, often allow R&D expenses to be capitalized rather than deducted from current earnings. Under such a rule, only the current year's depreciation reduces those earnings. This provides an incentive to raise R&D expenditure levels or to maintain them over the full course of an economic cycle. Such a rule can facilitate long-term planning and consistent strategic implementation. It also suggests new policy dilemmas as divergent systems come into more direct contact with one another through the aegis of expanding multinational competition.

[4] See G.A. Ndubizu, "Accounting Disclosure Methods and Economic Development," *The International Journal of Accounting* 27:151-214, 1992.

[5] See P.R. Peller and F.J. Schwitter, "A Summary of Accounting Principle Differences Around the World," *Handbook of International Accounting*, F.D.S. Choi (ed.) (John Wiley & Sons, 1991), ch. 4. Also see R. Bloom and M.A. Naciri, "Accounting Standard Setting and Culture: A Comparative Analysis of the United States, Canada, England, West Germany, Australia, New Zealand, Sweden, Japan, and Switzerland," *The International Journal of Accounting* 24:70-97, 1989.

tomer needs, and the stabilization of employer-employee relations. Unique patterns of corporate ownership and control, and associated differences in relations between owners and managers, appear crucial (see table 7-7).

The dispersion and mobility of shareholders in the United States seem to fixate the managers of American corporations on short-term financial performance. This is not necessarily a bad thing, unless those corporations are engaged in global competition with rivals capable of longer-term thinking.[34] German and Japanese MNEs have demonstrated just such a capability in the past.

[34] For legal analysis and debate, see J.C. Coffee, "Liquidity Versus Control: The Institutional Investor as Corporate Monitor," *Columbia Law Journal* 91 (6) 1276-1368, 1991.

TABLE 7-7: Ownership Structure of Publicly Listed Corporations (in percent)

	United States	Japan	Germany
Banks	0.3	25,2	8.9
Insurance companies	5.2	17.3	10.6
Pension funds	24.8	0.9	—
Investment companies	9.5	3.6	—
Nonfinancial businesses	—	25.1	39.2
Households	53.5	23.1	16.8
Government	—	0.6	6.8
Foreign	6.7	4.2	17,7

SOURCE Central banks and stock exchange data, 1991, adapted from WC. Kester, "Industrial Groups as Systems of Corporate Governance, " *Oxford Review of* Economic *Policy,* 8(3) 33, table **4,** autumn 1993

The concentration of corporate ownership in Germany and Japan helps explain their longer-term, customer- or employee-focused strategies. As two analysts recently put it:

> In contrast to the United States' primary focus on shareholder value, these other countries' corporations are seen as durable national assets that serve a broad base of constituents. Quality products, market share, and employment are just as legitimate as goals as return on shareholder investment. While some U.S. top managers and directors prefer this perspective themselves, they are swimming against the dominant national tide.[35]

Such differences are reflected not only in the investment decisions of particular firms, but also in the nature of the national technology bases those firms have created and exploited on global markets.

Throughout the post-war period and in various high-technology sectors such as electronics, transportation systems, and others using advanced manufacturing techniques, Japanese MNEs became noted for pursuing aggressive strategies keyed on market share, not return on investment. Corporate governance structures, accounting conventions, and public policies at home contributed to their ability to design and implement such strategies. Those structures fostered balanced relationships and an enduring sense of trust, especially among employees, managers, and institutional owners. They facilitated the sharing of information across allied firms. Most importantly, they rendered the providers of base capital patient, while simultaneously attempting to limit the scope for managerial abuse. Periodic scandals indicate that the latter attempt can fail. Japanese consumers, moreover, continue to bear significant opportunity costs associated with this patient capital system. Meanwhile, Japan's massive trade surplus and international investment imbalance indicate the external consequences of such a system.

The Japanese system of corporate governance spreads large volumes of minority equity claims among lenders, customers, suppliers, and affiliates. Despite some recent flux, OTA interviews indicate that rather than changing in a fundamental way, the current corporate restructuring is an attempt to come to grips with unforeseen consequences: the creation of surplus capacity in sectors where growth has turned down dramatically, ill-advised diversification (especially into U.S. and

35 Lorsch and MacIver, 0p. cit., footnote 6.

Japanese commercial real estate), poor management of cash reserves built up during the 1980s, and associated financial scandals.

The managers of Japanese MNEs are aware that charting their way through the current difficulties and recapturing technological advantages may well depend upon maintaining the essential structure of their equity bases, the confidence of their lead banks, and the loyalty of long-term employees, suppliers, and affiliated companies. The possibility of retaliation for breaches in network solidarity is not abstract. Bankers and MNE managers both maintained in interviews that all firms in industrial groups understood well the fact that companies contemplating appreciable sales of shares in related banks or companies would elicit immediate retaliation. Although marginal adjustment in some corporate ownership structures is occurring, it typically reflects mutual negotiation between the firms involved. The sense of responsibility for collectively managing the process of national economic restructuring within tight traditional constraints remains palpable.

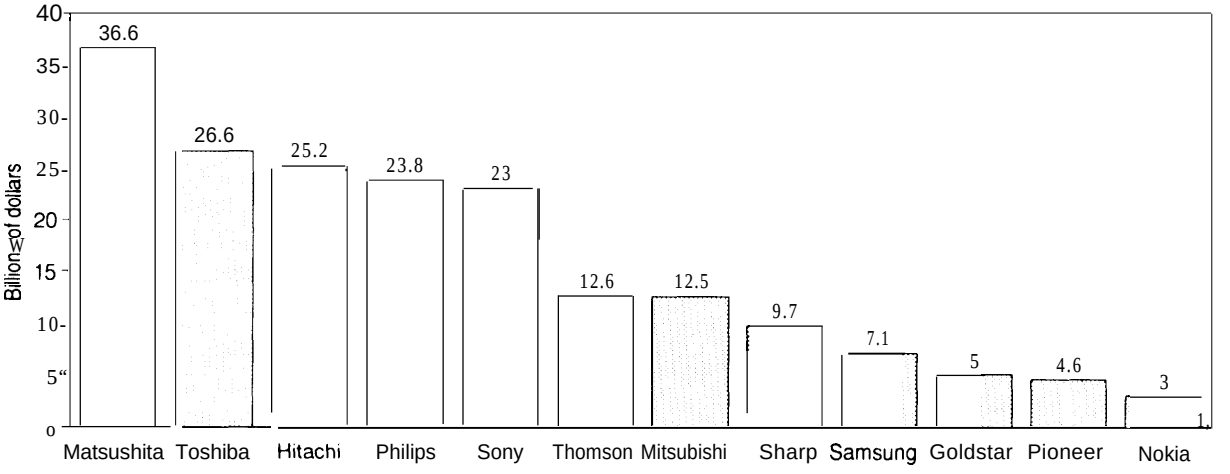
Parallels exist in Germany. The overarching system of corporate governance has in the past provided German MNEs with the financial stability necessary to build and exploit technological advantages in key industrial sectors. Together with a unique accounting system, it reinforced long-term relationships between stakeholders and enabled substantial reserves to be built up. Those reserves, and the knowledge that owners and creditors will not abandon firms at the first sign of trouble, encouraged managers to pursue long-term strategies. Cross-shareholding is a critical part of the traditional German system, but it is less extensive than its analog in Japan. Long-term bank relationships, combined with the depository voting system, provide an alternate source of stability. In addition, interlocking supervisory boards in Germany play a much more important role both in disciplining managers and encouraging long-term thinking.

The consequences of the German system can be seen in a number of sectors, but perhaps most obviously in the chemical and automotive sectors. Hoechst's purchase of Celanese, the steady expansion of BASF in the United States, the simultaneous building of major new plants by BMW in Bavaria and South Carolina and by Mercedes Benz in Alabama and Baden-Wuerttemberg--all require a highly developed ability to endure short-run perturbations in tough markets. Traditional corporate governance structures and accounting rules have helped foster just such an ability in the past. There is little reason to assume that they will not do so again in the future. Similar structures underpin high-profile MNEs based in Germany's EU partners, and nowhere is this clearer than in the U.S. consumer electronics market. The story of the abandonment of that market by once-dominant domestic firms is a long and involved one. Respected analysts, however, have emphasized strategic mistakes made by American corporate managers and the extremely high costs that would now have to be absorbed to regain their original positions.[36] But underlying governance structures enabled two non-Japanese firms based outside the United States to calculate their strategic options in a different light, and therefore to stay in a market whose top tier is now dominated by a few Japanese firms (as shown in figure 7-2).

There is a connection between the survival of Thomson Consumer Electronics and Philips Electronics in the U.S. consumer electronics market and the nature of their respective shareholder bases. Although privatization plans for its parent company have been looming for several years, Thomson is in reality owned by the government of France. Common shares in Philips are more widely held; the company relies on no one lead bank

36 See A Chandler, "Chemicals and Electronics: Winning and Losing in Post-War American Industry," pre-publication manuscript, Harvard Business School, November 1993. The author notes that the domestic market for consumer electronics grew at a compound rate of 15.2 percent between 1976 and 1986, but the share produced domestically plummeted from nearly 100 percent in 1950 to about 5 percent in the late 1980s. After 1986, the consumer electronics operations of all but one major U.S. firm, Zenith, had been acquired by foreign MINEs.

FIGURE 7-2: World's Leading Consumer Electronics Firms, by 1991 Electronics Sales



NOTE: Electronics sales are revenues earned by each company from sales of electronic products and services

SOURCE "The Electronics Business International 100, *"Electronic Business 18(12) 84-85,* December 1992

and its shareholders include foreign investors. However, a controlling block of voting rights, connected to special preference shares, remains vested in a foundation (Stichting Preference Aandelen Philips). That foundation, in turn, is controlled by a small board comprised of members of Philips' supervisory board and descendants of the founding family.[37] Combined with advantages generated by strong cash-flow from other operations, Philips did not face the takeover threats that helped shape the thinking of American rivals in the 1980s. To be sure, neither company is assured of future success. Especially in the United States, the market remains difficult, basic research has come under severe pressure, and long-run profitability is far from certain. The point, however, is that the dominant surviving players in a key technology sector are all embedded in corporate governance systems that differ markedly from the system characterizing most publicly owned corporations in the United States.

The three systems of corporate governance compared in this chapter each have their own strengths and weaknesses. It is important to emphasize, however, that they are all deeply rooted in distinctive national histories. The scope for drawing useful lessons from one system and applying them directly to another is therefore severely limited. Moreover, despite the expanding cross-jurisdictional operations of MNEs and the resulting insertion of particular forms of corporate governance into alien environments, convergence appears to be a long-run prospect at best. The challenge is to find new ways to balance across the Triad the benefits that result from the activities of MNEs without allowing their intensifying competition to compromise core values reflected in traditions of corporate governance. Frictions created by the deepening interaction of diverse systems of corporate governance must be managed. They cannot be assumed away.

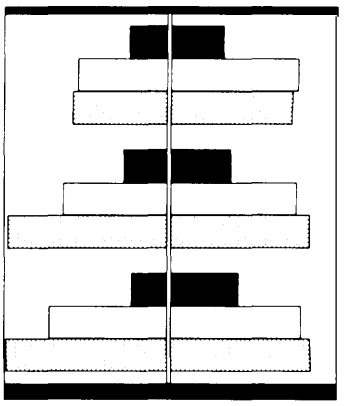
[37] The 1993 Annual Report of phi lips Electronics N.V. makes clear (on pages 62 and 63) that one of the purposes Of the foundation is to prevent unwanted overtures from other corporations. In this regard, the report states: "Should a situation arise in which the acquisition of a controlling influence in Philips Electronics N.V. by a third party appears imminent, the Foundation may resolve to exercise [the right to acquire] as many preference shares as there are common shares in Philips Electronics N. V."

Corporate Finance and National Technology Systems

8

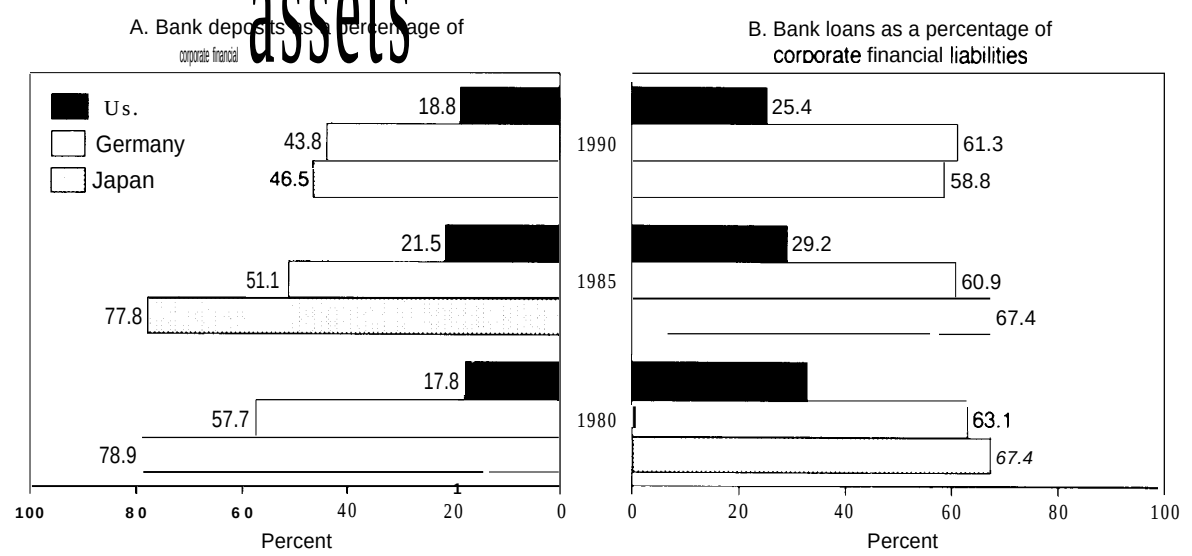
As the previous chapter noted, the corporate roles assigned to banks and other financial institutions constitute one of the starkest differences between American-style capitalism and other systems. Chapter 6 of the first report in this assessment provided an orientation to the changing international financial environment within which MNEs operate.] This chapter examines continuing differences among national financial structures and explores their impact on the investment strategies of MNEs and thereby on national technology bases. Once again, the focus is on the United States, Japan, and Germany, but not to draw lessons from one case for application to another. The point, rather, is that national differences are likely to persist and need to be taken into account by governments seeking stable expansion of international trade and investment across the Triad. Despite the fact that MNEs now have a wider array of financial options open to them, the nature of their respective strategies continues to be profoundly influenced by financial structures prevailing in their home countries.

In the United States, banks provide MNEs mainly with secondary financing, cash management, and other finance-related services. The trend has been for corporations to reduce their reliance on commercial bank financing, and to fund their long-term requirements from internal retained earnings or directly from bond and stock markets.



[1] U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest: Playing by Different* Rules, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September I 993).

FIGURE 8-1: Indicators of the Relative Importance of Banks in the Financing of Corporations in the United States, Germany, and Japan



SOURCE: International Monetary Fund, *International Capital Markets Developments, Prospects, and Policy Issues* (Washington, DC International Monetary Fund, 1992), p 3

In Japan and Germany, conversely, banks have long played critical coordinating and steering roles in the ongoing process of national industrial and corporate development. Before the bubble burst in Japan, commentators frequently noted that the centrality of banks was breaking down and Japanese MNEs were becoming more independent. Today, the trend is not so clear. In Germany, on the other hand, banks have never ceased to play their central roles. Figure 8-1 illustrates these national differences.

Both OTA interviews and an expanding scholarly literature suggest that the roles assigned to banks, as well as the basic structure of national capital markets, affect the competitiveness of both MNEs and the technology bases of the countries in which they are based. Corporate performance in particular industrial sectors where the core technology is in a stable stage of development appears to be most affected by cross-national differences in financial structure. During the 1980s in the United States, for example, it was in such sectors that the most aggressive and destructive takeover struggles occurred.[2] Indeed, the experience of such excesses challenged the conventional American view that the structure and operation of its decentralized capital markets were optimal for building solid industries and for diffusing new technologies. This issue is developed further in this chapter after the U.S. system of corporate financing is compared with its analogs in Germany and Japan.

FINANCIAL MARKET STRUCTURE IN THE UNITED STATES

Financial markets in the United States are the world's largest and most dynamic—and most

[2] A. Chandler, "Competitive Performance of U.S. Industrial Enterprises: A Historical Perspective" in *Business History Review*, spring 1994 (forthcoming). Relevant comparative historical analysis is also included in J. Zysman, *Governments, Markets, and Growth: Financial Systems and the Politics of Industrial Change* (Ithaca, NY: Cornell University Press, 1983).

idiosyncratic. Both the timing and relative isolation of American industrialization created conditions that permitted a high degree of political intervention and experimentation. By the middle of the 20th century, the interplay of democratic politics and rapid industrial expansion created a complex and decentralized system of corporate financing. It also created the world's largest pool of venture capital. Not coincidentally, the United States became the world's leader in creating new technologies.

In the nineteenth century, the United States did have a system of corporate financing not unlike those existing in Germany and Japan. Banks could perform both commercial and investment banking functions. They were also allowed to hold equity positions in nonfinancial enterprises. In the wake of a series of financial scandals and crises culminating in the Great Depression, however, new rules were imposed at both federal and state levels of government. Various institutional interests gradually coalesced around those rules.

The first restrictions on the ability of commercial banks to own shares directly in industrial enterprises emerged between 1863 and 1892. Through the vehicle of investment banks, such activities persisted, however, until 1933 when the Glass-Steagall provisions of the Banking Act effectively banned linkages between commercial and investment banks. Bank holding companies came under similar constraints in 1956. In 1970, the so-called "Douglas" amendments to the Bank Holding Company Act ensured that, even indirectly, banks could not own more than 5 percent of the shares of nonbanking companies. They were also precluded from seeking to control such companies in other ways, for example, through cross-shareholding arrangements. Reinforcing such restrictions has been the evolution of bankruptcy law within the United States; creditors to a bankrupt firm can find their claims subordinated if the courts interpret them also to have a controlling equity stake.

The functional segmentation of the American banking industry and the restriction of bank-corporate alliances evolved along a parallel track to the geographic limitation on bank branching. An ambiguous division of regulatory responsibility for banking between federal and state authorities goes back to the nation's founding. Explicit limitations on interstate branching were codified in various state laws, the federal McFadden Act of 1927, the Banking Act of 1933, and the Bank Holding Company Act of 1956. With the emergence of regional banking pacts in recent years and various federal regulatory and legislative developments, rigid rules on branching gradually eroded. Their effect on money-center banks, however, would long be felt.[3] Somewhat more slowly, the functional segmentation of the industry also came under pressure.

The financial-industrial combinations that existed in the United States during the late 19th century, complete with interlocking boards and cross-shareholding, were effectively demolished by the 20th century. The institutional financial arrangements still characteristic of Japanese and German industry have long been considered anathema.[4] Despite prohibitions on formal linkages, however, "relationship banking" characterized American corporate finance at least until the

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[3] A "regional banking pact" is an agreement among individual states, usually contiguous, that allows banks chartered by one another to expand across state lines. "Money-center banks" refer to the large commercial banks, usually federally chartered, based in New York, Chicago, Los Angeles, and other regional financial centers.

[4] F R Edwards and R.A. Eisenbeis, "Financial institutions and Corporate Investment Horizons: An International perspective," background paper prepared for M. Porter et al., *Capital Choices,* A Report to the Council on the Competitiveness and co-sponsored by the Harvard Business School, June, 1992. As Edwards and Eisenbeis put it, "It was the legacy of the 1870-1911 period, however, that cemented concerns with the evils of "bigness." The creation of a decentralized Federal Reserve System in 1913 was in deference to fears about the concentration of banking power. [n addition, the passage of the Bank Holding Company Act of 1956 was rooted in the failure of the Supreme Court to break up the Trans-America Corporation and prevent its attempt to monopolize banking in the western part of the country; and it was a fear of so-called "congeneric" or "near zaibatsu" banking companies that resulted in the restrictions contained in [the Douglas] amendments of 1970."

late 1970s. Practical business relationships between commercial and investment banks and their leading corporate clients were much looser than in Germany or Japan. In the United States, for example, it was much easier for a corporate client to switch lead banks. Nevertheless, most corporations relied on one main lender and one main underwriter. Especially during difficult periods, most corporations could count on their lead banks for patience, special loans, and other strategically useful services. In addition, as they expanded abroad, U.S.-based MNEs could often rely on the support of the international networks of their lead banks.

During the period after World War II, when many of America's top corporations were transforming themselves into MNEs, this form of relationship banking provided a stable financial base. Even this looser form of bank-corporate alliance, however, has been undermined in recent years. Successful corporations built up substantial retained earnings and came to rely less and less on banks for financing. This natural trend was reinforced by technological and regulatory developments, which led to the creation of an array of new debt instruments and new competitors for the banks. In addition, heightened price competition eroded bank profit margins on traditional forms of corporate financing. Over time, the banking industry lost a large portion of its aggregate U.S. market share to nonbank financial institutions, such as pension funds and mutual funds.[5]

The responses of banks to the heightened competition were skewed by the legal restrictions noted above. Within their confines, however, many banks sought new and often riskier clients to take the place of prime corporate borrowers. Many also expanded their overseas operations, as well as their trading and money market activities. Through such avenues, as well as through various regulatory loopholes, commercial banks began poaching the corporate clients of investment banks. Investment banks returned the favor.

All of this activity helped establish the financial conditions in the United States for the spectacular rash of corporate takeovers that occurred in the 1980s. Many formerly staid corporate banks, driven by fierce competitive pressures, even helped hostile buyers acquire their own clients. In so doing, some richly deserved the label "predator" that came to be associated with them in the popular media. By the beginning of the 1990s, few could doubt that the era of relationship banking in the United States was over.

The same could not be said for other countries, however, as is suggested by the retreat of many U.S. banks from foreign markets in the early 1990s. Although markets like Germany's and Japan's were, in a legal and regulatory sense, more open than they had ever been, an increasing number of U.S. banks retreated or scaled back their direct foreign operations because they could not earn enough to justify their expenses. In the competition for high-profile corporate business, they often found themselves up against formidable indigenous banks. Not only could those banks match their pricing, but they also had long-standing linkages with the leading corporations in their markets, linkages often formalized through reciprocal shareholding. As a former senior Treasury official put it, such bonds no longer existed "in the commoditized U.S. market where price is virtually all that matters."[6]

The decline of banks as sources of long-run financial stability for American corporations has not been matched by the rise of other sorts of institutions that could play a role equivalent to that played by lead banks in Germany and Japan. American insurance companies are often pre-

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[5]For data on the sectoral distribution of assets and liabilities overtime, see U.S. Board of Governors of the Federal Reserve System, *Flow of Funds Accounts, 1946-1993: Annual Total Flows and Year-end Assets and Liabilities* (Washington, DC: Federal Reserve System, 1994).

[6]M. Jacobs, *Short-Term America: The Causes and Cures of Our Business Myopia* (Boston, MA: Harvard Business School Press, 1991), p. 153. See also S. Strange, *Casino Capitalism* (Oxford, England: Basil Blackwell, 1986).

TABLE 8-1: Major Industrial Groups in Japan

Former Zaibatsu	New Bank-Centered	New Manufacturer-Centered
Mitsubishi	Dai Ichi Kangyo	Nippon Steel
Mitsui	Sanwa	Hitachi
Sumitomo	Tokai	Nissan
Fuyo	Industrial Bank of Japan	Toyota
		Matsushita
		Toshiba-IHI
		Tokyu
		Seibu

SOURCE Adapted from W.C. Kester, "Industrial Groups as Systems of Corporate Governance," Oxford Review of Economic Policy, 8(3) 29, table 1, autumn 1992

vented by state laws from owning controlling shares of stock in corporations. Mutual funds are discouraged by federal regulations and by the national tax code from concentrating their assets in individual firms; portfolio diversification is central to the investment management business. Similarly, pension funds, now the largest owners of corporate stocks in America, are subject to formal fiduciary obligations that require them to shift out of investments if certain return on investment criteria are not met. Liability laws, governmental regulation, and the mandates given by most plan sponsors encourage portfolio diversification. For better or for worse—and after the 1980s many corporate managers considered it much better-most American MNEs must obtain long-term financing from decentralized capital markets.

If room still remains for debate on specific causal connections and the costs and benefits of reform, a growing number of analysts have noted a correlation between the current structure of U.S. financial markets, the short time horizons of American corporate managers, and specific problems in the national technology base. Those markets are good at harnessing risk capital for the initial development of new technologies. They are less good, however, at assisting in the diffusion of innovations throughout the national technology base and ensuring that the benefits of new innovations are commercialized and fully exploited within the national market. The situation is much different in Japan and Germany.

FINANCIAL MARKET STRUCTURE IN JAPAN

Japan developed its corporate financing system during the Meiji Restoration in the 19th century. Until World War II, its main-bank system looked like Germany 's. The principal corporate alliances, the zaibatsu, coalesced around several large banks. Although the zaibatsu were formally dissolved after World War II, the core role of the banks was retained in the keiretsu system of corporate alliances that emerged in the post war period. As new bank-centered keiretsu and so-called "production keiretsu" (centered around large manufacturing enterprises) evolved during the same period, networks of affliated corporate contractors and subcontractors also tended to cluster their financial relationships around a few banks and trading companies (see table 8-1).[7]

The big change after World War II, however, was the imposition of a U.S.-style separation of financial functions on the market for corporate finance. In effect, the new Article 65 of Japan Securities and Exchange Law imposed a Glass-Steagall-type barrier between commercial bank-

[7] M. Gerlach, *A//lance Capitalism: The Social Organization of Japanese Business* (Berkeley, CA: University of California Press, 1992).

ing and investment banking. Following adoption of the law, the city banks were restricted mainly to short-term lending and deposit-taking functions. Long-term credit banks did what their name implies and funded themselves mainly through the issuance of bank debentures. Securities companies took on the functions of securities' underwriting and ancillary services. One difference between U.S. and Japanese practices, however, centered on the role of bank equity stakes in nonfinancial companies. Currently the ownership limit is 5 percent for both Japanese banks and U.S. bank holding companies. However, in the context of Japan's cross-shareholding system, a 5 percent share is sufficient to reinforce long-term business relationships, preclude hostile takeover bids, and legitimize direct intervention in the event of emergencies. By contrast, financial equity stakes held by U.S. bank holding companies are very restricted and prevent the banks from exerting influence over management.

Banks played the key corporate financing role during Japan's rapid recovery and growth in the 1950s and 1960s. Contemporary Japanese MNEs benefited in the past from the banks' ability to harness and channel scarce national financial resources. Even into the 1970s, banks continued to provide Japanese corporate borrowers with over 60 percent of their external requirements. Securities markets, meanwhile, remained underdeveloped, providing only 7 percent of the country's financing in 1973, a number that would grow only marginally until the mid- 1980s.[8]

Japan's 13 city banks originally concentrated on their corporate lending role, but the market for retail deposits was decentralized. Government used the banking system, as well as an intricate set of public institutions engaged in deposit-taking and policy-based lending, to steer household savings to industry. Banking functions developed under the tight constraints of direct governmental regulation and indirect guidance.[9] In such a context, and given the absence or strict regulation of alternative funding mechanisms, the main-bank system proved critical to the success and rapid global expansion of Japanese MNEs.

The Japanese system provided the financial spark that, through those MNEs, energized the national technology base. As in the case of Germany, the banks played a variety of other roles, not least of which was the provision of fall-back resources. Indeed, it is still common for a corporation's lead bank to dispatch special teams to manage and restructure troubled firms.

In the late 1970s, aspects of the system began to change. The technological and market pressures that promoted a financial deregulatory agenda elsewhere were also at work in Japan. In addition, the leading Japanese MNEs had reached maturity. The corporate bond market began to expand as long-standing interest rate regulation and residual foreign exchange controls were relaxed. As Japanese MNEs built up their own internal reserves, corporate borrowing fell sharply. The banks, in turn, began diversifying their operations abroad. At the same time, banks and other Japanese financial institutions started a long and tendencious process of encroaching onto one another's traditional market segments.

Foreign political pressure reinforced a trend toward deregulation and liberalization. By the end of the 1980s, Japan's financial economy was booming and Japanese financial institutions dominated global markets. It was not uncommon to hear both market participants and observers speculate about the end of the main-bank system and Japan's inevitable convergence toward global norms.

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[8] L. Pauly, *Opening Financial Markets: Banking Politics on the Pacific Rim* (Ithaca, NY: Cornell University Press, 1988), p. 13.

[9] See K. Kate), T. Shibata et al., *Policy-Based Finance: The Experience of Postwar Japan* (Tokyo, JA: The Japan Development Bank, January 1993); also see World Bank, *The East Asian Miracle: Economic Growth and Public Policy* (Washington, DC: World Bank, 1993); and R. Wade, *Governing the Marker* (Princeton, NJ: Princeton University Press, 1990).

A very different story was still unfolding when OTA interviews for this study took place in Japan late in 1993. The deregulation and financial euphoria that dramatically pushed up Japanese stock and real estate prices had long since passed. A deep recession followed a tight credit squeeze. Leading Japanese MNEs and their bankers suddenly found themselves overextended. The city banks, down to 11 from 13 after mergers in 1989 and 1990, now supplied a smaller percentage of the financing needs of large corporations; nevertheless, their role as lenders of last resort and work-out specialists was once again becoming apparent. It was an inauspicious time for a struggling corporation to be caught without a solid relationship to a main bank. Many corporate executives expect the current economic problems facing corporate Japan to be resolved in the traditional way, by concerted efforts within industrial groups to restructure themselves with the active assistance of their bank creditors. Indeed, some expressed relief that the wild ride of the 1980s was over.

In one respect, however, the deregulatory legacy of the past decade appeared likely to endure. By the early 1990s, Article 65 of Japan's Securities and Exchange Law was becoming moot. With the limited but growing role of the banks in underwriting corporate stocks and bonds, some aspects of German-style universal banking appeared to be coming quickly.

FINANCIAL MARKET STRUCTURE IN GERMANY

On December 17, 1993, the entire senior management of Metallgesellschaft, Germany's fourteenth largest industrial conglomerate, was abruptly dismissed by the firm's supervisory board. [10] The dismissal followed reports of massive trading losses in the firm New York office. The chairman of the supervisory board, a senior executive from Deutsche Bank, which along with Dresdner Bank was the company's leading lender and shareholder, publicly criticized the managers for inadequately supervising the New York operation. At the same time, he announced the appointment of a new senior management group charged with turning the company around. It later transpired that losses extended far beyond those of the New York office, and a massive global restructuring of the company ensued.

Reports in the financial press interpreted these events as indicative of the erosion of the traditional German system of corporate management, particularly the role of supervisory boards and banks as shareholders. It is more plausible, however, to reach the opposite conclusion. Crisis makes visible the fundamental principle of German corporate law: Ultimate authority over German corporations remains vested in supervisory boards. And at the core of the supervisory boards of most prominent German MNEs remain the banks.

Supervisory boards typically become more assertive and intrusive when troubles arise. At such times, banks play a crucial coordinating role: they are often lenders, partial owners, strategic advisers, and providers of emergency services, including debt work-outs and assistance in preventing hostile takeovers. Although the scale and timing of Metallgesellschaft's problems led to new scrutiny of the German system, that scrutiny looked unlikely to bring about its dismantling. If anything, the functions of the supervisory board will be underlined and board activism promoted. In this context, the role of banks maybe clarified and streamlined, but it will not likely be diminished. The Economics Minister of Germany implied as much when he publicly urged Metallgesellschaft's banks to assist the company to the extent necessary. German banks have done so in many other such cases before, and the result has been a significant bolstering of their various roles in the direction of corporate affairs.

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10 "The Revolution at Metallgesellschaft," *7'he Economist* 329(7843):90, *Dec.* 25-Jan. 7, 1994; and "Smoking," *The Economist* 330(7844):66, Jan. 8-14, 1994.

The prominence of banks in the German system should not be misunderstood. In many ways, it represents the legacy of Germany's rapid but relatively late industrial development. In the absence of broad and deep capital markets, the banks performed a crucial function in organizing the financial resources required for that development. During the past two decades, the direct financing role of the largest corporate banks declined somewhat as corporations accumulated the internal reserves required to fund future investments. In cases where the ownership role of banks has increased in recent years, financial crisis has usually been the cause. Because it agreed to convert some of its prior loans to equity when Daimler-Benz was having difficulties, for example, Deutsche Bank wound up owning more of the firm than it probably wanted. For that reason alone, the bank had an incentive to become intimately involved in Daimler's efforts to diversify both its corporate assets and its shareholder base.

Among German MNEs, however, the continuing influence of the banks comes mainly from their universal character and from the nature of the proxy voting system. In a universal banking system, banks are empowered to lend funds directly to firms as well as to underwrite their stock and bond issues. In the German case, they can perform these functions for firms in which they themselves have an ownership interest. In addition, the German depository voting systems allows the banks to act as agents for individual shareholders. An individual, for example, usually signs over voting rights to a bank, which serves as custodian for the shares. When votes are to be taken, the bank now tells the shareholder how it intends to vote. Unless the shareholder specifically disagrees-a rarity—the bank controls those shares as well as any shares it holds in its own name. [11]

Germany had recovered successfully from the war by the 1960s and its corporations ostensibly began to reduce their direct reliance on banks. During the next two decades, it is estimated that the banks owned between 5 and 7.5 percent of corporate stock.[12] Under the proxy system, however, they controlled about 60 percent. But that interest was concentrated, and most of it reflected the position of the banks in the leading corporations of the country. The German Monopolies Commission reported in the late 1980s that in only three of the largest German companies did banks or insurance companies directly control a majority of voting shares. At the same time, the Big Three banks held significant minority interests in 13 of the largest 100 firms. The picture changes, however, if the proxy voting system is taken into account. A recent study estimates that through the proxy system banks controlled 34 of the largest German firms in 1975 and 39 in 1988.[13]

The German financial system comprises a large variety of banks and other credit institutions. Commercial banks, of which there are approximately 340, account for about one-quarter of total business financing activity. Of that amount, the Big Three--Deutsche, Dresdner, and Commerz—account for approximately one-third, and most of that activity is highly concentrated on German MNEs. In relative terms, those banks play a much more active role in the financial life of German corporations than do their counterparts in the United States. The German system was reshaped after World War II, and it continues to change. What has never taken root at the highest levels of German corporate finance, however, is a broad and deep de-concentration effort similar to that which decisively transformed the American system by the 1930s.

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11 See U. Schaede, "The Creation of a New System of Corporate Governance for the EC: An Integrative Model of the Anglo-American and Germanic Systems, "Graduate School of International Relations and Pacific Studies, University of California, San Diego, June 1994, pp. 12-16.

12 U.S. *Congress, General Accounting office, Competitiveness Issues: The Business Environment in the United States, Japan, and Germany,* GAO/GGD-93- 124 (Washington, DC: August 1993), p. 112.

13 Ibid., p. 113.

German financial markets are more open to foreign participation now than they have ever been, although the role of foreign banks among German MNEs remains modest. Foreign banks have helped stimulate financial innovation, but the leading German banks have proved quite capable of keeping up with them. At the same time, through their active involvement in global capital markets, the biggest German banks also bring to their corporate clients full access to innovative financial techniques and new pools of capital.

During the 1980s and early 1990s, it began to look like this role might change as banks and corporations diversified their operations in the context of the evolution of a single European banking market. [14] Since the unification of Germany, however, the situation has become more complicated. German bankers believe that the substantial economic and political turbulence of the 1990s is reinforcing the links between leading MNEs and their main banks. The difficulties foreign banks have in building substantial corporate financing operations in Germany is symptomatic of the new reality. The market is now more open, but traditional bank-industry relationships are not under threat. No participants or observers told OTA that they expect this to change fundamentally even after the German economy fully recovers.

Neither the universal banking system nor the main-bank system is under imminent threat. The Metallgesellschaft case and others are certainly causing some public soul-searching, and anxiety concerning Germany technological future is frequently linked to the financial foundations and conservatism of German corporations. In light of Germany's industrial history as well as the constraints posed by circumstances now prevailing in European and world markets, however, it seems more than reasonable to expect those foundations to be reinforced even as they are incrementally adjusted. This will not preclude successful German MNEs from attempting to constrain the influence of their main banks during good times, for example, by building tactical relationships with other banks. But neither this nor the global strategies of the big German banks imply that the German system of corporate financing is moving toward the U.S. capital markets model.

CONCLUSIONS

The segmentation and decentralization of the American financial system, as well as the breakdown of relationship banking, can make life difficult for American industries in international competition. On the other hand, they force U.S. firms to be more agile, and they discourage reliance on potentially collusive strategies. Especially during the past few years, the American system inhibits investors inclined toward building large equity stakes. It also constrains institutional cross-shareholding. Competition between American MNEs and MNEs based in financial systems that do the opposite can therefore be skewed. Moreover, to the extent that unstable capital foundations discourage long-term corporate investment within the United States, the national technology base can be harmed.

The traditional American distrust of financial concentration, combined with the dynamic effects of various regulatory and technological changes, created an environment conducive to the hyperactive market for corporate takeovers in the 1980s. Although some firms undoubtedly needed the shake-up and rationalization that ensued, others were severely damaged. In addition, there would appear to be few benefits for the American economy as a whole from the excessive managerial autonomy that sometimes followed as various states competed to provide corporations with new forms

14 The strategies of the big German banks were in fact recast more broadly. In the context of the effort to create a single European banking market, for example, the banks have been active proponents of the development of Finanzplatz Deutschland as a potential rival to capital market centers in London and elsewhere. Cross-border alliances have also begun, the most prominent including Dresdner Bank's purchase of a minority stake in Banque Nationale de Paris, and Credit Lyonnais" purchase of Bank fur Gemeinwirtschaft.

TABLE 8-2: Technological Complexity, Merger and Acquisition Activity, and International Competitiveness During the 1980s

	Merger and Acquisition Activity	International Competitive Capability
High technology		
Chemicals	Medium	High
Pharmaceuticals	Low/medium	High
Computers	Low	High
Electronics	Low	Mixed
Aerospace	Low	High
Stable Technology		
Oil	Medium	High
Rubber	High	Low
Machinery	High	Low
Motor vehicles	Medium	Low
Metals	High	Low
Low Technology		
Food, drink, tobacco	High	Little foreign challenge
Textiles	High	Low
Paper	Medium	Little foreign challenge

NOTE: OTA obtained this chart from Alfred Chandler, who developed it in preparation for his forthcoming article "Competitiveness of U.S. Industrial Enterprises: A Historical Perspective," Business History *Review,* Spring 1994 (forthcoming)

of protection from future takeovers. In one of the most egregious and well-known cases, for example, the State of Pennsylvania passed a law in 1990 that absolved the directors of firms incorporated in that state from their primary fiduciary obligation to shareholders and in several other respects made takeovers much more difficult and costly. [5]

Unstable corporate financial foundations exposed many American businesses in the 1980s to unwanted and frequently damaging takeovers. Merger and acquisition activity was highest in sectors where core technologies were in relatively stable stages of development (see table 8-2); many firms in these sectors were substantially weakened or dissolved in the wake of these takeovers. [16] Takeovers also appear to have hurt some sectors where process technologies were rapidly changing. For instance, severe damage occurred among financially weak producers of rubber products, nonelectrical machinery and machine tools, metals, and transportation equipment. In addition, a dearth of patient capital was clearly associated with instability in significant parts of the U.S. electronics sector. In one other high-technology sector, inorganic chemicals, the high level of merger and acquisition activity of the 1980s—much of it initiated by foreign MNEs—appears to correspond to differences in underlying financial structures, especially between German and American firms.

OTA interviews in Europe and Japan underscored the importance of reliable corporate financiers to the strategic planning process of a wide range of MNEs. This is one reason behind the current spread of the universal banking model within the European Community. Certainly the future of that model is not compromised by the steady growth of stock and bond markets in Europe. In fact, the two trends—the spread of universal banking and the growth of nonbank capital markets—seem to go together. [18] The large corporate banks of Germany, for example, may be expected to dominate Finanzplatz Deutschland. A similar process is under way in Japan, although a deep conflict of institutional interests between the city

15 Jacobs, op. cit., footnote 5, p. 103.

16 A Chandler op. cit., footnote 2; also see U.S. Department of Commerce, *Foreign Direct Investment in the United States: An Update* (Washington DC: U.S. Government Printing Office, June 1993), ch. 6.

17 A. Chandler, op. cit., footnote 2.

18 See J B. Goodman and L. W. Pauly, "The obsolescence" of Capital Controls? Economic Management in an Age of Global Markets," *World Politics 46(1):*50-82, October 1993.

banks, long-term credit banks, and securities companies complicates the move to universal banking. In fact, a look at Japan, Germany, Canada, the United Kingdom, France, and other leading industrial economies, shows a clear move toward universal-type banking structures. Only in the United States is the trajectory unclear.

Corporate networks that center themselves on concentrated banks are provided with financial stability. This does facilitate long-term investment decisionmaking. There is little evidence that such financial structures are being held responsible for the severe financial pressures that have arisen for German and Japanese MNEs during the past few years. Indeed, OTA analysis suggests the opposite. In the face of deep domestic and regional recessions, negative developments in exchange rates, and problems in key export markets, many German and Japanese MNEs have recently been reminded of the wisdom of having long ago purchased the insurance policy of stable banking relationships.

To be sure, the U.S. financial system has its own strengths. From a purely economic point of view, these include its capacity to let the pendulum of market change swing rapidly. Periodic bouts of excessive risk-taking are followed almost predictably by excessive caution, but the system usually adjusts. The wild takeovers of the 1980s, for example, led to credit losses—and legal liabilities—for some financial institutions, and a retreat from excessive lending for leveraged buyouts subsequently occurred. But this sort of normal turbulence is no longer occurring in a system that is isolated. The swinging pendulum can compound long-term adjustment costs for American MNEs when foreign rivals are playing by different rules. In the face of such costs, American MNEs search for ways to shield themselves and stabilize their financial foundations.

Despite the difficulties confronting their Japanese and German competitors, American MNEs have reason to remain concerned. The planning myopia that plagued them during the booming 1980s might be masked in the 1990s by a normal upturn in the business cycle. Many of the corporations that realize this are now on a strategic track conventionally labeled "globalization." As discussed in the first report of this assessment, they seem to be driven in part by a desire to hedge their financial bets. Their treasurers are busy diversifying their capital foundations in a movement that runs in tandem with the geographic spreading of production facilities. In many of the leading American MNEs, this appears to be part of a fundamental corporate strategy. The crafting of new international alliances may be seen in the same light (see box 8-1).

Similar trends are, of course, noticeable in Japan and Germany. In the case of leading Japanese and German MNEs, however, the movement appears much more tactical. With respect to the fundamental financial foundations of such MNEs, an observer would be hard-pressed to find evidence of strategies truly aiming at deconcentration or decarte libation. The large Japanese keiretsu are certainly not coming apart. Similarly, hints of capital diversification in *Germany* need to be interpreted cautiously. The recent foray of Daimler-Benz into American equity markets, for example, does not appear to signal a new willingness on the part of German industry to move away from traditional financial and strategic relationships.

The dynamic nature of today's multinational corporate competition does, however, portend a heightened competition between national financial systems. In such a world, despite recent good news about the performance of many American corporations, it is by no means certain that the American system has proven its superiority. The system has created the world's deepest pool of venture capital, but that pool is increasingly open to non-U.S.-based MNEs. This is potentially very positive not only for Americans but for the rest of the world. Serious questions remain, however, as to whether American firms enjoy reciprocal access to the functional equivalents that have been developed abroad. Surely Japan's equivalent, the spinning off of new operations by established firms once they have reached competitive maturity, is not open; nor have acquisitions become easier to undertake in either Japan or Germany. It is also not clear that American venture capital can be easily attracted to support the development of

BOX 8-1: National Financial Structures and International Strategic Alliances

As discussed in chapter 5 of the first report in this assessment, financial considerations often provide a powerful motivation for the crafting of strategic alliances between otherwise competing MNEs. The vast expense and short technology development cycles experienced in such sectors as telecommunications and computing are often cited by corporate officials as central reasons for entering into such alliances.

Research on the causes of corporate alliances, and on their consequences for public policy, is still at an early stage.[1] OTA interviews, however, indicate the need to begin asking whether differences in underlying financial structures and related forms of corporate governance exert powerful and differential influences on the ways in which MNEs conceive of their participation in such alliances.

American MNEs involved in new alliances, for example, often view corporate alliances as intrinsically strategic. By providing a solution to otherwise binding financial constraints, new alliances are seen as sowing the seeds for future joint ventures, licensing agreements, and various forms of market sharing. In a sense, they are depicted as substitutes for the kinds of long-standing networking arrangements that typify the Japanese and German domestic markets, especially in high-technology sectors.

German and especially Japanese MNEs, conversely, seem to approach the calculation of interests differently. Embedded in the kinds of more stable financial structures discussed above, they tend to view alliances with unrelated MNEs in a more tactical light. Such a view was supported by a number of German and Japanese corporate officials in OTA interviews. Those officials suggested that in many of the alliances that developed in the 1980s, the American firm brought the technology, while partners contributed cash or access to their domestic markets. Indeed, deals that trade technology for market access lie at the heart of many alliances, especially those formalized as joint ventures. One recent study noted, for example, that such vehicles have been particularly popular in the electronics sector in Europe. In such cases, "joint ventures may represent not just a better option in entering a particular market: they may represent the only option."[2] In Japan, and sometimes in Germany, traditional structures of corporate governance and corporate financing clearly contribute to market access problems. They also help make plausible the view that Japanese and German MNEs think about alliances in a more tactical fashion than do their counterparts in the United States.

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[1] See P.F. Cowhey and J.D. Aronson, *Managing the World Economy: The Consequences of Corporate Alliances* (New York: Council on Foreign Relations Press, 1993); B.M. Gilroy, *Networking in Multinational Enterprises: The Importance of Strategic Alliances* (Columbia, SC: University of South Carolina Press, 1993); L.K. Mytelka (ed.) *Strategic Partnerships: States Firms and International Competition* (London, UK: Pinter, 1991); and D.C. Mowery (ed.) *International Collaborative Ventures in U.S. Manufacturing* (Cambridge, MA: Ballinger, 1988).

[2] Commission of the European Communities, *Panorama of EC Industry* ECSC-EEC-EAEC (Brussels, Luxembourg: Office for Official Publications of the European Communities, 1993), p. 51.

"boring" improvements in basic and process technologies, both of which will figure heavily in future global competition across a range of manufacturing industries. Indeed, in a number of sectors in the United States, there remains a serious funding gap between the time when initial venture capital for product development runs out and the time when product commercialization attracts routine financing.

German and Japanese MNEs have been able to take a longer-term view of their investment and strategic decisions. Contributing significantly to their abilities in this regard have been the main-bank system, universal banking (in Germany),

BOX 8-1 continued: National Financial Structures and International Strategic Alliances

Mergers and takeovers are the ultimate forms of corporate alliance. The structure and openness of American capital markets undoubtedly contribute to the fact that alliances culminating in mergers have been more common in the United States than in Europe (see table 8-1-1)

TABLE 8-1-1: Value of Completed International Mergers and Corporate Transactions (billions of dollars)

	Domestic		Cross-border			
			U.S.		Europe/non-Europe	
Year	U.S.	Intra-Europe	Buyer from U.S.	Seller from U.S.	Buyer from Europe	Seller from Europe
1985	181.5	8.3	4.8	9.7	6.1	2.4
1986	201.7	11.9	2.9	27.3	17.8	3.5
1987	199.9	38.3	7.7	35.3	27.8	8.3
1988	286.9	63.4	5.9	60.9	36.0	8.4
1989	200.3	74.4	17.5	44.6	33.4	12.7

SOURCE: A.E. Safarian, "Have Transnational Mergers or Joint Ventures Increased?" *Competition Policy in an Interdependent World*, E. Kantzenbach, et al. (eds.) (Baden-Baden, FRG: Nomos, 1993), p. 16.

Many observers, however, have noted structural barriers to takeovers (especially contested takeovers) outside the United States and Great Britain, both of which share certain similarities in the character of their financial markets. In Europe, the importance of such barriers became obvious in 1991 when Pirelli, Italy's leading tire company, made a hostile bid for Continental AG of Germany and was decisively rebuffed. As a survey published by the European Union put the matter, "[This] confirmed the view that German companies are impregnable as long as they have the support of big German banks."[3] A study by Coopers & Lybrand on the subject of corporate takeovers in Europe concluded more generally: "We found that only in the U.K. is the concept of 'hostile takeover' perceived to be an integral part of the financial market."[4]

[3] Ibid
[4] Ibid

and intricate corporate alliance structures (in both Germany and Japan). When such structures merely shield shoddy or overly conservative management practices, they have costly effects. But when they serve to keep corporate managers accountable to the full range of stakeholder interests, and when they provide emergency support during downturns in economic cycles, they can help build strong international competitors. Those same factors are now assisting leading German ant Japanese MNEs as they seek to adjust to radi-

cally altered domestic and international business environments. [19]

Business analysts frequently assume that competition between national systems of corporate financing will lead to the abandonment or continuing erosion of the American system. Two respected observers put the matter starkly:

> We are beginning an era of international competition between the entire financial and industrial structures of countries. The efficient ones will be those that survive this Darwinian competitive struggle. Legal and institutional impediments that fail this test will cease to exist. Our belief, or perhaps our prejudice, is that many of the present constraints on U.S. financial institutions will not survive.[20]

Universal banking and "corporate networking" are often portrayed as better adapted to the competitive world of the future, where massive investments in new technology will have to be undertaken and "stable" financial foundations—as well as "orderly" markets—will be needed to make those investments feasible. All of this may be true, but there are at least two basic impediments to the evolution of that future. The first is readily apparent in corporate America itself. Especially after the experience of the 1980s, when a number of firms watched their trusted bankers help raiders take them over, few corporate managers can be expected to be enthusiastic about the recreation of universal banking in the United States. The managerial flexibility provided to those corporate leaders by decentralized capital markets, even though it may force them to focus excessively on the short-term, is now highly valued. The more important impediment is rooted more deeply in the traditional American political reaction to financial concentration.[21]

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19 Note Kester's hypothesis (W.C. Kester, "Governance, Contracting, and Investment Time Horizons," working paper 92-003, Harvard Business School, Division of Research, 1991) that, although the German and Japanese systems may not be ideal, "they maybe more efficient than the Anglo-American system in coping with hazards posed by risky investment in new environments."

20 Edwards and Eisenbeis, op. cit., footnote 9.

21 The differences between th, American reaction to financial concentration and those of other countries also come out in the field of antitrust policy and its analogs. This is another area that will likely increase in importance as new multilateral roles for trade and investment are sought. See appendix C. See also U.S. Congress, Office of Technology Assessment, *Competing Economies: America, Europe and the Pacific Rim* OTA-ITE-498 (Washington, DC: U.S. Government Printing Office, October 1991); U.S. Congress, General Accounting Office, *Competitiveness Issues: The Business Environment in the United Stares, Japan, and Germany* GAO/GGD-93-*124*, (Washington, DC: U.S. Government Printing Office, August 1993); J.F. Rill, "Competition Policy: A Force For Open Markets,' '*Antitrust Law Journal* 61:637-650, winter 1993; F.H. Easterbrook, "Monopolization: Past, Present, Future," *Antitrust Law Journal 61* :99-1*18*, summer 1992; L.D. Tyson, *Who's Bashing Whom: Trade Conflict in High Technology Industries* (Washington, DC: Institute for International Economics, 1992); C.F. Bergsten and M. Noland, *Reconcilable Differences: United States-Japan Economic Conflict* (Washington, DC: Institute for International Economics, 1993); J.P. Trachtman, "International Regulatory Competition, Externalization, and Jurisdiction," *Harvard international Law* Journal, 34(I):47-104, winter 1993; J.P. Griffin, "United States Antitrust Laws and Translational Business Transactions: An Introduction," *The International Lawyer21* (2) spring 1987; R.P. Alford, "The Extraterritorial Application of Antitrust Laws: The United States and European Community Approaches," *Virginia Journal of International Law 33:1* -50, fall 1992; P.D. Sutherland, "The Competition Policy of the European Community," *St. Louis University Law Journal 30: 149-170, 1992.*

Appendix A: Glossary

Affiliate
A business operation that is established through direct investment by individuals or corporations based in a foreign country. In the U.S. trade accounts, a foreign affiliate is defined as a business establishment in which a foreign individual or corporation owns or controls, directly or indirectly, 10 percent or more of the voting securities of an incorporated business enterprise (or an equivalent interest in an unincorporated business enterprise). In the United States, foreign affiliates are a product of FDIUS; U.S. affiliates operating abroad are a product of USDIA.

Affiliated trade
International trade among firms within the same MNE group. Also called intrafirm trade (IFT).

AG
Aktiengesellschaft. A publicly held firm with limited liability in Germany.

APEC
Asian Pacific Economic Cooperation.

ANBERD
The OECD's principal database on business R&D expenditures.

ATP
The Advanced Technology Program, under the National Institute of Standards and Technology, U.S. Department of Commerce.

BEA
Bureau of Economic Analysis, U.S. Department of Commerce.

BERD
Business expenditures on research and development.

CFIUS
Committee on Foreign Investment in the United States.

CNT
Conditional national treatment.

CEO
Chief Executive Officer.

Corporate governance
The rules and norms that guide internal relationships among the various stakeholders in a business enterprise. These stakeholders typically include owners, directors, managers, creditors, suppliers, employees, and customers.

CRADA
Cooperative Research and Development Agreements between private industry and U.S. government agencies.

DIA
Direct investment abroad.

Distributor keiretsu
A type of cooperative business arrangement in which the manufacturer controls its distribution system through a combination of equity relationships, low-cost capital, and rebates. This enables it to reduce price competition among its distributors and can prevent competitors' goods from being sold in the same store.

EU
The European Union, formerly the European Community.

FDI
Foreign direct investment. In the United States, FDI is defined by the International Investment and Trade in Services Act as the ownership by a foreign person or corporation of 10 percent or more of the voting equity of a firm located in the United States.

FDIUS
Foreign direct investment in the United States.

Foreign affiliate
A subsidiary of a foreign corporation. See also affiliate.

GATT
General Agreement on Tariffs and Trade.

GERD
Gross expenditures on research and development.

GmbH
Gesellschaft mit beschraenkten Haftung. A privately held German firm with limited liability.

Horizontal keiretsu
A type of cooperative business arrangement characterized by large groups of companies tied together through such institutions as stable cross-shareholding agreements, president councils, and a common commercial bank, trust bank, insurance company, and trading company.

IFT
Intrafirm trade. Cross-border trade among firms within the same MNE group of companies.

Inward direct investment
Direct investment made in a country by residents and legal entities located outside the host country. Equivalent to foreign direct investment (FDI).

IRS
Internal Revenue Service.

Keiretsu
The cooperative arrangements formed by Japanese companies to reduce the risks of commercial activity. Also see horizontal keiretsu and vertical keiretsu.

Majority-owned affiliate
An affiliate in which foreign investors own or control, directly or indirectly, more than 50 percent of the voting securities of an incorporated business enterprise (or an equivalent interest in an unincorporated business enterprise). Compare with affiliate.

MNC
Multinational corporation.

MNE
Multinational enterprise.

MOSS
Market-Oriented, Sector-Specific trade talks between the United States and Japan.

NAFTA
North American Free Trade Agreement.

NSTC
National Science and Technology Council.

OECD
Organisation for Economic Co-operation and Development.

OSTP
Office of Science and Technology Policy.

OTA
Office of Technology Assessment.

Outward investment
Direct investment made by individuals and corporations outside the country in which they reside.

PNGV
Partnership for a New Generation of Vehicles. Also known as the Clean Car Initiative.

PPP
Purchasing power parity.

R&D)
Research and Development.

R&D intensity
Research and development as a percentage of total sales.

SEC
Securities and Exchange Commission.

SII
Structural Impediments Initiative trade talks between the United States and Japan.

STI
Science and Technology Indicators, an OECD database.

Supplier keiretsu
A type of cooperative business arrangement characterized by a vertical organization, with the manufacturer at the apex and a series of lower tiers consisting of smaller and more specialized firms.

Technology trade
Cross-border royal ty and license fee transactions representing sales and purchases of intellectual property.

Triad
The three major regional centers of industrial, technical, and scientific capability, centered on the United States, the advanced industrial economies of Europe, and Japan.

TRIMs
Trade Related Investment Measures.

TRIPs
Trade Related Aspects of Intellectual Property Rights.

UBO
Ultimate Beneficial Owner.

U.K.
United Kingdom of Great Britain and Northern Ireland.

Unaffiliated trade
Trade conducted among firms with no common ownership. Also known as arms-length trade. Compare with affiliated trade or IFT.

Universal banks
Banks that are able to engage in all types of financial transactions under one roof, including the holding of a controlling interest in their customers.

USDIA
U.S. direct investment abroad.

USTR
Office of the United States Trade Representative.

Vertical keiretsu
A form of cooperative business arrangement used by Japanese manufacturing firms to organize their supplier and distribution systems. See supplier keiretsu and distributor keiretsu.

WTO
World Trade Organization.

Appendix B: Summary of the First Multinationals Report (September 1993)[1]

In the post-cold war period, the role of multinational enterprises (MNEs) in the world economy is evolving far more rapidly than the rules that govern their operations. The policy challenge is to manage and defuse escalating trade frictions in ways that promote growth and ensure a fair and sustainable distribution of advanced technology and manufacturing assets among competing national economies. Multinational enterprises are central to this process because they are international conduits of technology, goods, and services. They also provide quality jobs and capital that support economic growth and a high standard of living.

The foreign affiliates of MNEs control a substantial portion of the world economy, perhaps as much as one-quarter of all economic activity in their host countries. In 1990, the last year for which complete statistics are available, worldwide sales of foreign affiliates in host countries reached an estimated $5.5 trillion as compared with approximately $4 trillion in total world exports of goods and services. Because they are both important and powerful, MNEs evoke a wide range of concerns from home governments, host governments, rival firms, and strategic partners.

Intensifying competition among firms in almost every sector of the international economy is changing the structure of multinational industry. At the same time, increasing competitiveness concerns and trade frictions among nations have led to a heightened awareness of the activities of MNEs. Because MNEs are the major force in international trade and are deeply enmeshed in local economies, they are influential in national politics and often essential to the industry of nations.

Congress is concerned about MNEs for several reasons. Significant asymmetries in the national policies of the major trading nations have developed, which may ultimately undermine the post-WWII system of international trade and investment. At the same time, the globalization of business and intense competition in many industrial sectors threaten to increase trade friction among nations to unmanageable levels. As tough talk on trade escalates between the United States and its principal trading partners, pressure builds

[1] U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest: Playing by Different Rules*, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993).

for a coordinated response from Congress, the Administration, and U.S. business leaders.

As a further complication, the distinction between foreign and U.S. companies is breaking down. As U.S.-based MNEs commit ever more resources to foreign affiliates, and foreign-based firms produce and invest in America, the question of what constitutes an American company for purposes of public policy becomes even more critical. The rapid expansion of the number and scope of international strategic alliances among MNEs adds complexity to this already difficult problem.

The answer to the policy question of what should constitute an American company is tied not so much to the ownership or home base of particular MNEs, but rather to how a firm affects the well-being and standard of living in the local and national communities where it operates. In this view, MNEs should be considered American if and when they act in the national interest, and as American companies, they should be entitled to a higher standard of consideration.

The interests of MNEs, however, do not always conform to those of the United States. The United States wants MNEs to conduct core business operations here, to interact with local firms to create employment and wealth, and to retain the benefits of that wealth for U.S. citizens. But MNEs are understandably less concerned with advancing national goals (which may conflict among different nations) than with pursuing objectives internal to the firm-principally growth, profits, proprietary technology, strategic alliances, return on investment, and market power.

The present system of international trade and investment can be characterized as one in which the interests of nations and MNEs have been drawn too tightly (as in Japan) or, conversely, have been allowed to drift too far apart (the U.S. case). This is the result of basic asymmetries, both in the different national systems of policy that regulate trade and investment, and in the organization of business (and business practice) within the Triad of modem industrial economies.

Atone extreme, the United States has permitted and encouraged foreign companies to take advantage of extraordinary access to its markets for trade and investment purposes. Accordingly, foreign affiliates in the United States account for a significant share of total U.S. assets, sales and, to a lesser extent, employment. At the other extreme, Japan has restricted foreign investment and imports, and has permitted foreign MNEs limited access to its markets, typically only through joint ventures with Japanese partners. Foreigners have often found it extremely difficult to invest in Japan, whereas Japanese investors have found man y opportunities abroad.

The policy questions turn on two issues: 1) how to achieve a rough balance between the need of MNEs to achieve global efficiency on the one hand, and the need of nations to retain technical and industrial competitiveness on the other; and 2) how to achieve an equitable and sustainable distribution of advanced R&D and manufacturing capabilities among competing economies. Greater coordination among the advanced industrial nations is probably required to harmonize the rules of multinational trade and investment.

PRINCIPAL FINDINGS OF THE FIRST REPORT

1. The policies and actions of governments may be decisive in determining which MNEs prosper in global competition. At a minimum, they will influence both which competitors will succeed and where state-of-the-art technology development and manufacturing take place.
2. Excess capacity and increasing competition among MNEs are leading to consolidation and shakeout in many global industries. A coherent system of international trade, investment, and monetary polices has not emerged to meet the challenges of the global economy.
3. Broad asymmetries in the policy regimes of the major trading nations have developed--especially market access, foreign direct investment, financial, and industrial policies related to the activities of MNEs. These asymmetries, when combined with major shifts in the global economy and protectionist responses to them, con-

tribute to increasing trade frictions and tensions in international relations.

4. Public policies and private sector initiatives have combined to restrict foreign direct investment in some major trading nations to a level far lower than that of others.
5. Governments remain influential in dealing with MNEs. The U.S. government, however, has opted to minimize its influence over many aspects of MNE behavior in the United States. This attitude, as reflected in government policies, is in stark contrast to Japan and several EU member states.
6. The modem MNE is a highly flexible and adaptable form of business organization. MNEs configure and reconfigure their operations to meet diverse requirements, including those imposed by different governments.
7. U.S.-based firms no longer dominate the list of the largest MNEs. This decline reflects in part the relative decline of the U.S. economy and the rise of Japan. Of the 500 largest MNEs in the world today, 157 are based in the United States, 168 in Europe, and 119 in Japan. In the late 1960s, 304 were U.S. companies, 139 were European, and 37 were Japanese.
8. Many MNEs are increasingly multi and less national than in the past; there appears to be a growing divergence of national needs and the needs of these MNE organizations. This finding is less true of Japanese and some European-based MNEs, where companies tend to retain a stronger national identity.
9. For an increasing number of firms, multinationalization represents a strategic response to a changing financial environment characterized by rising international capital flows, more open capital markets, expanded financing options, and volatile exchange rates.

Appendix C: Competition Policy Across the Triad

Due to the increasingly global character of modern commerce, competition policy has become an important element of international law and politics.[1] The United States has pursued overseas antitrust problems in bilateral discussions with Japan and other countries, and has participated in OECD, GATT, and WTO discussions of international competition policy issues. In recent years, the Antitrust Division of the U.S. Justice Department has focused a great deal of attention on international antitrust problems involving multinationals in a wide variety of industries. International legal issues are emerging rapidly and changing regularly, increasing the pressure on national governments to understand foreign competition policy regimes, clarify existing policies, and develop channels for cooperation and dispute settlement. As multinational firms become increasingly prevalent in foreign markets, the conflicts between different national competition policy regimes are likely to emerge ever more forcefully.

Nations define and administer competition policy very differently.[2] In the United States, antitrust law is constructed to protect consumers from restraint of trade, monopoly power, and collusive business practices. In Japan, competition policy historically has subordinated consumer interests to policies intended to strengthen and favor do-

[1] Outside the United States, the conventional term used to describe the regulation of competition is "competition policy"; the term conventionally used in the United States is "antitrust policy." Competition policy generally subsumes antitrust policy and addresses a wider range of political and economic objectives.

[2] For a discussion of the different competition policy regimes in Europe, Japan and the Untied States, see: M.C. Huie, "'Intrcxiuction—The EEC & Antitrust in 1992," *The Journal of Reprints For Antitrust Law and Economics 25(*1 -2):3-22, 1993; M.M. Mendes, *Antitrust in a World of Interrelated Economies: The Interplay Between Antitrust and Trade Policies in the US and the EEC* (Bruxelles, Belgique: Editions del'Universite de Bruxelles, 1991); U.S. Congress, General] Accounting Office, *Changes in Antitrust Enforcement Policies and Activities* GAO/GGD-91-2 (Gaithersburg, MD: October 1990); U.S. Congress, General Accounting Office, *Competitiveness Issues. The Business Environment in the United States, Japan and Germany,* GAO/GGD-93- *124* (Washington, DC: August 1993); J.D. Richards, "Japan Fair Trade Commission Guidelines Concerning Distribution Systems and Business Practices: An Illustration of Why Antitrust Law Isa Weak'? Solution To U.S. Trade Problems with Japan," *Wisconsin Law Review* (3):92 1-960, 1993; R.L. Cutts, "Capitalism in Japan: Cartels and Keiretsu," *Harvard Business Review* July-August 1992, pp. 48-55; and E. Fox, "The Tenth Milton Handler Lecture: Antitrust, Trade and the 2 1st Century—Rounding the Circle," *The Record of the Association of the Bar of the City of New York* 48(5):535-588, June 1993.

mestic producers, although there have been some signs that this emphasis may be changing.[3] In the European Union (EU), competition policy is designed to promote economic and political integration and enhance economic competitiveness, although attention is also given to preventing firms from abusing a dominant market position. Asymmetries in the regulation and enforcement of competition policy can affect the relative competitiveness of firms in both domestic and foreign markets.

Some governments have been accused of permitting and even supporting cartels, exclusionary practices, price fixing, market allocation schemes, predatory pricing in third country markets, and other restraints on competition.[4] Although governments can, in theory, enforce their laws against anticompetitive practices in foreign markets, they rarely do so due to intragovernmental conflicts. Private parties have virtually no ability to pursue anticompetitive behavior in foreign markets, apart from bringing actions against local affiliates of the alleged perpetrator. Matters are further complicated when the alleged perpetrators (a) do not have operations within the jurisdiction of the concerned government or (b) are located in jurisdictions that do not allow or encourage private antitrust actions.

U.S. antitrust law prohibits foreign anticompetitive behavior that restricts U.S. exports or limits market access by firms with operations in the United States. Likewise, the European Union and Japan claim extraterritorial jurisdiction over certain actions that have adverse consequences for their domestic firms. Nevertheless, the extraterritorial extension of domestic competition policy rules is frequently rendered ineffective by difficulties in gathering evidence from the alleged perpetrators. Negotiations and discussions aimed at harmonizing review procedures and enhancing cooperation among different national competition policy authorities have not yet created a framework that ensures compliance with the discovery process in foreign countries.[5] Despite precedents established in the area of publicly traded securities, exchange of confidential information between agencies charged with the enforcement of competition policy remains limited.

Ultimately, fundamental asymmetries across the Triad imply that effective enforcement of existing national competition policy rules would be insufficient to ensure fair and open global competition. In the long run, greater convergence across competition policy regimes may be necessary. To move toward this goal, some analysts have advocated a multilateral antitrust agreement such as that proposed by the Havana Charter.[6] But even if countries pursued such an agreement, extensive differences in national policies, political institutions, systems of corporate governance, and cultural norms suggest that an international competition policy regime is a long-term prospect at best. Consequently, it maybe preferable to pursue

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[3] Recently, the Japan Fair Trade Commission (JFTC) has stepped up its enforcement efforts, and some government officials have begun to recognize consumer interests in competition policy matters. To date, though, it remains unclear whether these signs foretell a significant reorientation in Japan's competition policy regime.

[4] See: Coalition For Open Trade, *Dealing With Japan: Responding to Private Practices in Restraint of Trade: An Assessment of Policy Tools* (Washington, DC: March 1994). Although its historical discussion is compelling, the report's recommendations are controversial.

[5] For a discussion of negotiations and agreements intended to enhance enforcement and cooperation, see: J.F. Rill and V.R. Metallo, "The Next Step: Convergence of Procedure and Enforcement," sponsored by 1992 Fordham Corporate Law Institute, B. Hawk (cd.), *International Antitrust Law and Policy (New* York: Translational Juris Publication Inc., 1993), pp. 15-39; R. Pitofsky, "Proposals For Revised United States Merger Enforcement in a Global Economy," *The Georgetown Law Journal 81(2): 195-250*, December 1992; J.F. Rill and V.R. Metallo, "Convergence of Premerger Notification and Review: A Case Study," *Wake Forest Law Review 28(1):35-50*, Spring 1993; and Fox, op. cit., footnote 2.

[6] The Havana Charter was never ratified. For the text of the charter, see: C. Wilcox, *A Charter for World Trade (New* York: The Macmillan Company, 1949), pp. 231-327.

a more limited international agreement, such as a nonbinding statement of core principles, that could set a normative context for greater international cooperation on competition policy matters.

In the short term, governments may wish to focus on achieving more effective enforcement of existing national competition policy laws and, perhaps, improving the ability of national governments to pursue foreign anticompetitive practices that directly affect domestic firms. For the U.S. government, short-term policy strategies could focus on four areas:

1. *Providing resources for the U.S. government to gather and analyze information on international anticompetitive practices.*

In the past, the U.S. embassies were responsible for gathering information on international cartels. The embassies provided antitrust authorities with much useful information on the number, methods of organization, influence, and market power of foreign business groups. At present, however, no agency is charged with this information-gathering responsibility. Consequently, the United States government may not be fully informed in international negotiations, and cannot easily detect foreign anticompetitive behavior that violates U.S. antitrust laws. The U.S. government might consider resuming some method of information gathering to identify antitrust violations for potential prosecution, to support civil suits (especially when brought by plaintiffs with few resources), and to assist ongoing negotiations intended to improve cooperation and harmonization.

2. *Improving international cooperation among competition policy authorities.*

Increased cooperation among different competition authorities may be relatively easy to encourage when the action in question is illegal in both jurisdictions and when the authorities vigorously enforce their laws and regulations.[7] It will be more difficult to foster cooperation when the action in question is legal in one jurisdiction and not in the other, and/or when enforcement is more lax.

Two important agreements which have fostered international cooperation are the Canada-United States 1990 Mutual Legal Assistance Treaty (MLAT) and the 1991 agreement between the United States and the Commission of the European Union to cooperate in the application of their competition laws.[8] The MLAT allows for mutual cooperation in law enforcement for criminal antitrust violations, but it does not require coordinated investigations by both countries.[9] The U.S.-EU Agreement seeks to reinforce competition policies by: a) requiring each party to notify the other of transactions that may affect important interests; b) requiring the antitrust authorities to meet on a regular basis to exchange information regarding pre-merger review, subject to confidentiality agreements; c) allowing coordinated investigations by both parties, when deemed mutually ad-

[7] For a brief discussion of legislation recently proposed by the Clinton Administration to foster greater international cooperation in the gathering of information on cartels organized outside the United States, see: K. Bradsher, "U.S. Seeks Law on Foreign Cartels," *The New York Times*, p. D2, June 14, 1994; and J. Kahn "US Acts to Boost Anti-trust Efforts," *Financial Times*, p. 5, June 14, 1994.

[8] The 1984 Memorandum of Understanding between the United States and Canada as to Notification, Consultation, and Cooperation with Respect to the Application of National Antitrust Law required notification and consultation with the other party when either the interests of the other country were involved or the information needed was located in the other country. Rill and Metal lo, op. cit., footnote 5.

[9] A dramatic example of increased international cooperation was provided by the efforts, including joint raids, of the U.S. and Canadian authorities that led to recent fines of over $8 million and the guilty pleas on the part of four executives in the plastic disposable tableware industry. See J. Davidson, "Four Men Plead Guilty to Fixing Prices of Plastics," *The Wall Street Journal*, p. A5, June 10, 1994.

vantageous; d) specifying means for determining when either government might defer enforcement responsibility to the other; and e) requiring consultation between the U.S. and EU competition authorities.[10] When appropriate, the United States might seek to negotiate similar bilateral agreements with other countries.

3. *Eliciting more cooperation from foreign firms in the discovery process.*

Cooperation could be facilitated in the case of mergers by the harmonization of merger reporting requirements and waiting periods.[11] This could reduce the burden of compliance for firms and assist in the coordination of merger reviews when several national competition policy authorities are involved. Enforcement would be greatly facilitated if agreements could be reached with the competition authorities to compel cooperation in investigations and discovery on the part of firms with operations located within their jurisdiction. Such agreements would need to include adequate safeguards to ensure that they could not be used to harass firms engaged in lawful activities, and that information of competitive interest but unrelated to the activity under investigation was protected.

Compelling cooperation in discovery and gathering evidence from firms based outside the United States, in the absence of active cooperation and support from the other foreign competition authorities, is difficult if not impossible. This is especially so if the alleged anticompetitive actions do not take place in or directly affect the U.S. market. Two possible measures could be considered to deal with such situations: a) providing for a different burden of proof for those cases in which active and effective cooperation proves impossible to elicit in a timely fashion; and b) increasing the damages and criminal penalties for firms convicted if they have failed to provide a satisfactory level of cooperation.

4. *Encouraging better enforcement of existing foreign competition policy laws.*

The United States has long-standing political and diplomatic channels through which it can encourage foreign governments to modify their competition policies and practices. For instance, some observers have noted that U.S. political pressure is partly responsible for improving the enforcement practices of the Japan Fair Trade Commission (JFTC).

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[10] A recent example of such cooperation was provided by the coordinated settlement reached by Microsoft with the U.S. Department of Justice and the European Commission. See: E.L. Andrews, "Microsoft Grip on Software Loosened by Antitrust Deal," *The New York Times*, p. A 1, July 17, 1994; and L. Kehoe, "Microsoft Deal Settles Antitrust Investigation," *Financial Times*, p.1, July 18, 1994. Recently, the European Court ruled that 1991 agreement between the United States and the European Commission was void and should have been concluded by the Council of Ministers instead of the European Commission. It is expected that the Council of Ministers will rapidly give their approval, restoring the legal validity of the agreement. See: E. Tucker, "Commission's Pact with US. Overturned by Euro-court," *Financial Times*, p. 1, Aug. 10, 1994.

[11] See '. Conflicts In International Merger Enforcement," American Bar Association, Section of Antitrust Law, *Special Committee On International Antitrust Report, 1991,* pp. 166-210; and OECD, *Merger* Cases In *The Real World: A Study Of Merger Control Procedures* (Paris, France: OECD, 1994).

Appendix D: Data Note

In order to minimize the distorting effects of inflation on time series data, much of the data in this report is presented in inflation-adjusted or "constant" 1987 dollars. This is done by multiplying unadjusted "current" dollars by price indices appropriate to the particular type of data.] For merchandise trade data, the report uses merchandise export and import price indices provided by the Bureau of Economic Analysis (BEA). For R&D and technology trade data, an implicit GDP price deflator is used; it also is provided by BEA. Time series data in this report are presented in constant 1987 dollars; this presents data values for all years as if the dollar was equal to the value of the dollar in 1987.[2]

Direct investment is more difficult to measure, because there are three different ways it can be valued at any given point in time. In the first report of this assessment, OTA described the three principal methods for valuing direct investment: historical cost, current cost, and market value.[3] The historical cost method, which values direct investment at its initial cost, is the most widely used measure. Most of the detailed direct investment data provided by the BEA is stated in historical cost terms. For this reason, and because historical cost reporting is in many ways the most accurate measure for comparative purposes, this report provides data on investment position and composition in historical cost terms. To maintain consistency across all data on direct investment, the value of direct investment flows (as opposed to static direct investment position) is stated in current terms.

Comparing data that is reported in different currencies requires an exchange rate conversion. For the type of international data analyzed in this report, purchasing power parity (PPP) conversion is the preferred method.[4] When appropriate, a PPP conversion schedule provided by the OECD was used.

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[1] Current dollars are often referred to as "nominal" dollars. Likewise, constant dollars can be referred to as "'real" dollars.

[2] Technically, any year can be used as the base year from which to adjust time series data. For the type of data analyzed in this repro, *1987* is conventionally used as the base year.

[3] U.S. Congress, Office of Technology Assessment, *Multinationals and the National Interest—Playing by Different* Rules, OTA-ITE-569 (Washington, DC: U.S. Government Printing Office, September 1993); box 3-A, pp. *53-54.*

[4] *See* footnote 37 in ch. 3 regarding the use of PPP conversion for R&D data.

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