Chapter 5

EC-92: Trade and Industry Policy

CONTENTS

Box

Figures

Tables

Chapter 5
EC-92: Trade and Industry Policy

The European Community (EC) is entering a new stage in its efforts toward greater unity. Most European history for the past thousand years centered on states establishing, defending, and expanding national borders. Now the power of these states will be altered in fundamental ways. This stems from the commitment to make the EC into a single market by the end of 1992 (EC-92).

The goal of completing the internal market was first adopted in the Treaty of Rome, which established the European Economic Community in 1957. However, progress was slow until, in 1985, the Commission of the EC[1] proposed a long stride forward, in the form of a White Paper that listed 300 specific policy actions, with the goal of removing barriers to the free movement of goods, services, people, and capital throughout the EC.

While EC-92 will not be completed by the end of 1992, the reforms already introduced and the growing commitments of governments, industry, and the public mean that this process is not reversible. Just what that means is debatable. According to some observers, businesses will become more efficient when the barriers to trade and cross-border operations fade and competition increases. The more optimistic forecasts estimate that growth rates could increase by 50 percent or more, while reducing inflation and unemployment. Although the size of the growth spurt is subject to debate, it is likely that the economies of the EC will get at least a temporary shot in the arm from the single market.

If EC countries are to open their markets fully to each other, it will be difficult for the individual nations to continue to create special advantages for their own firms. But that is precisely the aim of most existing national industrial policies in Europe. Thus, EC-92 could lead to either the elimination of some kinds of national industrial policies, or their control and supervision by the Commission. Some policies, such as the control of credit favored in France until the mid- 1980s, could be swept away entirely, in this case by the removal of barriers blocking the flow of capital across borders. **Other policies, such as** controls over large mergers, will be transferred to the Commission. Many, such as subsidies policy, will remain in the hands of the member states but under the Commission's supervision.

Not all the important differences among member nations have been ironed out. Subsidies are at the heart of a significant remaining dispute. Some member nations, led by Britain, oppose government intervention to save EC-owned firms threatened by Japanese or U.S. competition. Others, with France in the lead, are determined to keep alive European companies-often their own national companies—in key industries such as electronics and motor vehicles.

Although some national industrial policies will likely be constrained under EC-92, the forces that generated them remain strong. Government intervention in cases of market failure is widely accepted in Europe. Hence, the EC is under pressure to develop an industrial policy of its own, one that does not favor industry in one EC country over that in another but seeks to improve the competitiveness of European industry.

In principle, the EC is committed to free trade. In practice, that is only partly true. While some early fears of Fortress Europe were exaggerated, the EC governments do use trade policy to protect European industry. Some defensive policies are longstanding (auto quotas dating back to the 1950s); some are new (rules of origin for semiconductors that favor manufacture within Europe); and some are now pursued more aggressively (antidumping).

Whatever the sources, current policy is not set in stone. EC officials seem to have considerable latitude in their interpretation of trade policy. And the outcome of the GATT[2] Uruguay Round, expected to conclude in 1993, may change existing policies considerably; for example, the EC has put its discriminatory public procurement policies on the table. Overall, however, EC trade policy does have significant protectionist components, e.g., high tariffs, quotas, aggressive use of antidumping laws, discriminatory public procurement policies, protective rules of origin.

EC trade policy is less multilateral than it appears. It is aimed more at Japan and other Asian countries than at the United States. Key trade policies—

notably antidumping--have been used to dampen Japanese competition in strategic sectors, such as consumer electronics. This country-specific selectivity reappears in reciprocity clauses that extend specific benefits to trading partners only when reciprocal access is available.

EC efforts to protect European industries have encouraged importers to become local manufacturers through foreign direct investment,[3] and there has recently been a large influx, especially from Japan. U.S. firms have had a major manufacturing presence in Europe for decades, and many (e.g., IBM, Ford) are now regarded as European in many respects. Other U.S. companies, however, are developing or improving their presence in Europe, not only to take advantage of the EC single market but also to expand sales into Eastern Europe. This strategy could prove tough for smaller companies.

This accelerated foreign direct investment offers a new set of challenges to the EC. For example, while the EC has used trade policy to protect its semiconductor producers, and through technology policy has spent billions of dollars trying to accomplish the same end, a strong Japanese manufacturing presence in the EC challenges both. The Commission has responded by moving toward policies that encourage specfiic kinds of investment likely to bring high wage jobs, technology transfer, work for European suppliers, and development in depressed areas.

The EC also seeks to improve the competitiveness of existing European firms through other policies. One method is technology policy aimed at supporting generic research through R&D consortia; another is support for large multinational projects like Airbus; and a third is competition policy (analogous to U.S. antitrust policy), which will discourage subsidies and state ownership. Other policies may exert indirect effects. For example, regional policy is aimed not only at redressing the inequalities of income and wealth within the EC, but also at helping failing industries and underdeveloped regions to adjust.

It is too early to assess the results of many of these policies on European competitiveness. The consequences of encouraging local production, especially in high-technology industries, remain unclear. Technology policy has been expensive and the payoffs for competitiveness remain indistinct at best, although it may have encouraged the development of an integrated European economy. Cross-border mergers that result in the formation of giant firms may improve competitiveness in some industries but not others. Progress toward deregulation of national public procurement markets could encourage EC firms to become more competitive, as could efforts to control national subsidies and limit their duration.

Trade between the EC and the United States is no small affair. Taken together, the 12 nations of the EC are the largest market for U.S. exports; in aggregate they are the biggest U.S. trading partner. Individually, 4 members of the EC (Germany, the United Kingdom, France, and Italy) are among the top 10 in volume of total trade with the United States. In 1990, the United States ran a small merchandise trade surplus with the European Community, although the range of variation with individual countries was wide; Germany's $8 billion trade surplus with the United States in 1989 was fourth highest among all U.S. trading partners, and Italy's $4.7 billion was eighth. Europe is also the location of the bulk of U.S. foreign direct investment.

The effects of EC-92 policies on trade between the EC and the United States and on U.S.-owned companies are not entirely clear either, but are not likely to be large. The most direct effects of EC-92 on the United States will come through trade policy, public procurement policy, and new mechanisms for setting technical standards. EC trade policy differentiates between goods produced within the EC and those imported into it, discriminating against the latter. The new EC public procurement policy does the same, providing large benefits for goods where at least half the content is added in the EC. And as Europe develops new procedures for setting EC-wide standards to replace existing national standards, U.S. firms have worried both that they will be frozen out of the process and that EC firms will use the standards to keep out foreign-made goods.[4]

These policies will have different effects on U.S. exporters and U.S. firms that manufacture in Europe. Many of the policies that accompany EC-92, e.g., tariffs, quotas, antidumping enforcement, rules of origin, and public procurement, will encourage exporting firms to relocate production to the EC. Firms that do not relocate could face significant trade barriers, more so in important sectors such as computers, semiconductors and telecommunications equipment. Exporters should benefit somewhat from the macroeconomic effects of EC-92, for growth

brings increased demand that should expand U.S. exports. It is likely that any resulting boost to exports will be modest. It is too early for a conclusive judgment on U.S.-EC trade, especially as the EC has indicated that it will negotiate over many protectionist policies.

U.S. manufacturers in the EC should encounter expanded opportunities as national barriers and preferences are removed. Conversely, they may also face stiller competition from other foreign competitors into Europe (mostly Japanese firms), or from European firms themselves.

Besides its effects on U.S. exports and U. S.-owned firms operating in Europe, EC-92 is interesting as a source of policy ideas and options for the United States. In many ways, EC-92 is responding to a set of issues this country is also grappling with in the face of formidable international competition. Europe's solutions may not be those we would choose, but it is a very large working laboratory for policy experiments. As its efforts take effect over the next few years, they will bear close scrutiny as to their possible relevance to the United States.

THE EUROPEAN SINGLE MARKET

The push to create a unified market **in Europe began in 1957** with trade policy and the slow **reduction of tariff barriers among members, which reached** zero in **1968. Nonetheless, barriers** re**mained. Even the process of crossing the border was inordinately complex and** time-consuming, sometimes **taking days for** commercial vehicles.[5]

In 1985, the Commission of the European Communities (CEC) introduced a package of radical reforms in a White Paper.[6] This ambitious program aimed to remove barriers blocking the free flow of people, goods, services, and capital among EC countries. The package boiled down to 287 specific actions, each of which had to be negotiated in detail with the 12 member governments, affected interest groups, the European Parliament, and even third parties like the United States. This would have been impossible without a key institutional change, the Single European Act (SEA), which allows most agreements to be pushed through by modified majority vote among the member countries; a single country can no longer block adoption. These changes **take place in the** institutional and political context described in box 5-A.

Progress in removing barriers among EC nations is substantial but incomplete. The process of approving and implementing measures is complex and time-consuming. Most measures have been agreed on in principle, but as of mid-1991, only about one-third had been finalized, and only a handful have been adopted as law throughout the Community. Serious obstacles remain, such as harmonization of monetary policy. Yet there is little doubt that the process is irreversible. Member states have made too many crucial commitments and central reforms have already been implemented.

For goods, the hundreds of documents needed to cross borders have been reduced to one, and the Commission aims to remove all border formalities in the next few years. Quantitative restrictions are formally illegal among members, and the EC is working to resolve some signicant exceptions (e.g., autos).[7] Taxes are being reformed so that indirect taxes do not discriminate against imported items.[8] The free flow of goods can still be restricted on health and safety grounds, but the European Court is interpreting this loophole very narrowly.

For capital, three directives remove national controls on deals in stock and mutual shares:

1. **long-term commercial** credits and securities not **traded** on exchanges;
2. admission of securities to capital markets; and
3. investments in short-term securities, current **and deposit** accounts, and loans.

Once the three directives are fully irnplemented,[9] there will be no barriers to the free movement of capital within the EC.

Services have always been tightly regulated in Europe; even the right to establish a business has been limited. That will now change, as companies operating in any EC country will have increasing access to services markets in all the other EC countries. Banks, for example, will operate under the key principles of the single banking license, mutual recognition, and home country control. These will create a single market for banking services, regulated by the authorities of the bank's home country. This also sets off a race toward deregulation, as banks will tend to setup shop in the country with the least restrictive regulatory regime.[10]

Box 5-A—The Politics and Institutions in the European Community[1]

Institutions-There are four institutional power centers in the EC: the Council of Ministers, the Commission of the European Communities (Commission), the European Parliament, and the European Court of Justice (European Court).

The *Council of Ministers* represents national political power within the EC and is the strongest of the four centers. European Council meetings,[2] are attended by heads of government for the 12 countries. More specialized topics are discussed by Councils of particular ministries-e. g., the EC's Science and Technology Framework Program is considered by Ministers of Science, Technology, or Research. The Foreign Ministers' Council is the most important of the specialized Councils.

Until 1985, legislation considered by the Council of Ministers had to be passed unanimously, so that even the smallest state held an absolute veto over the affairs of the EC. In 1985, the EC passed the Single European Act (SEA), which applied majority voting to all decisions affecting the implementation of the single internal market, except fiscal decisions and those relating to the free movement of people and workers' rights. The decisions needed to implement the single market will be taken largely by qualified majority voting.[3] The Council is chaired by the President of the EC, an office that rotates biannually among the member states, in alphabetical order.

The Commission is the executive branch of the EC and has the sole right to make proposals to the Council of Ministers. Under its current President, Jacques Delors of France, the Commission has been a dynamic force pushing member states to give up sovereignty on the way to the single market, and then economic and even political union.

The Commission is divided into 24 Directorates General (DGs), the equivalent of Ministries. Each is led by a Commissioner, of which there are 17 (the President included), one nominated by each small member state and two by each large one.[4] There are powerful tensions between DGs and Commissioners who strongly support free market

[1] This material is drawn from various CEC documents and Alberta Sbragia, "The European Community and Institutional Development: Politics, Money, and Law," Brookings Institution forthcoming.

[2] Sometimes called EC summit meetings.

[3] Votes in the Council are weighted roughly by population: the United Kingdom, France, Germany, and Italy hold 10 votes each; Spain 8; Belgium, Greece, the Netherlands, and Portugal 5 each; Denmark snd Ireland 3; and Luxembourg 2. Proposals pass underqualified majority voting when they receive at least 54 out of the 76 total votes. Hence a blocking veto requires at least two major countries plus one medium sized one. Britain has been the country most consistently opposed to decisions but overruled under the SEA.

[4] The member states with tWO Comissioners are France, Germany, Italy, Spain, and the United Kingdom.

Article 48 of the Treaty gives workers the right to move freely within the EC to take up offers of employment.[11] This right has been expanded so that workers can now also seek work and bring family and some dependents.[12] There are still difficulties, such as the mutual recognition of professional qualifications, but EC citizens are now in essence free to work anywhere in the EC. Going further, France, Germany, the Benelux countries, and Italy have recently signed the Schengen agreement, which will eliminate all border checks on people. Spain and Portugal also intend to participate.

Other aspects of EC policy are not as settled. Disagreements remain, especially over the issue of subsidies and trade protection for firms whose ultimate owners are mainly European. This rift among member countries was highlighted in disputes over how to treat companies in the electronics sector. Britain's conservative government, sticking to its free market principles, allowed the Japanese electronics giant Fujitsu to buy the premier British computer firm, ICL, in 1990. At the opposite pole, the French Government announced in April 1991 that it would provide $1.5 billion in subsidies to its two state-owned electronics companies-the computer manufacturer Groupe Bull SA and the defense and consumer electronics group Thomson SA, both of which experienced large losses in 1990. The justification, given by French Minister of Industry Roger Fauroux, was that "the future competitiveness of entire sectors of European industry" depended on the survival of European electronics firms.[13] The EC Commission, which has supervisory power over industry subsidies, was reported to be divided over whether to approve the French subsidy.

It would be a mistake to view the progress toward EC-92 as a flood propelling all before it in one direction. In tone and even intent, various EC

principles (notably Leon Brittan of the United Kingdom) and those who support a more interventionist industrial policy (notably Pandolfi of Italy and Delors).

Until recently, *the Parliament has* been relatively weak essentially a talking shop. Direct elections strengthened the Parliament; its role was also enhanced by the SEA. It can now delay but not block proposals. The powers of the Parliament will be extended.

The European Court acts somewhat like the U.S. Supreme Court. The Commission occasionally uses the Court to define its own rights and to interpret the key legal statutes of the EC. The Treaty of Rome and subsequent amendments, notably the SEA, provide the written constitution on which the Court bases its decisions. The Court may become increasingly important, as the EC seems to be moving away from a governmental system based on administrative discretion toward a more rule-driven model of government.

Politics-Industrial policy in Europe has attracted political backing from three key points on the political spectrum. While *the left* has abandoned a fully socialist economy in favor of a mixed model after World War II, it seeks to mitigate market outcomes and prevent market failures. The mix varies, as do the mechanisms chosen.[5]

Christian Democratic parties have developed corporatist ideas based on notions of reciprocal rights and obligations between the state and the major social groups. These parties usually have tight relations with major producer groups-both employers and unions-and see negotiation with these groups as the basis for economic and industrial policies.

Nationalist tendencies springing from the right also support industrial policies. *Gaullism stresses the importance* of strategic industries and national independence, for national security reasons. That implies national control of the technology base. Together, these three philosophies have given industrial policy the respectability that it lacks in the United States.

Still, industrial policy is not universally viewed in Europe as either successful or appropriate. The tide of political opinion in Europe turned against it following the election of Margaret Thatcher as British Prime Minister in 1979.[6] Thatcherites view industrial policies as expensive, inefficient, and corrupt. They replaced nationalization with privatization. EC-92 itself in many respects rejects traditional European industrial policy; it is committed to make markets work and reduce the role of the government in the economy.

[5]For a good example of moderate left thinkin gin the post-War period, see Anthony Crosland, *The Future of Socialism* (Westport, CT: Greenwood Press, 1977).

[6]Even in Sweden, the Social Democratic party has recently been forced into a mainstream agenda influenced by Thatcherism.

directives are at loggerheads with others, reflecting the differing views of the members on how close government-industry cooperation ought to be. Even where several policies converge toward one result, they are not entirely consistent and probably were not designed to be so. Rather, they evolved in that direction.

EC-92 AND U.S. BUSINESS: ECONOMIC GROWTH AND TRADE POLICY

EC-92 will affect U.S. companies in three ways:

- a growth effect, in which an expanded EC market will offer greater sales opportunities to both European and American fins;
- a near-term protectionist effect, as some EC policies governing trade, public procurement, and standards give EC-made goods an advantage over U.S. exports; and
- a longer term competitiveness effect, in which EC support of technology advances and collaboration among European firms might improve their performance compared with U.S. fins.

Nearly everyone expects a boost in economic growth from EC-92. The questions are how great it will be and whether it will outweigh any losses U.S. firms may suffer. EC-92 policies will affect U.S. exports and sales by U.S. firms located in Europe differently. The distinction is important from the standpoint of U.S. national interests. Success in exports tends to strengthen the national economy and raise standards of living. Success by U.S.-owned firms operating in foreign countries is not so closely tied to the Nation's interests, though it may be indirectly supportive if profits from the foreign

Table 5-l—Macroeconomic Consequences of EC Market Integration for the Community, 1992-98

	Trade barriers	Public procurement	Financial services	supply effects	Total value
Change			(percent)		
GDP	0.4	0.5	1.5	2.1	4.5
Consumer prices	–1.0	-1.4	–1 .4	–2.3	-6.1

SOURCE: Paolo Cecchini, Michel Catinat, and Alexis Jacquemin, *The European Challenge:1992: The Benefits of a Sing/e Market* (Aldershot, U.K.: Gower Press, 1989). Paolo Cecchini was Chairman of the Cost of Non-Europe Steering Committee, and Special Advisor to the Commission of the European Communities.

ventures come back to enrich American citizens or enhance domestic investment.

Economic Growth Due to EC-92

EC-92 is still in early stages of implementation, so its effects on growth are not yet discernible. However, most analysts expect EC-92 to increase the EC's productivity by removing intra-European trade barriers, encouraging restructuring, promoting competition, and boosting investment. All this is expected to result in faster economic growth.

The original estimates on the medium-term (1992-98) growth effects of EC-92 were produced by Paolo Cecchini for the Commission. Relying extensively on macroeconomic analysis, Cecchini used OECD and EC economic models to produce a set of estimates for the medium-term impact of EC-92 on the European economy over 6 years, as described in table 5-1.

This estimate from the Commission strongly influenced European policymakers. It suggested that there was a specific policy route available that would increase the rate of economic growth by around 50 percent every year for 6 years, with further effects later on (the Cecchini estimate of 4.5 percent extra growth over 6 years is the average of a range of estimates, from 3.2 to 5.7 percent). According to the report, still more growth might result with changes in macroeconomic policy, such as increased public investment and reduced income taxes. In that case, gross domestic product (GDP) gains might be as high as 7 percent over the 6 years, and employment gains could rise from about 1.8 million new jobs to 5 million, at the cost of a smaller reduction in consumer prices (4.5 instead of 6.1 percent).

The Cecchini report has not been accepted unchallenged. While Richard Baldwin sees dynamic gains from EC-92 that dwarf the estimates made by Cecchini,[14] most other American (and several European) economists regard the Cecchini estimates as optimistic. Merton Peck, for example, concludes that 1.5 to 2.5 percent additional growth in GDP is a more justified figure, although he concedes that his estimate is itself only a guess based on previous experience of GDP gains with removal of trade barriers, and that his work excludes the dynamic gains stressed by Baldwin.[15]

Keynes long ago pointed out that a primary determinant of economic activity was the "animal spirits" of entrepreneurs, and EC-92 already has been a shot of adrenalin for Europe. "Europhoria" may be no more appropriate than 'Europessimism,' but it does have the benefit of making the business community more optimistic and more likely to invest, hence improving chances for the economy to grow faster. How much faster is, for now, an unanswerable question.

Opportunities for U.S. Exports

If EC-92 is successful in making European firms more competitive, both imports and exports would be likely to increase. This growth in trade, added to the growth of the EC market, could help U.S. exports, assuming they are able to take advantage of the growth.

An obstacle to increased U.S. exports could lie in the EC's trade and procurement policies. Since most European countries already have some protectionist trade and procurement policies, only EC policies that move in the direction of greater protection will make it harder for U.S. exporters to sell in Europe. But the early fears that EC-92, while dissolving trade barriers within the Community, would erect a Fortress Europe against outsiders have abated. An overall move toward more protectionism against non-EC traders now appears unlikely. However, there are important exceptions affecting specific industries. One of these is the electronics complex, including computers, semiconductors, and telecom-

munications equipment. This is the largest and most important category of U.S. exports to the EC.

Table 5-2 shows exports and trade balances for the industries accounting for most U.S. manufacturing exports to the EC in 1989 (the last full year for which detailed trade figures are available). It seems that changes in trade and procurement policy will make little difference to two of the three industries that are our biggest exporters to Europe--chemicals and aircraft. The electronics situation is murkier. Without question, EC trade, procurement, and technology policies are all targeted toward helping European firms compete more vigorously in the computer, semiconductor, and telecommunications industries. Although this effort is unlikely to cripple U.S. exports, it could dampen them.

U.S.-EC trade in chemicals is large and two-way; the $9.9 billion in U.S. exports to the EC was almost matched by U.S. imports from the EC. This reflects the fact that both the United States and the EC are home to strong, competitive chemicals industries (though EC companies are larger and have a bigger share of world sales[16]). There are no new departures in EC-92 trade or procurement policy likely to hinder expanded U.S. chemicals exports to the EC as that market grows. The new, more unified system of standards and testing could make it easier for U.S. firms to export to the EC, because their products will have to pass only 1 set of tests and requirements, not 12; however, it is unclear whether U.S. exports could be tested in the United States or would have to be tested in Europe (see the discussion of standards below). Firms just beginning to export to the EC may find it more difficult, because competition within the EC market will be keen.[17]

The U.S. aircraft industry is not only a big exporter but also a big generator of trade surpluses for the United States, in both EC and world trade. It is getting increasingly tough competition from Airbus, however. The large, sustained subsidies to Airbus from European governments are no small part of its success (see ch. 8), but those subsidies have nothing to do with new policies under EC-92.

Table 5-2—U.S. Balance of Trade With the EC, 1985 and 1989

Product category	1985' (billion dollars) Us. exports	Us. imports	Balance	1989 (billion dollars) Us. exports	Us. imports	Balance	Share of U.S. exports (in percent)
Total trade	$49.0	$67.8	$-18.8	$86.6	$85.1	$ 1.5	24%
Manufactures	36.8	56.8	-20.0	71.7	75.5	-3.8	26
Chemicals	5.9	6.2	-0.3	9.9	9.1	0.8	27
Basic manufactures	2.5	10.8	–8.3	5.4	13.4	-8.0	19
Paper	0.3	0.6	-0.3	0.7	0.8	-0.1	16
Textiles	0.4	1.4	–1.0	1.0	1.7	-0.7	25
Iron and steel	0.2	3.0	-2.8	0.4	3.1	–2.7	12
Nonferrous metals	0.3	1.3	-1.0	0.7	1.3	-0.6	15
Metal manufactures	0.6	1.2	–0.6	1.0	1.7	--0.7	21
Machinery and transport equipment	20.6	27.1	–6.5	42.7	36.2	6.5	27
Computers and office machines	6.5	1.8	4.7	11.2	2.7	8.5	44
Electric machinery and parts	2.7	2.6	0.1	5.5	4.3	1.2	21
Power generating machinery	2.4	3.2	-0.8	5.4	4.6	0.8	37
Non-consumer telecom equipment	0.9	0.3	0.6	1.7	0.6	1.1	23
Aircraft and parts	3.4	2.0	1.4	9.4	3.5	5.9	39
Construction and supplies purpose machinery	1.7	2.7	–1.0	2.6	4.8	–2.2	23
Agriculture machinery and tractors	0.2	0.9	-0.7	0.6	0.9	-0.3	25
Machine tools and metalworking	0.3	0.8	-0.5	0.7	1.1	-0.4	26
General industrial machinery	1.4	2.7	-1.3	2.9	4.5	–1 .6	22
Motor vehicles	0.1	7.9	-7.8	1.0	6.7	-5.7	10
Auto parts	0.5	1.5	-1.0	1.0	2.5	1.5	8
Miscellaneous manufactures	4.6	9.7	–5.1	11.0	13.2	–2.2	31
Science and control instruments	2,2	1.1	1.1	4.1	2.0	2.1	36
Photography, optical, and time equipment	0.6	0.9	–0.3	1.4	1.4	0.0	40
Clothing	0.1	1.8	-1.7	0.3	1.7	–1.4	14
Footwear	0.0	1.1	-1.1	0.1	1.3	-1.2	24
Toys and games	0.1	0.3	-0.2	0.4	0.4	0.0	25

'1985 data includes Spain and Portugal.

SOURCE: National Association of Manufacturers, from Department of Commerce data.

None of the EC-92 trade and public procurement policies should change the prospects for sales of U.S. aircraft in Europe very much; developments in the competition among Airbus, Boeing, and McDonnell Douglas are likely to affect U.S.-EC trade in aircraft much more than EC-1992 (see ch. 8).[18]

EC Trade and Public Procurement Policies

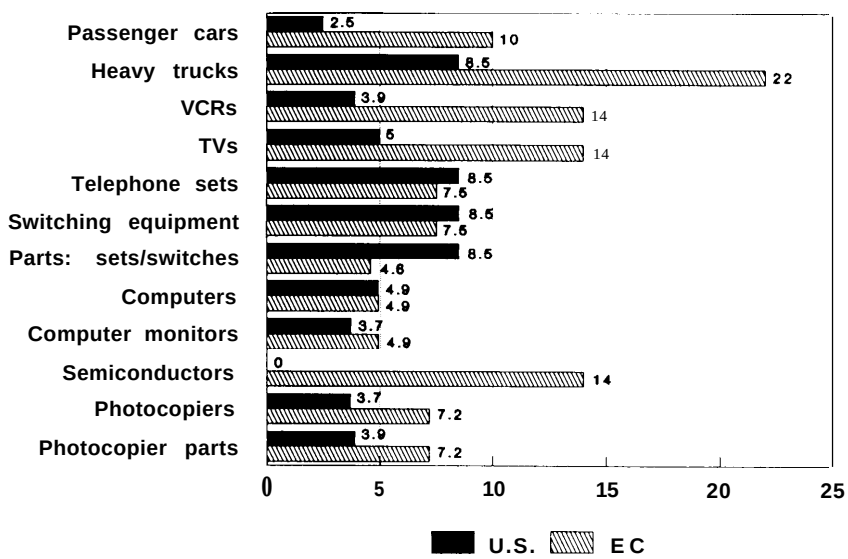
New EC-92 trade and procurement policies do affect U.S. electronics exports directly. Europe is the leading destination for computer and electronics exports from the United States, and an important market for these industries. As shown in table 5-2, computers and office machines alone accounted for $11.2 billion of U.S. exports to the EC in 1989, generating an $8.5 billion surplus for the United States. Electrical machinery and parts-mostly semiconductors-added another $5.5 billion in exports and nonconsumer telecommunications equipment $1.7 billion; together, these two sectors generated a $2.3 billion trade surplus.

As shown in figure 5-1, EC tariffs on computers and telecommunications equipment are the same as or a little lower than U.S. tariffs on the same items—around 5 to 8 percent. The largest tariff in the group is on semiconductors, at 14 percent; the United States has had no tariff on semiconductors since the early 1980s. The EC semiconductor tariff has not stopped U.S. exports. In fact, the Commission can waive the tariff when a certain chip is needed by an EC producer and is not made there or is in short supply. According to one estimate, about 20 to 30 percent of semiconductor imports faced no tariff in 1988.[19]

What is new is the EC's rule of origin for semiconductors, introduced in February 1989. Under this rule, the country of origin is defined not by the testing and assembly of chips, as had been the case, but by the location of wafer fabrication (where the diffusion process occurs) .20 Wafer fabrication is the most important and technically demanding part of semiconductor manufacture. The final step, testing and assembly, adds only 10 to 15 percent of the chip's total value; wafer fabrication constitutes about 60 percent.[21] Semiconductors that do not qualify as EC-made (i.e., are not fabricated in Europe) face the 14-percent tariff. But more important is the combination of the semiconductor rule of origin with strong preferences for EC-made goods in public procurements and the settlement of antidumping actions.

EC directives allow public purchasers in four sectors—water, energy, transport, and telecommunications-to reject bids that have less than half EC content by value. (These sectors are excluded from GATT rules that govern public procurement,

Figure 5-I —U.S. and EC Tariff Duties for Selected Commodities, 1990



NOTE: Japan had no tariffs for these products.

SOURCE: Office Of Technology Assessment, 1991, derived from published tariff schedules for the United States, EC, and Japan.

and therefore are designated the excluded sectors.) Even if the purchasers choose to consider non-EC bids, they are required to give a 3-percent price advantage to goods and services of EC origin. The four sectors account for at least one-quarter of all public procurement in the EC[22] (some estimates are as high as one-half[23]) and for many high-technology purchases. Public procurement, as defined by the EC, covers not only governments but also firms that benefit from exclusive geographical rights or barriers to entry in their industry and businesses that governments control through the granting of licenses. This means, for instance, that British Telecom, a private firm licensed by the British Government, follows the public procurement rules. The U.S. International Trade Commission reckons that public sector purchases account for as much as 90 percent of U.S. companies' telecommunications equipment sales in the EC, and up to one-third of EC sales by computer companies.[24] Semiconductors are essential components of the computers and telecommunications equipment covered by the public procurement rules.

On the other hand, U.S. exporters could benefit from some changes in public procurement under EC-92, especially as they apply to purchases outside the excluded sectors. The new rules require greater openness and less discrimination in public purchases. Assuming tough enforcement, this could break the hold that many national companies now enjoy as favored suppliers-an important EC goal, for favoritism is costly. One of the main sources of the economic growth and reduced prices expected in EC-92 is lowered costs arising from competition in public procurement. The Commission has a measure of control over the national governments in this regard. Public purchasers must disclose annual projected procurement figures and report on contracts awarded in the past year.[25] So far, however, the Commission's enforcement powers are weak. For example, when the Danish Government specified that only Danish labor and materials could be used in building a bridge, the EC stopped short of taking court action to halt the project and reopen bids. Instead, it agreed to an out-of-court settlement in which Denmark promised to change its ways in the future and allow the excluded bidders on the bridge project to sue for compensation. Nevertheless, even this much is progress.

The excluded sectors also fall under new nondiscrimination rules, but with more exceptions and looser criteria for openness. The preference for EC suppliers in these sectors remains one of the biggest worries for U.S. exporters facing EC-92. GE, for example, noted that it was hard to justify spending upwards of $200,000 on bids to provide power plant equipment when the bids need not even be considered. Other U.S. firms have made the same point, emphasizing that the EC rules differ from the U.S. Government's Buy American preferences, which give U.S.-based bids a price advantage of 6 percent (12 percent for small businesses), but then require that all bids be considered on an equal basis. The uncertainty under the EC rules may be enough to deter bids from any company that cannot confidently claim 50-percent EC content.

Some U.S. producers of semiconductors are fearful that the restrictions on public sector purchases could spill over into the private sector (or public purchases outside the excluded sector). A firm selling computers, say, in more than one market might not want to make different product lines for each, and so would have reason to buy chips from EC sources to help satisfy the 50-percent requirement. Thus the public procurement rule could set the standard for the whole market.

These fears may be exaggerated. U.S. firms have done quite well exporting semiconductors, computers, and telecommunication equipment to the EC, despite the European tradition of making public purchases from national champion firms.[26] U.S. exporters stand to benefit from the new rules for greater openness to all bidders. Furthermore, there is a possibility that even in the excluded sectors, U.S. exports may eventually win the same treatment as EC goods. In the Uruguay Round of GATT negotiations, the EC has shown interest in an expanded GATT Government Procurement Code, which would extend to signatories equal treatment in *all* public procurement (except defense). Meanwhile, however, the combination of new rules of origin and discriminatory public procurement is pushing foreign firms to manufacture in Europe rather than export to Europe goods formerly made at home. While that may be good news for U.S. multinationals, it could be bad news for exporters, especially small ones without the scale of operations to justify locating in Europe.

Another EC trade policy that affects U.S. exports, especially in electronics, is its recent aggressive pursuit of antidumping actions. From 1985 through

1990, the EC initiated 209 antidumping actions, concluded 190, imposed penalties in 67, and made agreements to remedy the injury to EC producers in 51, often by shifting high-value-added production to the EC.[27] The most significant actions were against Japanese, other Asian, and Eastern European companies; hardly any were directed against U.S. firms.[28] But aggressive antidumping actions and penalties add much weight to the factors that encourage foreign firms to locate and manufacture in Europe, and that has consequences for U.S. exports.

The EC has often settled cases against Japanese producers with agreements that, in the future, the goods in question can avoid antidumping penalties (i.e., additional duties) by including at least 40 percent non-Japanese content. This doesn't necessarily mean EC content, according to the Commission. However, there are reports that some manufacturers of machines using semiconductors assume that it does mean EC content, or at least it might, and to be on the safe side they design in EC-made chips rather than U.S.-made chips.[29]

In the well-known Ricoh case, the EC did go after photocopiers made in the United States. In November 1988, Ricoh copiers, made in Japan, were found to be dumped. The EC assessed 20-percent antidumping duties (the regular EC duty is 7.2 percent). Three months later, the Commission charged that Ricoh had increased production in California, where it was simply an assembly operation, and that the real manufacture was occurring in Japan. Therefore, the EC ruled, the California-assembled copiers should face the same duty as if they were all-Japanese. Moreover, an EC rule adopted in July 1989 extended new rules of origin to copiers. It stated that the country of origin would be determined by where "technically sophisticated components, such as the various printed circuit boards, lenses, various motors and high-voltage generators" were manufactured.[30] Nowhere is it explicitly stated that these high-technology components would have to be made in the EC in order for a photocopier to escape penalties in an antidumping case, or perhaps to be considered for public procurement. But again, that may well be the practical effect.

EC Standards, Testing, and Certification

A central part of EC-92 is the creation of a unified standards and testing system in Europe. This means that goods that pass muster in 1 of the 12 member nations should be accepted in all of them. Pan-European acceptability should be a boon for European as well as foreign firms, since it relieves them of the need to meet varying standards in different countries. For many U.S. companies that positive effect will outweigh any negative ones.

Still, there are worries about negative effects. One has to do with the content of the standards and another with the means of testing them. Initially, U.S. companies were concerned that the new EC standards were being written behind closed doors, and that they might be designed so restrictively as to handicap all but European firms. This fear has receded somewhat as EC standards-making bodies have allowed U.S. companies a more substantial voice in the process, for example, by letting them comment on proposed standards at an early stage, before it is too late to make any difference. Concern about the content of the standards has not vanished, however. U.S. firms find that they must push their own interests quite aggressively in the standard-setting process. Even for large, well-organized companies this requires a great deal of vigilance, and for smaller ones it maybe impossible. For many U.S. exporting firms, however, the biggest remaining worry is not so much the content of the EC standards as how their products will be tested to make sure they conform to the standards.

A new testing system is part of EC's new unified approach to standards. Before EC-92, all 12 nations had to agree before any European standard could be adopted. The process was glacially slow and produced standards that were sometimes immediately obsolete. EC-92's new approach is based on a two-pronged strategy. First, the EC has taken direct jurisdiction over "regulated products' that involve health and safety risks to consumers and the environment. The Commission writes broad essential requirements for these products into directives,[31] which then become EC law. Nonregulated products will follow national standards, but with the crucial proviso of mutual recognition; that is, any good that can be legally sold, manufactured, and marketed in one member nation should be equally salable in another.[32]

For regulated products, manufacturers can meet the essential requirements by submitting their products to testing by an independent laboratory, which is itself licensed as a "notfiled body" by a member government.[33] Another route to meeting the requirements is known as self-certification. The EC's

standard-setting bodies, CEN, CENELEC, and ETSI,[34] are writing detailed standards that will meet the requirements for regulated products. Manufacturers may choose to follow these detailed standards. This involves testing their products themselves for the various characteristics required (or getting an outside lab to do so), following approved quality assurance methods, and keeping documentation; they can then put the official CE stamp of approval on their own products. Self-certification is something of an honor system. It can be challenged by rival producers, in which case the self-certifying company would have to show proof of its claims. And the EC may decide to limit self-certification to products in which environmental and safety risks are not great.

There are advantages to the other route for approval of regulated products—submission to testing-since it allows innovative departures from the detailed standards set by CEN, CENELEC, and ETSI so long as the EC's broad essential requirements are met. However, the problem for U.S. firms (as for other non-EC companies) is to get their products tested in their home territory. Considering that parts and components, as well as final products, may require testing, shipping these overseas could be totally impractical, especially for small companies. U.S. industries and government agencies are pushing the EC to license U.S. test laboratories as notified bodies, or else allow EC notified bodies to subcontract testing to U.S. labs.[35] Such devices have precedents. For example, Canada accredits U.S. labs that have passed the inspection of a Canadian official.

As of mid-1991, the EC had initially refused to accredit U.S. labs and was taking a narrow view of possible subcontracting; for example, it appeared that quality assurance audits could not be conducted by outsiders. Possibly, testing may be done in affiliated labs that EC notified bodies set up in the United States. There is already a move in this direction, and while it might solve manufacturers' testing problems, it could also put some U.S. labs out of business.[36] Mutual international recognition of standards is also possible, but here there are difficulties, too. The EC will deal only with a national authority, and the U.S. system is highly decentralized. Standards for various products are set by hundreds of public and private bodies at the National, State, and sometimes regional levels. Testing and certification matters were far from settled in 1991; all were under negotiation.

Discussions were held in June 1991 between U.S. Secretary of Commerce Robert Mosbacher and EC Commission Vice-President Martin Bangemann. These yielded promising prospects for conformity assessment facilities in the United States to receive EC notified body status, allowing them to carry out "the full range of required conformity assessment procedures under the EC directives.' This would be conditional on the successful conclusion of a mutual recognition agreement allowing, in return, EC bodies to have full participation in U.S. conformity assessment systems.[37] The Commission, however, has not yet received a mandate from the Council to negotiate such agreements, and it is still not clear what the terms of such an agreement would be, except that third country governments would have to ensure the technical competence of the facilities concerned. Both sides also renewed their commitments to the promotion of international standards.

Standards for nonregulated products are relatively unaffected by EC-92. Although the EC standards-setting bodies are working on harmonizing detailed standards for these products too, that is a long-range task. Meanwhile, the mutual recognition rule still applies to these products, as it has since 1979; no EC member nation can exclude a product that meets another member's standards, solely on the grounds of having a different standard.

Finally, if the EC gains wide adoption of its standards throughout the world, U.S. exports could lose some luster. The EC has already announced its intention to give Eastern Europe a special place at the standards-setting table, and to give technical assistance on standards to non-European countries in the Mediterranean, South America, India, and Southeast Asia.[38] Some of the EC's draft policies on standards go further in this direction. For example, some standards include patented technologies. Standard-setting bodies in most countries, including the United States, require that the owner of the patent must license it, on fair and equal terms, to anyone wishing to produce to the standard and sell in that country's market. However, one draft EC policy would require the patent holder to license it equitably *only* to EC producers, or to producers in countries that adopt the EC standards.[39] This would not only exclude firms in the United States and Japan from the required licensing and equitable treatment

(since these countries are not necessarily going to adopt the EC standards for their own markets), but would be an incentive for other countries to sign on to the EC standards.

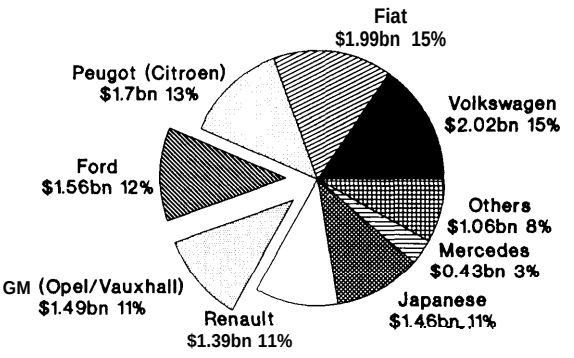
Quite possibly, this last draft policy will not be adopted. Certainly, U.S. exporting firms oppose it. It does illustrate the fact that American and other foreign firms must carefully watch out for their interests in the standard-setting process and express their concerns forcefully. overall, it appears that U.S. exporters will gain from the unified EC-92 standards and testing regime, and the problems it raises can be manageable, though not without effort.

Opportunities for U.S.-Owned Companies in Europe

EC-92 could confer some special benefits on American-owned companies already established in Europe, at least in the short run. Ford opened its frost auto plant in Europe 80 years ago, and both Ford and General Motors have been operating as European firms for decades. They have plants in several European countries, along with widespread sales and service networks, and they are leading sellers in European markets (figure 5-2). IBM dominates the European computer market. Other U.S. firms have longstanding alliances with European firms, e.g., GE Aircraft Engines with the French firm SNECMA. Many of the U.S.-based multinationals have strong ties with local suppliers, and some have world-class R&D labs in their host countries (e.g., high-temperature superconductivity was discovered in IBM's R&D facility in Berne, Switzerland). Such companies will have no trouble qualifying their products as EC-made goods, and thus will escape tariffs and quotas. Many EC-92 reforms are specifically designed to disrupt cozy relationships between national governments and national champion fins; in some areas of public procurement, U.S. multinationals will be able to compete on a more equal footing with EC-owned companies.

The advantage some U.S. firm have in already being there will not last forever. Japanese firms are latecomers as foreign direct investors in Europe (as they are in the United States), but that is changing fast (table 5-3). In 1989, for example, there was just 1 Japanese-owned semiconductor wafer fabrication plant in Europe (there were 12 U.S.-owned),[40] but at least 3 more were under construction in 1991.[41] Three Japanese auto plants in EC countries were

Figure 5-2—Automotive Market Shares in Western Europe in 1989 (bn=billion)



SOURCE: Kevin Done, "W Europe Car Sales Continue Rising: Volkswagen Group Keeps Place at Top of League," *Financial Times*, Jan. 22, 1990, p. 3.

turning out 295,000 cars per year in 1990, but 6 new Japanese plants will be up and running by 1994, producing 934,000 units a year (table 5-4). Tariffs, quotas, anti-dumping actions, and public procurement policies are driving Japanese firms to establish branches in Europe, with the prospect of a growing market under EC-92 as the reward.

Foreign Direct Investment in Electronics in the EC

EC policies that favor goods made in Europe are most prominent in the electronics sector, covering everything from semiconductors to computer printers to compact disk players. Many of these policies are longstanding, predating the passage of the Single European Act of 1985 and the decision to push forward with EC-92; some are national policies of member states. Notably, European computer firms have long enjoyed favored status in government purchases; public sector purchases make up about 15 percent of the European computer market, and most of that goes to each nation's own champion firms. Groupe Bull in France and Siemens-Nixdorf in Germany each make about one-third of their domestic sales to their own governments.[42] The state-owned Bull has received about 7 billion francs (more than $1 billion) in subsidies since 1983,[43] and the French Government proposed to give it still more in 1991.44

The EC is committed to ending member states' support for national champion companies, a support that never achieved its purpose. The heavily subsi-

Table 5-3--Direct Investment Outflows From Japan

	Total (billion dollars)	Europe, (percent of total)	North America (percent of total)
1980	$4.7	12.3%	34.O%
1985	12.2	15.8	45.0
1986	22.3	11.5	46.8
1987	33.4	19.7	46.0
1988	47.0	19.4	47.5
1989	67.5	21.9	50.2

NOTE: Fiscal year from April to March.

SOURCE: Organization for Economic Cooperation and Development (OECD), *OECD Economic Surveys 1989/1990: Japan* (Paris, France: 1990), table 14, p. 52.

Table 5-4-Japanese Production Capacity in Europe[a] (000s of units)

	1990	1994
Toyota		
Burnaston, U.K.	O	200
Lisbon, Portugal	O	15
Honda		
Swindon, U.K.	o	200
Nissan		
Washington, U. K.	200	200
Barcelona, Spain	O	74
Mitsubishi[b]		
Boom, Netherlands	O	100
Suzuki		
Linares, Spain	50	50
Esztergom, Hungary	O	50
IBC (Isuzu-GM)		
Luton, U. K.	45	45
Total	295	934

[a]The capacity figures given are incremental capacity beyond that currently existing. The Barcelona, Linares, Boom, and Lutton plants are facilities already being operated on a smaller scale by European or American companies. They will continue to produce European designs exclusively for their European or American joint-venture partners while adding the capacity shown in the table to produce Japanese designs to be sold by both partners.

[b]No final announcement of Mitsubishi's plans has been made. Negotiations are understood to be held up over the Dutch Government's asking price for its ownership stake in Volvo's Dutch subsidiary. Mitsubishi would take this stake to form a joint venture with Volvo to produce and market a Mitsubishi designed car.

SOURCE: James P. Womack and Daniel T. Jones, "European Automotive Policy: Past, Present, and Future," contractor report prepared for the Office of Technology Assessment, July 5, 1991.

dized national computer companies have not done well in world markets.[45] Nor have European semiconductor producers achieved international success, despite trade protection and government assistance. Their share of the world market declined from about 25 percent in the early 1970s to around 10 to 12 percent in the late 1980s, and today their chips are sold largely in Europe. The weakness of the European computer industry has meant limited demand for high-performance, leading-edge integrated circuits.[46] In the electronic sector overall, the EC's trade deficit was about $35 billion in 1990.[47]

While disavowing support for national champions, the EC nevertheless has policies that strongly favor EC-made electronics goods. The hefty EC tariff of 14 percent applies not only to semiconductors (see figure 5-1) but to several consumer electronics items (e.g., color TVs). And protection has increased in the 1980s. The EC tariff was raised from 9.5 to 19.5 percent for compact disk players in 1983, and from 8 to 14 percent for VCRs in 1985. As discussed above, public procurement in the excluded sectors under EC-92 will give European goods strong advantages. Perhaps most forceful of all has been the EC's aggressive pursuit of antidumping actions in the electronics sector.[48] As we shall see, all these EC policies favoring locally made electronics goods have powerfully encouraged foreign firms to locate more of their production in Europe.

Several EC antidumping actions in recent years have been directed against the Japanese and other East Asian electronics producers. Of 149 actions initiated in the 4 years 1987 to 1990, 16 were against Japan, 18 against Korea, 6 against Hong Kong, and 6 against Taiwan.[49] Most of these actions concerned electronics products, including both office equipment and consumer products: typewriters, photocopiers, computer printers, video cassette recorders and tapes, audio cassettes and tapes, compact disk players, and small color TVs.[50] There were 63 antidumping actions against China (16), Turkey (14), Yugoslavia (11), and other Eastern European countries (22 in all), but these mostly involved low-technology products such as building materials, textiles, and apparel. Only three actions were taken against U.S. firms (two in 1987, one in 1990).[51]

During the 1980s, European electronics firms protested strongly against what they saw as aggressive Japanese pricing. Many Japanese companies employ product cycle pricing, in which early models of a product are priced as high as the current cost of

producing them would warrant but lower in relation to the average production cost over the expected product cycle-which would include the period after economies of scale and learning have been achieved. Japanese firms are also known for their commitment to building market share over short term profit-taking. These strategies led to accusations that Japanese firms were dumping, for which there are remedies under GATT if it causes injury to the recipient country's industry.

The EC tightened its antidumping enforcement so aggressively as to be accused in some quarters of protectionism. The EC has interpreted its antidumping regulation so as to make the finding of dumping and the proof of injury to EC producers much more likely, and the size of the injury greater.[52] EC mechanisms for determining the dumping margin tend to exaggerate the "fair" value of a product;[53] higher "fair" prices help to ensure both that dumping is found and that the margin between the "fair' and dumped price is large. The EC also tends to assume that there is a causal link between dumping and injury to home producers, rather than having to prove the link; for example, even low market shares captured by imports have been used as evidence of injury.[54] Other practices also put exporters accused of dumping at a disadvantage. The Commission itself verifies complaints; limits access to the case file; holds informal hearings in accordance with Continental law practice, which allows ex *parte* communications and does not require a written record; and grants no automatic right of review.

Most important, the EC does not set antidumping duties individually for each importer. Rather, one rate is imposed on all imports from the country as a whole, affecting dumped and non-dumped imports alike. In principle, importers can get their own antidumping duties reduced or eliminated by showing that they did not dump or dumped by a lesser amount, but the procedures to do this are slow, uncertain, and burdensome.[55]

The EC forgoes duties in some cases in return for undertakings by foreign exporters to charge higher prices. This was the case in the EC semiconductor agreements with Japanese producers in 1989 (for DRAMs) and 1990 (for Erasable Programmable Read-Only Memories, or EPROMs). Like the U. S.-Japan semiconductor agreement of 1986, these agreements set price floors, with the goal of encouraging European producers to invest in production facilities without fear of cutthroat below-cost competition from the Japanese.[56]

Foreign exporters on whom antidumping duties have been imposed have also avoided paying these duties by shifting the last part of their production offshore, usually to the EC. An order directed to imports of finished goods from the exporter's home country would then no longer apply. Very often, only the final assembly was shifted. The EC responded with an anticircumvention, or "screwdriver assembly,' rule. Under this rule, the Commission has the authority to levy the same duty as before on the finished goods if the parts and materials used come at least 60 percent (in total value) from the country or countries subject to the previous order. To avoid this provision, firms have decided to use over 40 percent EC-origin parts and materials, even though, according to the letter of the EC rule, those components and materials could be produced in third countries.[57] Japan, the target of many important EC antidumping actions, took the EC rule as it applied to Japanese plants in Europe to GATT, where it was found by a GATT panel to be illegal.[58] The EC did not abjure its anticircumvention rule, but after the GATT ruling in March 1990, antidumping actions came to a temporary standstill; however, a new action on components of disposable lighters is reported to be under way.

The antidumping rules, the new rule of origin for semiconductors, and the preference for EC-made goods in public procurement all add up to powerful incentives for foreign electronics firms to locate production facilities in the EC, which they did. By 1988, Japanese manufacturers of photocopiers, electronic typewriters, and printers had 10 subsidiaries in Britain, 6 in Germany, and 4 in France.[59] But these did not suffice. They were labeled screwdriver plants. To comply with the EC's anticircumvention rule the companies then had to scramble to find European parts suppliers-not always with great success since the components sector, especially in the United Kingdom, was weak. According to a Japanese source, "Japanese manufacturers looking to procure parts locally had to start by training and helping parts makers themselves."[60]

Similarly, when Japanese companies started making audio cassettes in Europe, they were hit with an antidumping action that imposed duties on the magnetic film going into the cassettes. The Japanese response was to shift production of the film into the

EC.[61] As for semiconductors, the indispensable electronic guts of all these products, the EC's 1989 rule of origin is forcing still more inward investment. Fujitsu, Mitsubishi Electric, Hitachi, and Sony have started to build or have announced plans for new wafer fabrication plants (fabs) in Europe; NEC is already there.[62]

It is putting it too strongly to say that the EC now has a coherent, unambiguous policy of forcing inward investment, even in the electronics sector, where the forces are most powerful. For example, when Fujitsu bought out the British computer company ICL in 1990, the company was promptly expelled from the industry's most influential lobbying group and was partially excluded from JESSI, the semiconductor research consortium heavily supported by the EC. This suggests that it could take more than local investment for a Japanese company to be treated like a European company. All the same, many EC leaders are strongly and explicitly committed to encouraging inward investment in forms that promise to create well-paid knowledge-intensive jobs and to transfer valuable technology to local supply fins.

For U.S.-owned companies already well established in Europe,[63] the new Japanese presence could mean greatly intensified competition in the European market. For U.S. companies that export to Europe but have no wafer fab there, the rule of origin for semiconductors could cause problems, especially for smaller companies that can hardly afford the $200 to $300 million investment in a European plant. Intel (not a small company but not a giant either) was one of those faced with the alternative of laying out hundreds of millions for an EC plant or losing EC sales. At congressional hearings in early 1989, an Intel representative protested against the EC's "domestic content policy," saying that it forced U.S. companies to transfer jobs, technology, and investments to Europe regardless of competitive considerations.[64] In October 1989, however, Intel announced a decision to build a $425 million wafer fab in Ireland, with substantial investment aids (i.e., subsidies) from the Irish Government.

Foreign Direct Investment in Autos in the EC

If there is some ambiguity in the EC's policy of encouraging foreign inward investment in electronics, there is more in motor vehicles. Longstanding quotas and informal arrangements that restricted Japanese auto imports, combined with newer local content requirements, spurred Japanese investment in auto plants in the EC in the late 1980s. However, in April 1991, the European Commission proposed a scheme that, reportedly, would allow only a small increase in the Japanese share of the EC market through 1998, Counting imports and transplant production as the Japanese share. At the end of July 1991, the Japanese Government reached an agreement with the CEC on auto exports and possibly production in the EC through the end of 1999. Although all the details were unclear as of August 1991, the pact apparently caps the Japanese producers' shares of the overall market at 16 percent (about half imports and half domestic production) by the end of 1999.[65] Though this is a higher share than they now hold, the agreement apparently permits no growth (or a slight decline) in Japanese exports, compared to 1990, with little additional production in Europe above that already announced and under construction.

Until quite recently, many policymakers in Europe considered their motor vehicle industry to be a competitive success. European automotive trade showed a positive balance through 1989, and for a remarkable 6-year period, from 1984 through 1989, European motor vehicle sales were extraordinarily robust, far higher than analysts had forecast (table 5-5). This prosperous period followed one of stagnation, in which the number of car companies shrank and employment greatly declined, but the result was a high level of capacity utilization and profits for every surviving company.[66]

This seeming strength was deceptive. First, national auto champions have been protected and encouraged through a panoply of industrial policy measures in European countries throughout this century. Quotas have quite effectively controlled Japanese imports into the major auto-producing countries, as is evident by comparing their imports with those of European countries with no domestically owned motor industry (table 5-6). Italy and Japan agreed in the 1950s on a limit of 2,000 imported Japanese cars annually, and the limit stood until the July agreement, which will permit Japan to export 138,000 cars to Italy by the end of 1999. France imposed a 3-percent market share limitation in 1977; Britain and Japan reached an informal agreement in 1975 limiting Japanese imports to 11 percent of the U.K. market. Germany has no formal agreements with Japan on market share limitations. However, in 1981, when the U.S. voluntary restraint

Table 5-5-Motor Vehicle Production in the EC, 1973-1989 (millions of units)

Year	FRG	U.K.	Spain	Italy	France	Belgium	Holland	Total
1973	3,949	2,164	822	1,958	*3,569*	*299*	107	12,868
1978	4,186	1,607	1,144	1,656	*3,508*	*303*	85	12,489
1981	3,897	1,184	987	1,434	*3,019*	*237*	101	10,859
1982	4,062	1,156	1,070	1,453	*3,149*	*278*	109	11,277
1983	4,154	1,289	1,288	1,575	*3,336*	*285*	122	12,049
1984	4,045	1,134	1,309	1,601	*3,062*	*249*	129	11,529
1985	4,445	1,311	1,418	1,573	*3,016*	*267*	128	12,158
1986	4,578	1,203	1,307	1,913	*3,195*	*295*	142	12,633
1987	4,634	1,389	1,704	1,913	*3,493*	*352*	152	13,637
1988	4,625	1,545	1,866	2,111	*3,678*	*398*	149	14,372
1989	4,852	1,626	2,046	2,221	*3,920*	*389*	149'	15.203

[a]Estimated

NOTE: Spanish production is included although Spain was not amember ofthe ECuntil 1985. Because the European motor vehicle production system is highly integrated but as yet has no integrated production totals available, it is necessary to estimate production for the whole of the EC by totaling production country by country. This method may lead to some double counting, in particular of French and German vehicles assembled in Belgium and French vehicles assembled in Spain.

SOURCE: For all countries except Holland: *Automotive News,* Market Data Book, 1990 edition, p. 3. For Holland: Motor Vehicle Manufacturers Association of the United States, *Wodd Vehicle Data,* various years.

Table 5-6-Japanese Share of the European Car Market, 1989 (in percent)

Finland	*39.6%.*
Ireland	*39.4*
Norway	*37.8*
Denmark	*31.8*
Austria	*30.3*
Greece	*29.9*
Switzerland	*29.4*
The Netherlands	*25.9*
Sweden	*24.7*
Belgium and Luxembourg	19.2
West Germany	14.8
United Kingdom	11.3
Portugal	*6.1*
France	*2.9*
Italy	*1.6*
Spain	1.1

NOTE: Sweden is an exception in having a large domestically owned motor industry and a high level of Japanese imports. However, the Japanese imports are almost entirely in the smaller size classes where no Swedish products are offered. For comparison purposes, the Japanese share of the U.S. car market was 27.4 percent in 1989.

SOURCE: *Financial Times,* Feb. 5, 1990. For the United States, Earl Kreher, Motor Vehicle Manufacturers Association, personal communication, Aug. 7, 1991.

agreement covering imports of Japanese autos was announced, it was widely reported that the Japanese Government gave these assurances to the German Government: exports would not be diverted to Germany, and Japanese companies would not increase their sales in the German market by more than 10 percent per year (about 1 percentage point of market share).[67]

While the high level of trade protection and its long duration might not be proof of fundamental weakness in European auto manufacture, there is more direct evidence. The first independent global survey of auto company performance in plants, R&D operations, and supply chain management indicates that European companies, both the mass producers (Volkswagen, Fiat, Renault, and PSA) and the high-priced specialists (Mercedes, BMW, Volvo, Jaguar, and Rover), lag behind Japanese and even U.S. performance significantly.[68] They score worse in productivity, product quality,@ and responsiveness to changing demand.

Finally, by the end of 1990, the European market had run out of steam; sales were falling in all markets but Germany. Exports to the United States had already dropped with the decline of the dollar, and firms with the heaviest dependence on the U.S. market (Jaguar, Saab, and Volvo) had been forced to find buyers or joint venture partners. At the same time, Japanese firms were making major investments in new production capacity within Europe, gearing up to produce 935,000 units per year by 1994 and as much as 1.2 million units in 1998. Thus it began to occur to European policymakers that the European motor industry might face in the 1990s what the Americans faced in the 1980s—a catastrophic loss of market share at the hands of the Japanese. This prospect is probably much exaggerated because of the protective measures the EC has taken for its auto companies. Even so, European auto producers face an unaccustomed challenge, as do the well-entrenched U.S. auto makers in Europe.

The frost mitigating factor is the extension of quotas on Japanese imports, under the aegis of the

EC. Originally, the EC Commission intended to remove all member states' quotas, beginning in January 1991 and completing the process by January 1993.[70] But this idea was conceived when the European auto boom was at its height. As the industry's sales weakened, leaders of the German industry abandoned the free-trade camp they had traditionally occupied, joining the French and Italians to urge Europe-wide share limits on Japanese imports along with a transition period for dropping individual country restrictions.

Terms of the agreement made with the Japanese by the EC in April 1991 were not all public, but trade sources reported that they would allow Japanese companies to increase their sales of passenger cars in the EC—including both imports and transplant production-horn about 1.2 million in 1990 to 2.3 million in 1999, or from about 10 percent to somewhere around 16 percent of the EC market.[71] EC estimates of additional production from the Japanese transplants by 1998 range from 900,000 to 1.4 million cars per year, which implies that virtually all of the growth in Japanese car sales would come from transplants, and that imports would stay flat. Also, these numbers imply sizable growth in the EC market-over 2.5 percent per year.[72] The EC scheme also states that the very restrictive formal national quotas on Japanese imports in France, Italy, Spain, and Portugal will be abolished at the end of 1992, but that the Japanese will "voluntarily" limit imports into those markets under EC and Japanese supervision, to account for "unexpected circumstances [that] might arise after January 1, 1993.' After 1998, the EC market would be open to the Japanese, according to the proposal.

There are still parts of the agreement that are not entirely transparent. In particular, it is unclear how long the Japanese will be willing to abide by informal limitations on transplant production in the EC. "We can't accept this," said Moriharu Shizume, Paris representative of the Japan Automobile Manufacturers Association. "They set up local content rules-60 percent, 70 percent, then 80 percent. Now that we've got almost 80 percent, they still don't accept it. ' "[73]

Domestic content requirements for Japanese cars were set first in Britain, which was in the vanguard for Japanese auto transplants in Europe. In negotiating terms with the Japanese companies, the British Government demanded high levels of European content, both as a condition for investment aids provided by the national and local governments and in order not to count the transplant vehicles against Britain's 11 percent quota on Japanese imports.[74] The result was a commitment for 60 percent European content in the initial production runs at the three largest Japanese transplants (Nissan, Toyota, and Honda, all in the United Kingdom). What is more, these facilities are committed to 80-percent European content by 2 to 3 years after startup, a level not currently contemplated by any North American transplant even after several years of production.[75] This level of local content requires that the body, most major mechanical components, and either the engine or the transmission be fully manufactured in Europe.

The local content requirements have probably slowed the rate of Japanese assembly plant investment in Europe. Also, under EC urging, the British have ceased offering investment aids to the transplants, and that, too, may have slowed the rate. This does not mean that the Japanese have no further designs on producing in Europe.

Another important but often overlooked reason for slow growth, both of Japanese imports into Europe and of Japanese transplant production, is the European distribution system for motor vehicles. It differs greatly from the U.S. system. The United States has always been a large market without internal barriers where similar vehicles are sold for the same price in every region. Moreover, since the late 1940s, U.S. antitrust laws have forbidden assembler firms from requiring that their dealers sell only one brand from a single site.

By contrast, EC rules allow the established European auto assemblers to limit the freedom of the dealer and the customer, to their own distinct advantage. The assemblers are able to sell the same car for vastly different amounts in different countries, both in Europe and elsewhere. Their usual approach is to price very low in their own home market to establish a volume base and keep others (e.g., Japanese imports) out, and to sell at much higher prices in other markets. At the same time, European (and Europe-based American) assemblers forbid their dealers to "dual," that is, to take on Japanese brands at established dealerships. It was precisely the aggressive use of dualing that allowed the Europeans (in the late 1950s) and then the Japanese (in the early 1970s) to rapidly build

distribution networks in the United States with practically no investment.

For all these reasons—an EC-wide quota *at least* for Japanese imports (and possibly an unwritten agreement governing transplant production as well), high local content requirements for transplant vehicles, and the existing distribution system-a surge in Japanese share of the European auto market is not likely over the next few years. The current EC rules allowing selective pricing and exclusive selling come up for renewal in 1995, and the result may well be rules more like those in the United States. Even so, EC-wide quotas and local content requirements would continue to provide very substantial protection for European producers. The gradual relinquishment of voluntary national quotas could cause problems for the French, Italian, and Spanish industries, but the Japanese firms have practically no distribution and service networks in any of these countries and cannot build them overnight.

The likely prospect is for only a gradual increase in competitive pressure on European automakers from Japanese imports and Japanese transplants combined.[76] That goes for U.S.-owned auto firms in Europe as well. Whatever pressure they feel will not compare to the hammer blows suffered by the Big Three in the United States in the 1980s. In just the 5 years from 1985 to 1990, cars made by Japanese companies (imports and transplants) rose from 22 to 33.5 percent of a shrinking U.S. market (overall sales declined from 11.0 million to 9.3 million units); in the same 5 years, the market share of Big Three cars sank from 72 to 59 percent.

There may even be an opportunity for some modest increase in U.S. auto exports to Europe in the 1990s, in all likelihood coming from the Japanese transplants in this country, not the U.S. Big Three.[77] Later in the decade, this eastward flow across the Atlantic might be balanced by exports to the United States and Canada from Japanese transplants in Europe. Each Japanese company might decide to produce certain kinds of vehicles at only one site in its global production system, in Europe or North America, for high-volume sales in the region of production and for exports in lower volumes to fill market niches in other regions.[78]

A final note: The pressure of Japanese competition, mitigated though it may be, has finally made bedfellows of European auto producers and the American-owned firms in Europe. For 80 years, since Ford established an assembly plant in Britain in 1911, American companies have been treated as outsiders by the Europeans. For example, the organization formed in the 1970s to promote the interests of European motor vehicle fins, the Committee of Common Market Motor Vehicle Constructors (CCMC), resisted all efforts of the Americans to join. However, in the debate about how to deal with the Japanese in 1992, tensions in the CCMC became so great that 11 of the 12 members resigned in December 1990. Left behind was Jacques Calvet, PSA chairman, who was intransigent in demanding curbs on Japanese imports and transplant production. A new organization is being formed that will include the Europeans and the Americans, but will exclude the Japanese.

Thus the course of events has strengthened the perception that the two American firms, with their top-to-bottom production systems spread across the continent, are now European, after 80 years on probation. It seems most unlikely that the EC will apply anything like the import or investment barriers on these fins, or their U.S. parents, that are contemplated for Japanese firms, even if the European market should prove disappointingly flat.

EC-92 and the United States: Conclusions

If EC-92 does substantially increase the growth of the Community's GNP, as many Europeans believe it will, that should also increase demand for the products of U.S. companies. As internal trade barriers are cleared away, U.S. firms should find it easier to sell and distribute their products to customers throughout the EC. Market growth could help some American exporters to Europe, especially in industries whose base of operations already is global, such as the chemical industry. On the other hand, some of the EC's most effective protection is focused on computers and electronics, the biggest and arguably most important of U.S. exports to Europe.

Even if demand for U.S. products does grow, EC trade and public procurement policies in some sectors will encourage U.S. firms to supply the demand from a production base in Europe. No one policy alone might force a U.S. firm to manufacture in Europe. But companies will judge their effects in the context of other factors: the new opportunities to be found in both Eastern and Western Europe; the shift of competitors, especially the Japanese, into Europe; advantages for manufacturers in getting

closer to suppliers and customers in a bigger, richer, more unified market; and uncertainties about more forceful protection in the future. These factors, combined with steady pressures of protectionism, especially in electronics, seem to be encouraging a wave of foreign direct investment, which implies some shift in the manufacturing base into the EC.

Thus from the U.S. perspective, the message of EC-92 is mixed for exports to the EC but more positive for those planning or able to produce there. For businesses that would profit from locating production in Europe, not all are equally well-placed to make the shift. EC-92 could create problems for small U.S. exporting firms, although there has been no flood of complaints so far, according to the Small Business Administration.[79] It might also have ill effects on small firms that are not now exporters. As some large U.S. firms shift production into the EC, they may not make an effort to bring their traditional suppliers with them, and many of the suppliers are themselves simply too small to follow.

EC Technology Policy

European firms face a difficult time competitively. In several industries, years of protection and government support have sapped firms' competitiveness. Now those firms are newly vulnerable, as the national policies that formerly pampered and protected them give way to EC policies that forbid subsidizing one member nation's firms at the expense of another's. Another form of competitive pressure is the trend in EC policies to treat foreign-owned firms operating in Europe much like locally owned fins. As we have seen, the trend is by no means complete or universal (witness the continued EC favoritism toward European auto companies), but it is strong enough that many foreign fins, especially the Japanese, are shifting production into the EC to evade trade restrictions.

A particular worry is the new challenge from Japan, a more serious matter than the longstanding American dominance of European computer and semiconductor markets. Europeans viewed with alarm Japanese companies' incursions into U.S. markets where, in some industries, they wiped out the domestic competitors altogether. Europe was the next target. This new competitive pressure on European firms, and the increased intensity of international competition generally, especially in high-technology fields, spurred the Community to develop policies meant to improve the competitive performance of EC-owned firms.

First, the EC is vigorously attacking the entrenched structure of European industry through a reinvigorated competition policy (more on this below). Second, it is trying to develop mechanisms to close what it sees as a crucial technology gap between Europe and both the United States and Japan. The new technology policy is an ambitious attempt to use R&D consortia, partly funded by the EC, as a means of reaching the technical frontier in some strategic sectors, notably information technology, telecommunications, and energy. Another major goal is to create a supranational, European orientation among EC fins.

Technology is key to improved competitiveness, in everything from product innovation and design to manufacturing quality and efficiency. Even before the 1980s, European efforts to improve technology were afoot. In 1979, the EC Commissioner for Industry, Etienne Davignon, created a task force to study the long-term needs of the telematics sector (telecommunications and information technologies) and to draft a strategy for the EC as a whole to revitalize high-technology electronics industries.[80] Eventually, this effort spawned two new European technology development and implementation programs, ESPRIT (the European Strategic Programme for Research and Development in Information Technology), begun in 1984, and a few years later, RACE (Research in Advanced Communications for Europe). By the end of the decade, several other EC R&D programs, brought together under an umbrella called the Framework Program, had begun: BRITE, or Basic Research in Industrial Technologies for Europe; EURAM (European Research in Advanced Materials), which was merged with BRITE in its second phase; several biotechnology programs; and a host of small programs aimed at promoting research and development, science, and cooperation across the borders of the EC nations. In addition, 19 countries (the 12 of the EC plus Austria, Finland, Iceland, Norway, Sweden, Switzerland, and Turkey) participate in a project called EUREKA (European Research Coordination Agency).

The total effort represented by the Framework Program and EUREKA is prodigious. The Third Framework Program (1990-94) is funded at ECU 5.7 billion, and EUREKA projects announced between 1985 and 1990 came to ECU 7.4 billion. As the

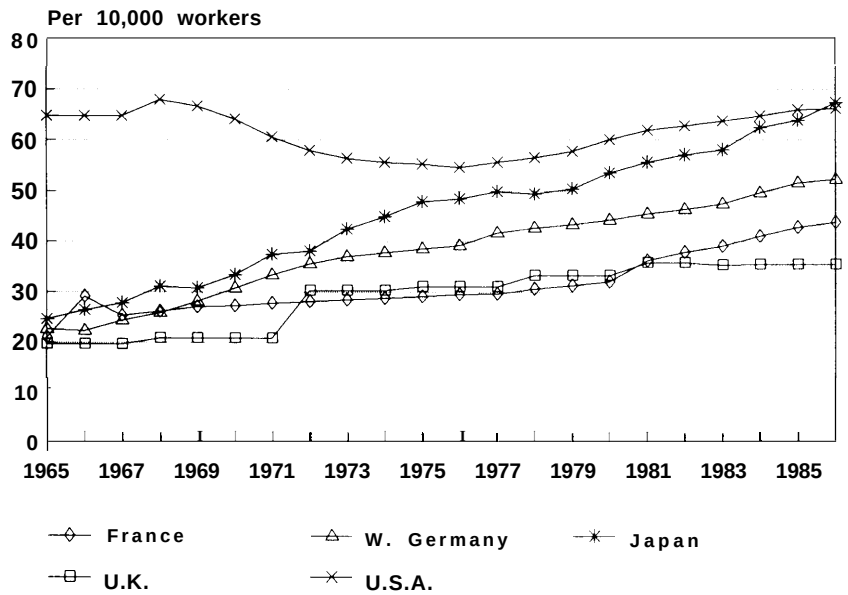
Second and Third Framework Programs overlap, exact annual finding is hard to estimate, but at a rough estimate, public funding of European cooperative research in both the Framework and EUREKA programs comes to about ECU 1.6 billion ($1.9 billion) per year.[81]

There is a new spirit of optimism in Europe now, and the technology programs begun in the 1980s are apart of it. But will the programs have a real effect in changing the European technological landscape? This is not answerable now, because many of the initiatives launched in the 1980s are too new to evaluate fairly; the oldest have been going less than a decade. Many of Japan's more impressive technical accomplishments, such as the birth and development of microelectronics manufacturing, required far more than a decade to yield conclusive results (though when Japan began its industrial targeting and technology initiatives it was technically much further behind than Europe). But there is enough information to make tentative conclusions about the likely performance of Europe's new technology efforts. So far, the programs have achieved some things-a greater degree of transborder and multiinstitutional cooperation, a greater sharing of technical and scientific information, and generally positive reviews on the part of participants about the contribution to technology-but they have not yet made much difference in competitiveness.

Framework Program

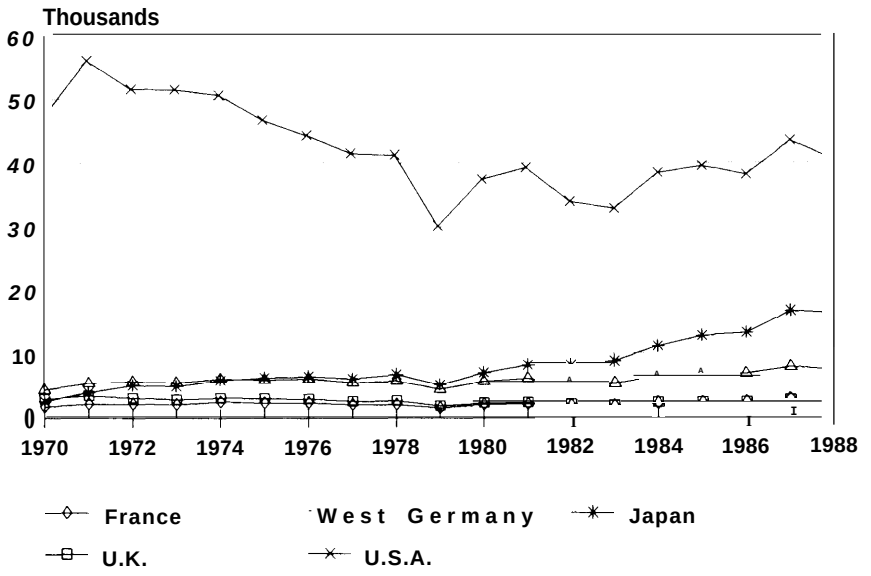
The broad purpose of the Framework Program is to improve living standards, which in turn means boosting European industrial competitiveness and technology .82 It was apparent to European companies and governments in the 1980s that many of the more important technological developments of the past decades had skipped Europe. Several indicators show Europe's failure to keep up. A 1988 EC study disclosed that Europe was the world leader in only 2 of 37 technologies identified as economically important. (The same study concluded that 31 were dominated by the United States and 9 by Japan.)[83] Europe was also behind the United States and Japan in the concentration of R&D workers in the labor force (figure 5-3), and Japanese inventors streaked past Europeans in obtaining U.S. patents (figure 5-4). Moreover, the areas in which Japanese and European patents were granted tell the story of European decline in electronics, communications, and information technology in particular. The Japanese patents were heavily concentrated in electronics, while Germany's were mostly in chemicals and materials, and France's were a diverse list, promi-

Figure 5-3-Scientists and Engineers per 10,000 Labor Force



SOURCE: National Science Board, *National Science and Engineering Indicators,* NSB 69-1 (Washington, DC: U.S. Government Printing Office, 1989), p. 262.

Figure 5-4-U.S. Patents by Nationality of Inventor



SOURCE: National Science Board, *National Science and Engineering Indicators,* NSB 89-1 (Washington, DC: U.S. Government Printing Office, 1989), p. 365.

nently including nuclear energy and industrial machinery.[84]

The Framework Program was set up to overcome the European weaknesses. European industry remains strong in some high-technology fields—chemistry, certain energy technologies, and aeronautics—but is weaker in electronics and most information technologies (hardware and software), motor vehicles, and biotechnology. The biggest program, ESPRIT, tackles information technologies. RACE aims at improvement in telecommunications hardware and service and manufacturing technologies. BRITE/EURAM's research includes, in descending order of funding: new materials; reliability, wear, and deterioration; CAD/CAM and mathematical modeling; new production technologies for textile products; new testing methods; laser and joining technologies; membranes; and new testing methods.[85]

High-technology sectors are a particular focus, probably for the same reason that they are a focus of industrial policy elsewhere: they are viewed as making disproportionate contributions to well-being. They are knowledge intensive, often have application in many other sectors, and contribute disproportionately to value added. In some cases, such as telecommunications, they are also a key part of the infrastructure of developed nations. The lion's share of the ECU 5.7 billion in funding for the Framework program goes for projects designed to improve European competitiveness in high-technology industries and services.[86] The combined finding for medicine and health, information and communication technologies, biotechnology, and nuclear fusion is ECU 2.7 billion, more than half the total.[87] ESPRIT II (European Strategic Programme for Research and development in Information Technologies), the biggest program, is funded at ECU 1.6 billion from 1988 through 1992. Tables 5-7 and 5-8 show the funding, purpose, and duration of the individual programs within Framework.[88]

Another characteristic of the Framework Program is that it is designed to do precompetitive research. The definition of precompetitive is comfortably loose (the CEC defines it as being at a stage prior to industrial development) yet it still exerts a real effect on projects, making officials wary of approving those that seem too close to the market. Further, all Framework projects are collaborative, not just among companies but across national borders. Only projects that have participants from more than one country can be considered.

EUREKA

EUREKA, the European Research Cooperation Agency, was begun in 1985 at the initiative of

Table 5-7—Funding and Duration of the Framework Program

Main area	Program	Funding (million ECU)	Duration
Quality of Life	Medicine-Health	65	1987-91
	Human Genome Analysis	15	1989-91
	STEP/EPOCH	115	1989-92
Information and Communication Technologies	ESPRIT II	1,600	1987-92
	RACE	550	1987-92
	DRIVE	60	1988-91
	DELTA	20	1988-90
	AIM	20	1988-90
	EURET	25	1990-94
Industrial Technologies and Advanced Materials	BRITE	60	1988-89
	BRITE/EURAM	499.5	1989-92
	Raw materials	45	1990-92
	B.C.R.	59.2	1988-92
Biotechnology	Biotechnology (revision)	20	1988-89
	BRIDGE	100	1990-94
	ECLAIR	80	1988-93
	FLAIR	25	1989-93
	Agriculture	55	1989-93
Energy	Radioactive waste	79.6	1990-94
	Decommissioning	31.5	1989-93
	TELEMAN	19	1989-93
	Fusion	551	1988-92
	JOULE	122	1989-92
Science and Technology for Development	S.T.D.	80	1987-92
Marine Technologies	MAST	50	1989-92
	FAR	30	1988-92
Improvement of European Science/ Technology Cooperation	SCIENCE	167	1988-92
	SPES	6	1989-92
	Large-scale facilities	30	1989-92
	MONITOR	22	1989-93
	DOSES	4	1989-92
	EUROTRA	7	1989-90
	VALUE	38	1989-93

SOURCE: Commission of the European Communities, *EC Research Funding: A Guide for Applicants* (Brussels, Belgium: January 1990), p. 117.

France and West Germany. Although it is not an EC project, the EC countries and the CEC itself are members, along with the European Free Trade Association (EFTA) nations and Turkey. Its aims are similar to those of the Framework Program-to promote cross-border collaboration in research and technology and to improve competitiveness. As a result, there is overlap between EUREKA projects and parts of the Framework Program in scope and funding. However, the programs do differ, principally in sources of funding. For EUREKA projects, funding is mostly private. National governments (and the EC) can fix their own contributions at any level they desire up to 35 percent of total project costs, so public funding is generally low compared with the Framework Program. According to one source, of the ECU 7.4 billion allocated to 388 EUREKA projects between November 1985 and June 1990, less than 10 percent was public funding.[89]

EUREKA does not limit projects to precompetitive R&D. EUREKA projects can be closer to the market than projects done under the Framework Program, although not as close as some participants might wish. While some EUREKA projects involve basic research, most are on topics of immediate commercial interest.[90] Large companies involved in both Framework projects and EUREKA sometimes prefer EUREKA as a result.

Table 5-8-Glossary and Description of the Framework Program

1. Quality of Life

Medicine/health: Coordinates and improves efficiency of medical and health research

Genome analysis: Studies use and improvement of biotechnology in the study of the human genome

Radiation protection: Improves knowledge of human exposure to radiation and effects of radiation on humans and their environment

STEP/EPOCH (Science and Technology for Environmental Protection European Programme On Climatology and natural Hazards): Provides scientific and technical support for environmental policies of the EC

ESPRIT ii (European Strategic Programme for Research and development in information Technologies): Develops basic technologies for European information technology industries

RACE (Research and development in Advanced Communications technologies for Europe): Contributes to introduction of Integrated Broadband Communication taking into account Integrated Services Digital Network

DRIVE (Dedicated Road infrastructure for Vehicle safety in Europe): Develops information technologies to improve road transportation efficiency and safety

DELTA (Development of European Learning through Technological Advance): Applies advanced information technology to education and develops tools to support (long) distance learning

AIM (Advanced Informatics in Medicine): Develops information technologies for improving health care services at reasonable cost

EURET (REcherche clans le Transport en Europe, or Research on Transportation in Europe): Develops a Community transport system to respond to increases in demand for all types of transport necessitated by the single market

2. Industrial Technologies and Advanced Materials

BRITE/EURAM (Basic Research in industrial Technology for Europe, and European Research in Advanced Materials): intended to strengthen the competitiveness of European manufacturing industry (including particularly small and medium-sized enterprises) in world markets

Raw materials (Raw materials and recycling): Enhances the competitiveness of the Community's industries involved with raw materials and recycling

B.C.R. (Bureau Communautaire de Reference): improves the reliability of chemical analysis and physical measurements to achieve agreement among member states

3. Biotechnology

BRIDGE (Biotechnology Research for innovation, Development and Growth in Europe): Promotes cross-border research to speed up the production of biological data, materials and processes needed for the optimal use of natural organisms

ECLAIR (European Collaborative Linkage of Agriculture and industry through Research): Promotes application of new developments in life sciences and biotechnology to products for industrial agricultural use

FLAIR (Food Linked Agro-industrial Research programmed): Contributes to the competitiveness, safety, and quality of Europe's food industry

Agriculture (Competitiveness of agriculture and management of agricultural resources): Helps farmers adapt to situations created by overproduction and restrictive price and market policies

4. Energy

Radioactive waste (Management and storage of radioactive waste): Perfects and demonstrates a system for managing and sorting radioactive waste

Decommissioning (Decommissioning of nuclear installations): Develops a system to manage decommissioned nuclear installations and radioactive wastes

TELEMAN (TELEMANipulation dan les environments nucleaires dangereux et perturbes; or Remote handling in hazardous or disordered nuclear environments): Develops advanced remote operated equipment for the nuclear industry, and a scientific and technological basis for remote operating systems

Fusion (Controlled nuclear fusion): Establishes physical and technological basis necessary for planning of NET (Next European Torus)

JOULE (Non-nuclear energies and rational use of energy): Develops energy technologies that take account of new and renewable energy sources and increases security of supply of energy

5. S.T.D. (Science and Technology for Development): Promotes scientific cooperation between the EC and developing countries

6. Marine Technologies

MAST (MArine Science and Technology): improves knowledge of the marine environment and promotes new expiration technologies

FAR (Fisheries and Aquaculture Research): Promotes rational and scientific research on resources; develops aquaculture

7. /improvement of European Science/'Technology Cooperation

SCIENCE (Stimulation des Cooperation internationales et des Echanges Necessaires aux Chercheurs en Europe; Scientific and Technical Cooperation): improves general quality of scientific R&D, promotes training through research; enhances mobility of researchers

SPES (Stimulation Programme for Economic Sciences): Establishes cooperation and interchange between European economists

Large-scale facilities (Large -scale scientific facilities and installations): Optimizes use of large-scale scientific facilities and installations

MONITOR (Strategic analysis, forecasting and evacuation): identifies new directions and priorities for Community research and technological development policy; improves evacuation of R&D program

DOSES (Development Of Statistical Expert Systems): Promotes use of advanced statistical techniques; in particular, application of expert systems

EUROTRA (Programme EUROpean de TRAduction automatique de conception avancee; machine transition): Develops a machine transition system capable of dealing with all official EC languages

VALUE (Valorization and Utilisation for Europe; Dissemination of results): Promotes dissemination and utilization of the results of scientific and technical research, with special consideration of the needs of small and medium sized enterprises

SOURCE: Commission of the European Communities, *EC Research Funding: A Guide for Applicants,* op. cit., p. 117.

EUREKA is like Framework in putting special emphasis on high-technology areas. Its heaviest funding goes to robotics and production automation, closely followed by information technology and communications. Other fields with strong support are medical and biotechnology, transport, new materials, lasers, energy, and the environment (see tables 5-9 and 5-10).[91]

One of the most important EUREKA projects is JESSI, the Joint European Submicron Silicon Initiative. Begun as a l-year feasibility study in December 1986 and going through another 18 months of project definition and participant acceptance, the project started work in mid-1989 toward its goal: to produce static and dynamic random access memories (SRAMS and DRAMs) and logic chips using 0.3 micron feature sizes by 1995.[92] Major cooperators in JESSI include Philips and Siemens, who had a relationship as a result of their Megabit (Mega) project, an earlier effort aimed at producing 4-megabit DRAMs (Siemens) and l-megabit SRAMS (Philips). The Mega project, begun in 1983-84, was supported by the German and Dutch Governments to the tune of DM 320 million and DM 160 million, respectively; Siemens paid DM 1.4 billion and Philips DM 1.5 billion for production facilities. In the end, Siemens acquired production technology and know-how to make 4M DRAMs, and had an operation actually making IM DRAMs in Regensberg, West Germany. The Mega project and other development work at Siemens no doubt contributed to this success, but so did Siemens' licensing of Toshiba's IM miniaturization technology in 1985.[93]

However the success of the Mega project maybe judged, European microelectronics companies were still behind the world leaders at its conclusion and were facing escalating competitive pressure, particularly from the Japanese, whose market share in Europe was increasing steadily. Philips and Siemens together initiated the first discussions of JESSI, which other companies later joined. By 1988, a JESSI planning group included 29 companies and institutes from six countries. They put together a multiyear ECU 3.8 billion research effort with four subprograms: technologies for chip production, chipmaking equipment and materials, applications of microelectronics, and basic research (figure 5-5). The overall objective is "to secure the availability of world-competitive microelectronics for the European industry."[94] Recently, however, Philips withdrew from its leadership of the SRAM project of JESSI, probably reflecting a severe downturn in Philips' financial performance and large cutbacks in operations generally. Philips will probably abandon

Table 5-9-Funding of EUREKA Projects, by Area

Project area	Total cost, (million ECU)	Number of projects
Energy Technology	494	11
Biotechnology and Medical Technology	434	41
Communication Technology	809	15
Information Technology	*820*	*35*
Transport Technology	559	18
New Materials	136	17
Robotics and Production Automation	269	11
Environment	523	11

SOURCE: EUREKA Secretariat, *EUREKA: Together for the Future* (Brussels, Belgium: 1989), passim.

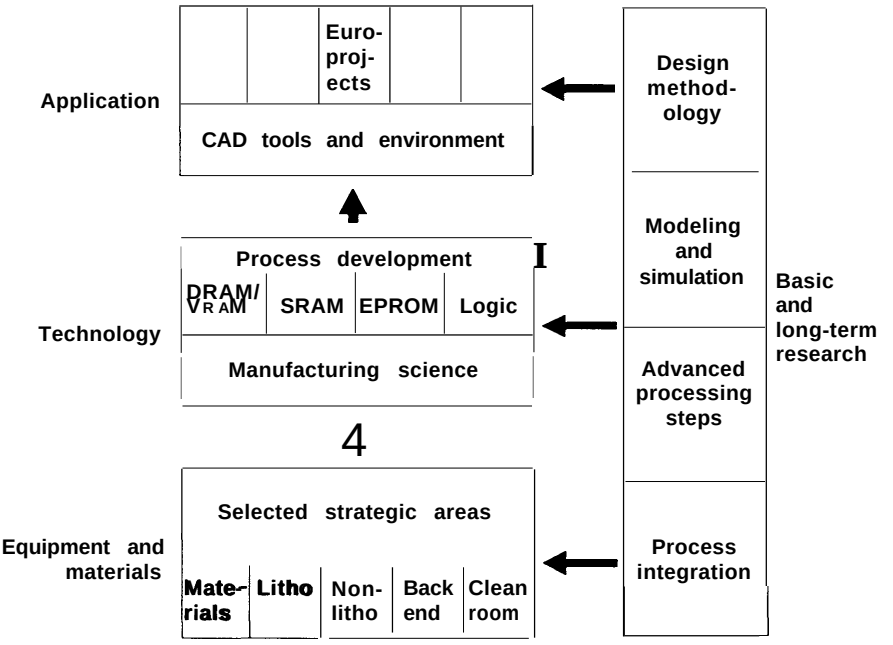
Table 5-10-EUREKA Projects: Number of Projects by Funding Category

Project cost (million ECU)	BIO	COM	ENV	ENE	INF	MAT	ROB	IAS	TRA	Total
<5	23	4	2	5	19	11	15	2	9	90
>5<10	3	1	1	2	6	2	11	0	3	29
>10 <20	9	3	2	0	4	3	9	4	1	35
>20 <40	3	2	3	1	2	0	8	2	1	22
>40	3	5	3	3	4	1	6	3	4	32
Total	413	15	11	17	35	17	49	11	18	208

KEY: BIO - Biotechnology and Medical Technology
COM - Communication Technology
ENE - Energy Technology
ENV - Environment
INF - Information Technology
MAT - Materials Technology
ROB - Robotics and Production Automation
LAS. Laser Technology
TRA - Transport Technology

SOURCE: EUREKA Secretariat, *EUREKA: Together for the Future* (Brussels, Belgium: 1989), p. 15. The total number of projects represented here is current as of June 1989.

Figure 5-5-JESSI Program: Functional Overview and Structure of the European Microelectronic Program



SOURCE: JESSI Planning Group.

the memory business altogether. While this is not by itself a crippling blow to JESSI, the fact that other participants are also in trouble is not a good omen for *JESSI's* eventual outcome.

JESSI is very much a commercial undertaking. It is principally a EUREKA project but has some funding from ESPRIT as well. ESPRIT funding goes into the basic research subprogram, which accounts for only 14 percent of JESSI cost and 22 percent of the manpower. Nevertheless, the contribution to JESSI accounts for 30 percent of the funding in ESPRIT's microelectronics program; some expect the overlap between the ESPRIT microelectronics program and JESSI to be nearly complete within a few years.

Some of the impetus for the Mega project, JESSI, and Framework's ESPRIT programs probably arose from European concern that competing with Japan in electronics would be a different ballgame from competing with U.S. companies. According to one analysis:

> Because Japanese chip producers were part of larger systems houses, foreign competitors began to suspect that systems divisions of the same Japanese companies were getting access to leading edge products before their foreign competitors. This may have been perfectly natural . . . but it put foreign systems houses at a competitive disadvantage in getting timely access to the new parts. The resurgence of European support for semiconductors in the mid-1980s, in frameworks like the Mega project and the ESPRIT program, in some measure reflected these mounting concerns. . . . Back in the late 1970s, reliance by European systems houses on U.S. semiconductor companies for supplies of advanced chips, though far from welcome, did not pose a strategic problem for European industry. The U.S. merchant chip manufacturers were not, for the most part, vertically integrated into downstream systems. All competitors enjoyed roughly equal access to state-of-the-art components.[95]

Emphasis on Cooperation

Cooperation across institutions and borders, and among customers, competitors, and suppliers, is valued by Europeans both as a means to improved competitiveness and as a contributor to European political and economic integration. Different kinds of cooperation serve different purposes. Cooperation across borders is a frequently mentioned goal, based on the underlying assumption that Europe's competitive problems stemmed in large part from both fragmentation of markets, which deprived compa-

nies and industries of economies of scale and scope, and fragmented research efforts, which resulted in overlapping but underfunded research and development projects.

Claire Shearman points to European market fragmentation as an important cause of Europe's weakness in electronics and information technology, and observes that the effect may have been aggravated by the protection of most national markets, which led European companies to focus more on domestic than on international markets.[96] Undoubtedly, the ability to achieve economies of scale is important in some parts of the electronics industry. The cost of investment in new plant and equipment; the difficulties and costs of acquiring engineering, design, and production expertise; and the efficient scale of operation are all quite high compared with most other industries. For example, a new wafer fabrication plant and its equipment can require an investment of half a billion dollars.

However, with a few important exceptions, such as electronics products, telecommunications equipment and service, and large jet aircraft, limitations imposed by markets the size of most EC members are probably minor. For example, it is unlikely that national markets in Europe were too small to have allowed producers of textiles, many types of machinery, paper, and some chemicals and pharmaceuticals to produce at an efficient scale. Moreover, while the European market was far from unified and cross-border movement of goods was not without trouble, 60 percent of European trade in the late 1980s was with other European countries, indicating that European companies were already focused on European, rather than strictly national, markets.[97]

In telecommunications, the fragmentation was real, but not strictly a function of market size. Telecommunications services in EC nations are provided by governments, through ministries of posts, telegraph, and telephone (PTTs); usually equipment is procured from one or two companies, frequently national champions. Because PITs retained monopolies over provision of services and tight control over procurement of equipment, different countries introduced new technologies (hardware and services) at different rates. The rates were mostly slower than in the United States, where because of deregulation private companies could offer many new services to American consumers.[98] In addition, there was no coordination of the different national services, making equipment and software incompatible from one country to the next. This made international telephone service inconvenient at best. According to one account,

> To establish a private line between Italy and the Netherlands in the early 1980s, a user had to deal with every PIT in between, frequently making it a nightmare to trace and correct breakdowns. . . . Tariff differentials were striking. A 500-kilometer leased line could cost ECU 840 per month in Britain, and ECU 2,230 per month in France. European businesses reported tremendous difficulties in establishing reliable, modern, efficient telecommunications links across Europe.[99]

Fragmentation of research and development efforts, public and private, is also seen as a handicap. According to the CEC, the fact that each of the large members and several smaller ones had mounted their own research efforts in high-technology sectors resulted in many small research efforts, most with inadequate resources. Coordination among them was inadequate, information was diffused poorly, and there was duplication of effort.[100]

In response to the problems they see as arising from fragmentation, EC policymakers encourage cooperation of all kinds. This includes cooperation across borders, between customers and suppliers, between industry and academia, between large and small companies, and among competitors.

Cooperation Across Borders

International collaboration is not strictly a European development. For the past decade or so, multinational firms have expanded their cooperative relationships with firms in other countries through a variety of arrangements: joint ventures, licensing, marketing agreements and exchanges, direct and indirect investments, mergers and acquisitions, and R&D collaborations.[101] In many high-technology sectors, the firm that can best integrate its technical expertise with that of other firms is better equipped than one that relies more on in-house developments. Japanese fins, in particular, have shown how much can be accomplished by integrating technological developments from around the globe with their own strengths in manufacturing and design and close collaborations with customers and suppliers in Japan.

The multinational enterprises responsible for the swell of technical collaborative arrangements around

the world are mostly Japanese, European, or American. The EC, in promoting international collaboration in technology, encouraged a trend that already had a head of steam, but there is little doubt that the encouragement was real; many of the resulting collaborations would not have happened without the Framework program as an enticement. For example, a senior manager in Plessey Research ventured the opinion that Plessey and Thomson, as competitors in gallium arsenide research, would ordinarily not work together, but they are doing so on an ESPRIT project (Advanced GaInAs-based Devices for High Speed Integrated Circuits)[102] because "you have to collaborate in order to get funding. "[103]

Even where the programs do not stimulate wholly new alliances, they strengthen existing ones. An evaluation of BRITE found that it was an 'excellent catalyst' of transborder collaboration. Although three-quarters of the bilateral relationships formed in the program already existed, BRITE strengthened the relationships, according to the evaluators, and helped turn bilateral relationships into multilateral ones.[104] The assessment was not all favorable; evaluators found that BRITE was not particularly effective at helping potential participants in isolated places find partners.

Preexisting relationships may be the norm in other parts of the Framework Program besides BRITE. One executive of Siemens, the largest single recipient of ESPRIT funds, states that the company wants to work only with partners it has worked with previously, and does not use the Framework Program as a dating service. Bad experiences with strangers account for this policy.[105]

Evidence from several quarters indicates that both Framework and EUREKA have succeeded in engendering cross-border collaboration. European evaluators seem confident that the Framework Program has done so. EUREKA has linked more than 800 organizations in more than 200 projects. The CEC notes that the Framework Program has many more applicant consortia than the available funds can support.[106] Part of this success is due to the Framework Program's requirement that funded projects must have participation from different countries.[107] Part is undoubtedly driven by the new optimism for market integration in Europe and the stimulation of European technology and science initiatives generally. The threat from a strong outsider (in this case, Japanese and American technology companies) may also have played a role, especially in industries where the time and money needed for a critical mass of R&D are difficult for companies to bear individually.

Customer-Supplier Cooperation

The success of Japanese firms is due in part to their development of links upstream to suppliers and downstream to customers. These links allow the joint development of technologies, standards, and quality controls. The days when arm's-length relationships with customers and suppliers were regarded as the best business practice are ending, especially when development costs of new products and techniques are high.

Development of large jet aircraft is an example. The cost of developing the Boeing 777 is likely to be in the neighborhood of $5 billion, not counting the engine, and Pratt & Whitney estimates the cost of developing a new high-thrust engine at $2 billion (see ch. 8). High development costs are nothing new in this industry; in the late 1970s, the cost of launching the 757 and 767 exceeded the net worth of the Boeing Co., and the development cost of the DC-10 was over three ties the capitalized value of the Douglas Co. Still, aircraft development costs are rising exponentially, with the result that all the major aircraft manufacturers are asking first-tier contractors to shoulder more of the development costs.

Cooperation is also becoming more important in electronics. Producers of computers, telecommunications equipment, and consumer electronics can no longer rely on off-the-shelf commodity chips as the primary building blocks of new products. Integrated circuits are now much more often application specific, and even entire systems can be integrated onto a single chip. This means that systems makers must transfer design information, including proprietary design information, to semiconductor producers, who could at least in theory convey that information to the competitors of the systems producers.[108]

These technical changes make vertical integration—production of components as well as final products within a single fro-an increasingly attractive strategy, and reliance on a vertically integrated competitor for semiconductors an increasingly risky one.[109] All the big Japanese systems companies are vertically integrated. Few American or European systems makers are, and even those that

are still have to depend on outside suppliers for key components. During the 1980s, the outsiders in question were more and more often Japanese, for the vertically integrated, well funded, and technologically proficient Japanese firms had seized the competitive high ground in semiconductors and were steadily capturing world market share. Systems companies in America and Europe became uneasy about relying on their powerful competitors for components. This unease spawned efforts to improve coordination between semiconductor equipment producers and semiconductor makers, and between semiconductor producers and systems makers, in both the United States and Europe. Cooperation between customers and suppliers in electronics became a survival tactic. In its evaluation of ESPRIT, the CEC made this point emphatically:

> The belief that all the industries which are becoming dependent on embedded microelectronics can develop competitively by purchasing standard components from remote and competing nations is fallacious. Close working relationships between major semiconductor users and suppliers are essential.[110]

The idea of fostering vertical linkages is not confined to high-technology industries. There are advantages to coordination and cooperation even in less technology intensive industries such as textiles and apparel. For example, increasing coordination all the way along the chain from apparel design through fiber and textile production, sewing, wholesaling, and retailing is the objective of the Quick Response program of leaders in the U.S. fiber, textile, and apparel industries.

The sparse information available on the subject suggests that the Framework Program has had some effect in generating links between customers and suppliers. Many of the BRITE projects involved small and medium-sized firms making capital goods (e.g., machinery and equipment) for industrial customers; here, the diffusion of technology that BRITE achieved was in the interest of all participants.[111] As the evaluation of the BRITE program stated:

> Projects which unite customers and suppliers are usually successful because there is a community of interests.[112]

JESSI explicitly emphasizes customer/supplier links. Like Sematech, JESSI recognizes the advantage of Japanese vertical integration, and one goal is to help overcome this advantage by forging stronger bonds between customers and suppliers. Its planning report states:

> What is lacking-above all-in Europe is the spirit of *togetherness* which is typical for Japan Incorporated. Japanese companies compete strongly amongst each other, but not before having shared in the effort to conquer a new market for Japan. Many semiconductor manufacturers, especially in [the] far east, are integrated into vertically structured system houses. Therefore, careful attention must be paid to defining user/producer interfaces in order to guarantee protection of the users' know-how.llq

User/supplier links are less prominently stated in RACE documents, but the goal is there nonetheless. Closer relations among industrial suppliers of equipment and telecommunications service providers (the PTTs) is one of the aims of RACE, where such linkage is regarded as necessary to accomplish RACE's other goals of making Integrated Broadband Communications and other innovative services available across Europe and setting common standards for European telecommunications services.[114] There is evidence that such linkages may be happening. RACE mostly aims to provide services, but participation is heavily tilted toward telecommunications equipment manufacturers. With 395 participations in RACE, equipment makers have a larger share of total participations than any other group. It can be inferred from this heavy participation, plus the positive evaluations of RACE by participants, that both suppliers (the equipment manufacturers) and users (the PTTs) find it beneficial to work together in RACE projects.[115]

There are a few hints that achieving cooperative relationships between users and suppliers could be improved. The CEC's evaluation of ESPRIT acknowledged that more inputs from major software system suppliers would be valuable in the Software Technology part of ESPRIT.. The program has made technical progress in software technology, but is not yet exploited commercially, and the time when all commercial programmers use standard techniques, and all universities teach them, is still far off.[116] The ESPRIT evaluators made similar comments on the Computer Integrated Manufacturing (CIM) projects. Computer integrated manufacturing requires an understanding not only of electronic equipment, but also of mechanical equipment; the evaluators noted that the absence of so-called mechatronic projects in ESPRIT, which united mechanical and electronic skills, was regrettable. The recommendation was to

pay more attention to user attitudes and understanding, which, more than a shortage of technology, delay wider adoption of CIM in Europe.[117]

Cooperation Between Competitors

This is one of the most difficult of all forms of cooperation. Competition and cooperation are not mutually exclusive, but neither are they broadly compatible. Competition, and the benefits that it brings to companies and economies, often falls apart if cooperation extends to collusion. In Japan, industrial interests and bureaucrats usually manage to balance promotion of competition-assuring that no one firm attains too great a market share within Japan-with encouragement of cooperative arrangements in R&D (and in some circumstances, production).[118] But even in Japan, with its long tradition of industrial cooperation and a deeply rooted perception of the need for national cohesion, cooperative research is difficult to manage. It took several years of "administrative massaging" by the director of Japan's VLSI (Very Large Scale Integration) Project to overcome the suspicion and fears of the participants from five companies and MITI's Electrotechnical Laboratories before real research couldbegin.119 In Europe and America, where cooperation without collusion is less well established, the problem is greater.

Evaluators of the BRITE program are unequivocal on this point.

> Projects which bring together competitors are unlikely to succeed. The Commission. . . hoped that cooperation in research might lead to such links. But these industrialists are often engaged in stern competition and their research forms the core of their business. When they do join together for research, it is usually for research that is on the periphery of their true concerns and therefore of doubtful industrial value; otherwise, disagreement soon arises. European culture is not the same as Japanese culture, and the only way any cooperation of this sort can succeed is if it is imposed at the highest level in the company. In reality, a number of projects in this category have patently failed, and the Commission must stop them. I[N]

The evaluators of ESPRIT came to a somewhat different conclusion. They note that early work plans for ESPRIT, though put together substantially by the "Big Twelve" European information technology companies,[121] "did not address the core business needs of the principal protagonists and concentrated on activities where competitors could actually agree to collaborate in a 'precompetitive' way."[122] Unlike the BRITE evaluators, however, the ESPRIT review board did not regard this as reason for stopping projects; rather, the problem was treated as minor.

Cooperation Between Academia and Industry

European universities have long been viewed as aloof from the concerns of industry, compared with those in the United States and Japan.[123] One goal of the Framework Program is to reinforce a growing trend toward stronger relationships between academia and industry. ESPRIT and BRITE, for example, have specifically encouraged university and industrial researchers to unite in certain research projects.[124] In ESPRIT, 75 percent of the collaborations include firms and academic research units.[125]

Although the overall impression is that industry-academic cooperation is good for both and should be encouraged, there are a few caveats. These partnerships will help bring academic research out of the ivory tower and into the real world. But the CEC warns that universities should not let industry's R&D funding lure them into abandoning inquiries of a fundamental or scientific nature and concentrating too heavily on short-term problems of companies. While noting that some shift of emphasis was exactly what was needed, the CEC is concerned that the pendulum could swing too far. University participants in BRITE had the same concern; several academics indicated to the BRITE evaluation review team that the industrial participants' emphasis on empiricism was excessive and could undermine the value of the results.[126] Further, exclusive relationships with industry could restrict the availability of research reports from universities, a problem already emerging in the United States.[127]

These caveats are relatively minor. Most collaborative projects involving academia are viewed by ESPRIT participants as working either adequately (45 percent of respondents) or well (over 20 percent).[128] In BRITE, three-quarters of the contractors viewed collaboration between industries and universities as enhancing the projects' chances of success.[129] However, this kind of cooperation is not sufficient to promote competitiveness in Europe without managerial know-how and skilled people to exploit market opportunities.

Precompetitive Projects

As noted, the Community is trying to find a way to balance competition and cooperation and obtain the best from both. One way to strike a compromise is to limit projects to precompetitive R&D. According to the CEC, this means limiting projects to "a stage prior to industrial development, or not yet 'market ready. ' This is to ensure that EC research does not lead to any distortion of competition, which would be in breach of the EC Treaty regulations. [130]

This is not a precise definition. There is some understandable puzzlement over what is precompetitive, and some frustration with precompetitiveness as a requirement for acceptance. The BRITE evaluation team said it best:

> *The panel remains puzzled by the incorporation of the concept of pre-competitivity in a research programme whose primary goal is to enhance the competitiveness of European industry. This is* a major contradiction that the Commission cannot escape. Some excellent projects were not funded because they were considered too 'competitive" by the selection team. Concern about the idea of pre-competitivity has also had the effect of pushing some projects upstream so that their industrial interest diminished. The panel fully realizes that there were good legal reasons for this criterion to be written into BRITE. But the law should be the servant of the Community, not its master.[131]

This concern is echoed by some participants. For example, one member of the Industrial Research and Development Advisory Committee (IRDAC) to the EC expressed frustration that no one knows what "precompetitive' means, and stated that efforts to keep JESSI precompetitive were making it uncompetitive.[132] A participant in JESSI from Siemens disagrees with the perception of JESSI as precompetitive, and believes that the consortium is successfully developing complex integrated circuits that can be integrated into systems; ESPRIT, according to this researcher, had failed in this respect.[133] Another observer notes a strong conflict between precompetitive research and the process of developing a specific product.[134] The limitations imposed by the requirement that the research be precompetitive tend to show up often in comparisons of ESPRIT and EUREKA, which is not required to be as far from the market as the Framework Program.

The EC will probably continue to stress precompetitivity, partly because the law constrains it to, and partly because many people still think that it is an appropriate guiding principle.[135] But certain adjustments can be made. In the second phase of ESPRIT, work continues to be precompetitive but more emphasis is placed on projects of clear benefit to industry. Among the goals of ESPRIT II are providing a sustainable capability to design and produce application-specific intergrated circuits (ASICs), developing technologies needed for next-generation information processing systems, and enhancing the ability of European industry to integrate next-generation processing into complete application systems.[136]

Small Business

The Framework Program emphasizes participation by small business. In Europe, as in Japan and the United States, most R&D is carried out by large organizations, with a few notable exceptions such as Silicon Valley microelectronics startup firms. Small businesses often lack staff and money to keep abreast of technological change and are often left behind as technology advances. To compensate, many developed nations have various types of extension and training services for small businesses; Japan's is particularly well funded and extensive.[137]

The EC's emphasis on including small and medium-sized enterprises (SMEs)[138] in the Framework Program is intended to improve their technological competence and ability to innovate. Both are important goals, though the former is explicit and the latter most often implied.

Some programs are naturals for SMEs, and others are not. ESPRIT, whose designers were the Big Twelve European information technology companies, is not. Much of the R&D for information technology (IT) involves too great expense for most small firms to handle. While there is a natural place for small, specialized firms in supplying the large IT companies with specialty materials and chemicals, production equipment, and other niche products, even these are difficult markets to enter because of high capital requirements and the increasing domination of Japanese fins, many of which are conglomerates and operate on a global scale. Even so, ESPRIT evaluators feel that the program has been successful in attracting and funding projects for SMEs. The Big Twelve participated in 70 percent of the ESPRIT projects and received 50 percent of the funding; SMEs participated in 65 percent of the projects and received 14 percent of the funding

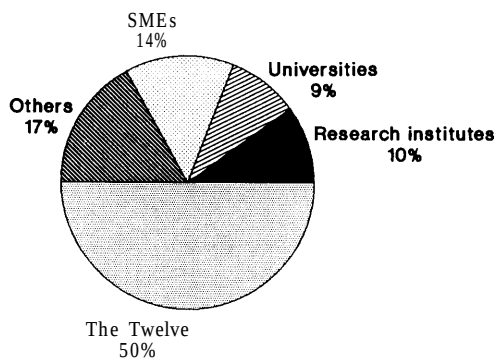
(figure 5-6). SMEs' share of the program has increased and that of the Big Twelve has fallen.[139]

RACE is another project that does not invite easy participation by SMEs. RACE's design, like ESPRIT's, relies heavily on large organizations-in this case, the large PTTs that provide telecommunications service in EC countries, and telematics equipment producers. RACE evaluations are nearly mute on the topic of SME participation. The management audit of RACE in 1989 discloses that just over two-fifths of RACE partners were SMEs, but there is no mention of their share of funding (figure 5-7).[140] By size class, the largest number of participants had more than 5,000 employees.

BRITE, on the other hand, was built for small enterprises; not entirely, to be sure, but substantial participation of SMEs was intended and desired in BRITE in a way that was never true of ESPRIT and RACE. The exact share of SMEs in BRITE funding is unknown; the evaluation team found that the reported figure of 31 percent is misleading because some of the companies placed in the category of SME are part of larger enterprises.[141] But it is also very likely true that a larger share of BRITE's funding goes to SMEs than is the case for RACE or ESPRIT

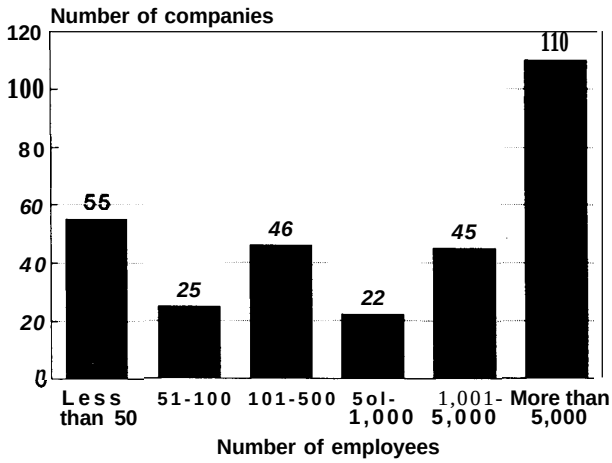
The CEC seems generally satisfied that it is meeting its goals in attracting and funding proposals horn SMEs, at least in the big Framework programs.

Figure 5-6-ESPRIT I Funding Allocated by Sector



SOURCE: Commission of the European Communities, *Communication from the Commission to the Council and the Parliament Concerning the Performance and Results of the Programme ESPRIT*, SEC(89) 1348 final (Brussels, Belgium: Sept. 7, 1989), p. 12.

Figure 5-7-Size of Partners in RACE Program



SOURCE: Commission of the European Communities, RACE 'W, (Brussels, Belgium: 1990), p. 93.

Whether or **how much SME participation is contributing** to the overall aims **of Framework is less clear. Large organizations do the bulk of R&D for a good reason: R&D is generally an expensive proposition, requiring specialized equipment and people, a longer term outlook, and stable financing; many small enterprises are unable to mount such efforts and most do not need to. There is merit in small organizations' having the technological expertise to keep up with the larger organizations that they supply, and in that sense bringing them into R&D consortia is helpful. But the most pressing technological issue for SMEs is usually not how to do more R&D, but how to apply what is known, as the BRITE evaluators said:**

> **The challenge facing traditional S.M.E.'s—like** many other firms-is not in fact the need to **adopt new technology, but rather to integrate** into their **production methods technologies that already exist on the market. Such an objective, which is crucial to the future of European industry, does not fall within the scope of BRITE . . . [T]he Commission should discuss the possibility of launching a much larger and more ambitious programme than the current SPRINT[142] programme, with suitable procedures for promoting the dissemination of technologies within the industrial fabric, and in particular for small and medium-sized firms.[143]**

Another salient finding of the BRITE evaluators is that SMEs benefit from contacts with larger organizations (companies and universities), in part because those larger organizations have easier access to information and can make it available to

smaller companies. Whether large firms benefit in equal measure from their participation in consortia with small ones is less clear (see the section on *Sleeping Partners).*

International Participation in the Framework Program

The Framework Program was designed to improve the competitiveness of European firms vis-à-vis American and Japanese firms. Naturally, this makes U.S. and Japanese efforts to join Framework Program consortia a thorny issue.

Up to now, American firms that want to participate have been given access, but not always as much as they would like. For example, IBM was allowed to participate in JESSI, which receives some funds from ESPRIT, but is not permitted to take part in working groups or committees that make management decisions about projects. RACE, on the other hand, has allowed IBM to function as a prime contractor, and EUREKA projects let IBM participate as the only computer company in a given consortium. In contrast, ESPRIT projects require IBM to have a European computer company as a watchdog.[144] Although participation by IBM is becoming more accepted, this does not end all the problems, either for IBM or for Europe. IBM would like unconstrained access, especially since it has substantial manufacturing and R&D in Europe (IBM conducts 12 percent of its R&Din Europe, 8 percent in Japan, and the rest in the United States). One reason for IBM's restricted access to JESSI and the Framework Program is that European companies do not have equal access to Sematech, which Europeans view as a comparable program.

More to the point, Europeans are still uneasy about access of foreign companies. While a few American companies besides IBM (and many companies from EFTA countries) have been able to participate in Framework and EUREKA projects, the question of who should get in is unsettled and controversial. An official of the Dutch consumer electronics firm, Philips, maintains that while the frost goal of the Framework Program is the integration of Europe, the second goal (especially of the telematics programs) is to break the domination of AT&T and IBM.[145] This statement is no doubt an exaggeration, but if there is any truth in it, uneasiness about even limited participation on the part of IBM and AT&T could be expected. Nevertheless, it could be self-defeating to exclude IBM from projects such as JESSI, which is supposed to foster tighter links between supplier and customer fins. As one IBM official put it: "We have to be in JESSI; all the key players--our suppliers and users—are there. IBM is the largest buyer and supplier of chips in Europe." The same goes for IBM's participation in RACE, Prometheus (a EUREKA project that links modern information and automotive technologies to improve transportation efficiency and safety), and other projects: 3 years ago, IBM was involved in only 3 projects; now it is in 20.[146]

Still more problematic is the question of Japanese participation, for Japanese firms are a greater competitive threat than most American firms, especially in information technology. Two things concern Europeans facing dependency on Japanese suppliers. For one, the big Japanese firms not only supply components, they also compete directly with systems integrators. Depending on a competitor for key supplies is risky at best. In addition, many fear that the Japanese firms will act nationalistically, or in keeping with long-established intercompany ties, serving the needs of their Japanese customers before foreign customers. Until 1990, the issue of Japanese participation in the Framework Program was avoidable. Then Fujitsu, a longstanding supplier of products (both components and systems) to the British computer firm ICL, bought 80 percent of ICL. ICL was one of the original Big Twelve information technology companies in Europe and a participant in many ESPRIT projects. Although ICL met and still meets the EC's criteria for participation in the Framework Program-an integrated presence in Europe, including R&D, sales, and manufacturing[147] —the prospect of one of the Japanese giants having immediate access to and decisionmaking power in ESPRIT' projects is forcing a reevaluation. As of spring 1991, ICL had been removed from the working committee that manages JESSI and was invited out of three of five projects.

So far, beyond the Fujitsu-ICL imbroglio, Japanese firms have not participated in Framework projects. Whether this is because they have been uninterested, reached a polite understanding that they were unwelcome, or been formally deterred, is unknown.[148] But the participation of Japanese companies is likely to be a bigger issue in the future, for they are beginning to knock on the Commission's door, as one participant put it, to ask for admission to the programs.[149]

Sleeping Partners

The Framework Program is required to contribute to the nations that fund it, though not in exact proportion to the funding. The contributions from the large economies--Germany, France, Great Britain, and Italy-are much greater than those of the smaller countries, particularly ones like Portugal and Greece that lack well-developed high-technology sectors. While every project need not scrupulously include participation from every member nation, and participation does not have to match exactly relative funding levels, there is some pressure to include participants from tie smaller and weaker economies.

Sometimes this is a minor problem. A few representatives from strong system companies mention that a drawback of Framework projects is that they were pressed to include unwanted organizations that contribute little to the project; these are variously termed sleeping partners or alibi partners. In response to questionnaires, participants in BRITE, RACE, and ESPRIT have all indicated that they are generally satisfied with the alliances formed within the programs, but not universally. Some of the disenchantment is undoubtedly due to the necessary coupling of strong and weak enterprises; this factor is also sometimes viewed as a weakness in the American high-technology consortium, Microelectronics and Computer Consortium. However, the inconvenience may be balanced, in part, by the benefits gained by weaker enterprises and nations.[150]

Performance of Framework and EUREKA Programs

Europeans are excited about the Framework Program and EUREKA. Most are happy with the significant increase in transborder cooperation, new linkages forged between companies and academic institutions, and alliances between small and large enterprises. The programs have also contributed to standard-setting in Europe. They claim to be eliminating wasteful duplication within national programs, as well as fragmented and unconnected national programs themselves. And they have produced some commercially exploitable results.

What the technology programs have not yet done is make much of a dent in the basic problem: Europe's slipping competitiveness in high technology. It may be too soon for the programs to have made such a difference; the oldest of the programs have been in operation for less than a decade. Moreover, Framework and EUREKA are only part of Europe's new economy, and many of the more sweeping changes planned for the single market have not yet been implemented.

Accomplishments—In some ways, the programs have much to show for the short time they have been in operation, most notably an increase in cooperation. International cooperative agreements were on the upswing before Framework and EUREKA got into gear, but observers inside and outside Europe agree that the programs have increased European firms' and research organizations' knowledge of each other, helped to arrange collaborations that would have been difficult before, and set the stage for future alliances. They have helped producers and users to hook up, and sometimes have become indispensable for that purpose. There is still room for improvement; RACE and ESPRIT have been criticized for not including enough user input, and concentrating too much on the agenda of the Big Twelve. But for the most part, policymakers, participants, and Europe in general seem pleased with the progress in linking up users and suppliers.

An often-cited contribution of the technology programs is in standard-setting. The programs help in two ways: greater communication among companies working in the same business helps to build consensus on harmonizing varying standards; and the cooperation of the 12 nations helps to make Europe more of a force in world standard-setting.

All EUREKA communications projects at least touch on aspects of standardization, and five aim directly at developing standards, including, for example, a project to develop high-definition television production and broadcasting standards and equipment for producing and receiving next-generation television broadcasts.[151] RACE is particularly interested in developing standards for integrated broadband communications (IBC) across the EC by 1995, which in turn will require common standards for telecommunications equipment and service. These and other such projects may lead to EC-wide standards and possibly to worldwide standards. That is both a significant accomplishment of European technology programs and a source of international friction. Foreign companies fear that by being excluded or accorded second-class status (e.g., being left out of the critical process of making decisions) in technology programs they will be at a

competitive disadvantage with regard to standards, for it is unlikely that their own product standards would be considered for the European Community.[152]

The Framework Program has also helped to solve one of Europe's particular problems: knitting together 12 separate, sovereign nations. The EC does not intend to become one unified economy and political entity-a United States of Europe-but one major aim of unification is to reduce the fragmentation and division that characterize the 12 members now. The Framework program, along with the 279 directives of the Single Market Act, will help to lower technical barriers among these nations, and to reduce the fragmentation caused by the traditions of different European institutions. If the evaluations of Framework programs are any indication,[153] Europeans are confident that the Framework programs have, in the words of the ESPRIT evaluators, "influenced several thousand of scientists and engineers in information technology fields to think European and to do so in a positive way. "154

Another contribution of the programs is helping to avoid duplication of effort. This is a benefit claimed for most R&D consortia, but in Europe's case may be well-founded because of prior national support for duplicative efforts. Several participants mentioned the efficiencies of learning from others. Officials of Siemens, speaking of the company's participation in the Eurolaser project, indicated that one of the benefits was the ability to go to the labs of another company and possibly do investigations there. This, according to Siemens, helps a company to do its technical work more economically.[155]

Duplication, or redundancy, is another issue that cannot be neatly resolved. The benefits of avoiding wasteful duplication are obvious, but there is also a danger of eliminating all overlap. Von Hipple points out that the best climate for innovation is one in which many organizations are involved in independent efforts to solve the same problem. There is perhaps a danger that too much cooperation could focus innovation efforts too narrowly. However, that danger probably is minuscule for Europe now, especially in view of the fact that some EUREKA projects are similar to but independent of EC programs.[156]

Competitiveness-The **Framework program and EUREKA have not yet made a big difference in the competitiveness of European industry. Whether they are on track to do so is an open question.**

EC evaluations tend to avoid the issue of competitiveness. This is understandable; it is difficult to measure. More importantly, the EC seems determined to give the programs plenty of time to work—a necessary part of competitiveness programs, particularly in programs designed to catch up with the leaders. Still, some attempts have been made to assess the programs in terms of market outcomes.

A few ESPRIT projects have already yielded commercial results, or are on the verge of doing so. For example, ASM Lithography B.V., a Dutch company, has the lead role in an ESPRIT project to develop a deep ultraviolet wafer stepper for semiconductor production. It recently announced that its deep UV stepper was being tested in several locations throughout the world. The stepper is capable of etching lines less than 0.3 microns wide, and if the tests go as expected the company stands to gain significant market share. The Japanese companies Canon and Nikon already have deep *W* wafer steppers, but at the end of 1990 they were not yet available outside Japan.[157]

Another ESPRIT project that helped produce a commercial product was the Supernode project.[158] It ran 3 years, and produced a modular, reconfigurable computer than can link a few to many processors together. Since the end of Supemode in 1988, both Telemat of France and Parsys of the United Kingdom have made and marketed Supernode computers, and by April of 1990 they had sold more than 200 of the machines.[159]

Stories of commercial exploitation of products resulting from Framework or EUREKA projects are beginning to appear, but are not yet plentiful. Participants in the first phase of ESPRIT reported that 143 of the 227 projects resulted in "industrially significant" results (table 5-11), but only about 12 percent of the projects of ESPRIT I resulted in a commercial product by the time of the evaluation. Concern is surfacing over the issue; a recent news item reported that several influential officials of the CEC criticized ESPRIT for producing little commercially useful technology, and were concerned that European electronics companies were still overly dependent on EC subsidies and trade protection.[160]

Table 5-1 l—industrially Significant ESPRIT I Results

Contributed directly to products and services available on the market	27
Contributed directly to products and services developed for the market but not yet commercially available	44
Used outside the ESPRIT project, either within the company concerned or in another company	44
Contributed to standardization, either adopted as an international standard or being elaborated by an international standards organization	28

SOURCE: J.F. Blackburn, London Representative of the Commerce Department for Industrial Assessment in Computer Sciences and Telecommunications, "Overview of European Strategic Technology in Computers, Telecommunications, and Electronics," *ESN Information Bulletin,* ESNIB 90-40, p. 12.

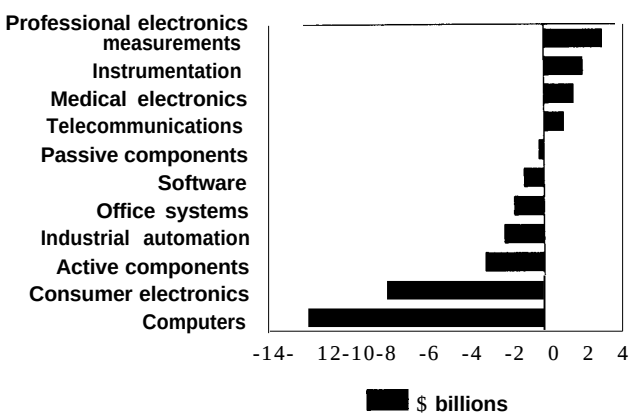
Results of BRITE are more promising. Fifty-nine percent of BRITE participants reported that they expected commercial benefits from their projects within 5 years. The evaluation team regarded this expectation as somewhat optimistic, but found it encouraging.[161]

JESSI got off to a slow start-according to one participant, work only began in 1990 after an 18-month startup phase[162]--and Philips recently announced it was pulling out of the JESSI SRAM development project. Another indication of trouble is that funding from the national governments has not materialized, and the EC is far behind schedule in its funding. However, several of the project's participants, as well as the ESPRIT evaluation team, indicated that its strategic direction is sound. Another comment on its significance is the news that JESSI and Sematech just initiated their first cooperative venture (others are expected).[163]

Overall, the assessment of commercial output from the Framework Program and EUREKA projects is mixed. Even if they come up with commercial products or services, that is not the same as competitive success, which means raising market share while maintaining or increasing standards of living. That, in turn, means helping to eliminate Europe's trade deficit in high-technology products. On these points, the evidence is clearer. So far, the projects have not made much difference. For example, in 1975, the EC had a trade surplus in information technology products, but by the beginning of ESPRIT I, it was becoming steadily more dependent on imports. The trade deficit in IT products reached $5 billion by 1980, and increased to nearly $22 billion by 1987 (figure 5-8). The largest deficits were in such products as integrated circuits, consumer electronics, and computers. That **year, the EC accounted for 28 percent of world consumption of computer systems but supplied only 13 percent, and consumed 17 percent of the world's microelectronics while producing 11** percent. The Commission praised European computer companies for giving good service and keeping upmarket share, but also noted that some "European vendors have kept their turnover up by adopting the role of system integrator or product distributor which results in a reduction in value added. ' [164] For example, Siemens' supercomputers are made for it by Fujitsu and its laptops are made by Matsushita.

Another problem is getting off the dole. It is hard to call a company or an industry truly successful if it needs continuing subsidies or protection to survive. One reason why Japanese electronics companies are judged successful is that they continue to flourish while formal and informal trade protection is disappearing (albeit slowly and sometimes grudgingly). Few European companies have managed this. The Airbus consortium, for example, is widely cited in Europe as a successful venture, yet it has received over $5 billion in success-dependent loans, which have yet to be repaid, and continues to receive substantial development loans from the governments of Germany, France, England, and Spain. Another example is a company called ES2 (European Silicon Structures). In 1985, the company was formed as a joint venture of major electronics firms from nine European countries to produce ASICs. In

Figure 5-8—Europe's Trade Deficit in Electronics in 1987 (21.9bn)



SOURCE: Information from the Commission of the European Communities, *Communication From the Commission to the Council and the Parliament Concerning the Performance and* Results *of the Programme ESPRIT,* SEC(89) 1348 final (Brussels, Belgium: Sept. 7, 1969), p. 6, who cite EIC as their source.

1989, it posted revenues of $19.3 million, 45 percent higher than in the previous year. No other company of the same size participated in so many European technology programs; it was a player in ESPRIT and JESSI. A success? The company had not yet managed to break even, much less turn a profit, by the end of 1989, and its revenues were considerably below the prediction of its founders, who announced in 1985 that its sales would break $100 million in 5 years.[165]

Even the evaluations, which are generally positive in tone and outlook, sound a few warnings. For example, ESPRIT evaluators noted that too much of the technological advance was in niche areas with limited market potential; that work in the software technology portion of the program had produced valuable inhouse developments but had yet to result in commercial exploitation; and the work in the office systems portion of the program were disappointing overall. The major success of the program was the increase in trans-European cooperation made possible by EC funding, but even that was judged possibly not robust enough to survive substantial funding reduction.[166]

European policymakers and many experts point out that it is too soon to bring the jury back on Framework and EUREKA, and they are right. The programs have achieved some notable results, and it is laudable that those in charge have resisted the temptation to make snap judgments. But at this point they have little to teach others about new ways to improve competitiveness.

EC-92: COMPETITION POLICY AND EFFICIENT FIRMS

EC-92's removal of trade, financial, and technology barriers within Europe will create big enough markets to satisfy the needs of any European industry that may have been handicapped by a national market too small to allow economies of scale. The Commission wants to encourage the formation of firms large enough to take advantage of the bigger market, but at the same time to foster competition. EC competition policy has two distinct aims. One, similar to the U.S. antitrust tradition, is oriented toward the regulation of restrictive practices and cartels in the private sector. The other is aimed at removing member countries' favoritism toward their national companies in a wide range of industries and sectors, including telecommunications, passenger air transportation, energy, autos, chemicals, and an array of service industries. The goal of these policies is to help create stronger, more competitive, possibly pan-European firms.

European Antitrust Policies

Competition policy governs mergers, acquisitions, and formal linkages such as joint ventures (merger policy) and corporate practices that limit competition in a market (restrictive practices). Until recently, antitrust policies in the EC have been run at the national level. In general, European countries are less sympathetic to antitrust actions than the United States. Some, like France and Germany, evaluate mergers and restrictive practices case by case, and allow firms a great deal of market power when they believe that consumers or the national interest gain thereby. France and Italy have also used antitrust law to favor national champions involved in mergers and takeovers. Britain, while in principle opposing restrictive practices by companies, is more relaxed in practice than the United States. Britain, France, and Germany all use balance of benefits arguments to determine whether business arrangements are appropriate, and their responses to unacceptable practices rarely involve structural change in the market.

In 1990, the EC took control of very large mergers in Europe. EC policy will probably remove the controls imposed by national governments, keep a close eye on firms' restrictive practices that tight distort competition among European countries, and at the same time encourage the creation of larger firms, including cross-border mergers. 167 Many EC officials believe that European firms in many industries are simply too small to compete effectively, and that a new single market can offer economies of scale that larger companies can exploit. However, some voices in the EC have warned against a simple view that bigger is better. In particular, Sir Leon Brittan, the EC Commissioner for competition policy, has argued that she alone does not create world beaters, and that the EC needs more competition in home markets.[168] As table 5-12 shows, European manufacturing firms are somewhat smaller than U.S. firms. They are closer in size to Japanese firms, but this maybe deceptive since most leading Japanese manufacturing companies belong to industry groups *(keiretsu)* that in effect expand their size.

Table 5-12-Shares of Manufacturing Industry Held by Large Firms in Japan, the United States, and the EC, 1986

	Share of largest firms in total sales of industry			
Largest	5	10	20	40
	(percent)			
EC	6.8	10.8	16.9	23.0
United States	13.5	19.6	26.5	34.6
Japan	8.0	12.6	17.5	23.7

SOURCE: EC Commission, "Horizontal Mergers and Competition Policy in the EC," *European Economy, No. 40,* May 1989, table 5-1.

The EC's mergers directive (put in effect Sept. 21, 1990) layers an EC merger-control office on top of the national offices, to deal with mega-mergers with a substantial European dimension. The EC office now has the power to veto all mergers, and those joint ventures in which one company is established in the EC, with worldwide revenues of at least ECU 5 billion and EC revenues of at least ECU250 million.[169] (However, the directive allows national merger authorities to intervene when they believe that a "legitimate interest" is at stake.[170]) The Commission can compel firms to disclose intentions, as well as block mergers and fine violators.[171] It also has extraterritorial powers over mergers between two foreign-based firms doing business in the EC: competition rules govern all business arrangements that operate witiin the EC, even firms that have no registered home office there.

In principle, the EC will approve business arrangements (including both mergers and interfirm links) when they do not impede competition within the Community. The directive offers a safe haven for mergers that will not result in one firm controlling 25 percent or more of a relevant market; there are also block exemptions, covering certain classes of business activity; and firms can seek a letter of comfort from the EC giving tentative approval to a proposed arrangement in advance. All restrictive practices are illegal unless they in some way benefit the interests of the Community.

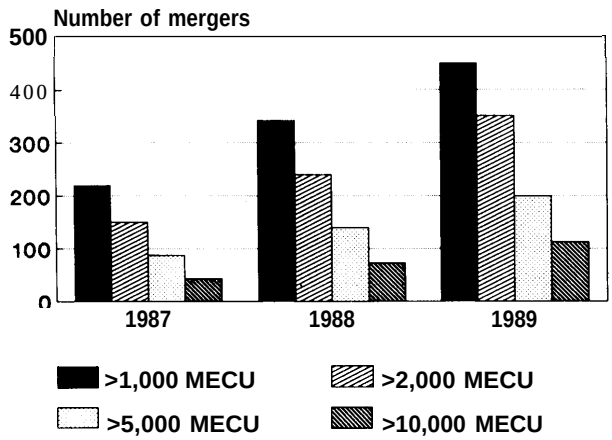
The directive allows the Commission to take into account social and economic factors when considering mergers.[172] It is not yet clear exactly how the Commission will interpret this mandate, but an indication comes from the Commission's decision not to intervene in the merger between Siemens and Nixdorf, on the grounds that competition from other EC and non-EC firms will provide effective competition despite the increase in concentration.[173] An approach consistent with this decision was earlier outlined in a paper by three senior officials in DG-11.[174] The authors analyzed mergers against two kinds of measures:

1. the danger of reduced competition, in which the key variables are the degree of market power concentration, the speed with which demand is growing (making entry more or less attractive), and the extent of import penetration; and
2. the potential for efficiency gains, focusing on the technology content of the industry and the existence of economies of scale.

These criteria suggest how the Commission may try to mesh the aims of encouraging mergers into larger firms with traditional antitrust policy.

Such an EC policy would bless and possibly accelerate a process already under way. Merger activity in the EC has taken off as firms jockey for position in the new single market (figure 5-9). The number of significant deals more than tripled between 1982 and 1987,[175] and by 1989 cross-border mergers rose to 1,267 deals with an estimated value of ECU60 billion.[176] Some national policies have also changed. French restrictions on foreign ownership appeared to be declining, as France was the second largest target country in late 1989 and the largest in the first quarter of 1990.[177] The Commission has specifically encouraged much of this activity, as the assertion of market forces over government regulation.[178]

Figure 5-9-Total Merger Activity, All National, Community, and International Mergers by Combined Takeover



SOURCE: EC Competition Reports [July].

Though it seems to be accepted wisdom among some in the EC that bigger firms mean better competitive performance in general, that belief is open to question. In some industries, to be sure, large size seems a distinct advantage. For example, the competitiveness of Japan's giant electronics firms is often given as a leading reason for their great success in the 1980s. But in other industries, the advantages of very large size are not so overwhelming. A famous misstep of Japan's illustrious MITI was its abortive attempt in the 1960s to reduce the auto industry to three firms, under the conviction that the industry could not support any more. The industry resisted, MITI abandoned the attempt, and there are still 11 Japanese auto producers, most of them doing very well. Likewise, MITI tried to rationalize the machine tool industry, and got no further. Today, Japanese machine tool builders, which are still very numerous, lead the world. Obviously, many factors contribute to success in manufacturing and in some industries size is one of them, but even in those, it may be quite far down the list in importance.

Subsidies and Nationalized Companies

Peter Sutherland, the former Commissioner in charge of competition, put the Commission's position on favoritism to national companies in these terms:

> If you remove national trade barriers, and if you also leave the capacity of governments to interfere with trade by supporting unfairly one industry against another, to allow companies to carve up markets and fix distribution, you would have the same effect of destroying 1992 as if the barriers were left untouched.[179]

The question is not only one of fairness and removal of intra-EC barriers. Protection and pampering can also sap firms' competitiveness.

Subsidies for both national champions and lame ducks are a prominent feature of the economic landscape in Europe. Moreover, nationalized industries have always had special relations with governments and their treasuries. Both are under challenge from the EC.

Subsidies--Subsidies have long been a central component of European industrial policies.[180] EC member states provide much greater industrial subsidies (known as "state aids") than either Japan or the United States. In the EC, state aids average around 3 percent of GDP, compared to 1 percent in Japan and 0.5 percent in the United States.[181] Table 5-13 shows the major subsidies provided by the largest EC member states.

There are many different, sometimes subtle, ways in which governments can help out industries. Simple cash grants are one possibility. Tax relief can be specially tailored. Debt can be written off. Different countries tend to provide subsidies in different ways: Germany uses tax concessions (58 percent of total aid); France provides 26 percent through equity and less than 20 percent through tax concessions; France and the Netherlands provide subsidized energy. Most national subsidies are sector-specific, with relatively little being spent on either R&D or support for small and medium-sized enterprises (5 and 2.6 percent respectively of national subsidies for the period 1981-86).[182] Steel subsidies, for example, amount, on average, to more than 50 percent of the sector's value added in Ireland, Italy, France, and Britain, while annual coal subsidies are about ECU44,000 per job in France, and more than ECU26,000 in Germany.[183] There have also been heavy subsidies for sunrise industries such as Airbus and microelectronics.

In the early 1980s, there was some falloff in European subsidies; state aid to manufacturing declined in real terms in 6 of 10 EC counties between 1981 and 1985.[184] The practice is far from vanishing, however. EC member states must notify the Commission of all proposed state aid, and notifications jumped from 162 in 1984 to 376 in 1988.[185] With the EC, subsidy patterns diverged during the 1980s, declining in Britain with the election and long duration of Mrs. Thatcher's conservative government, remaining stable in France, increasing slightly in Germany, and rising greatly in Italy. As of 1986, Italy was offering eight times as much state aid in absolute terms as Britain.

Within several member nations, subsidies have become hotly fought political issues, especially in the case of declining industries. The huge British coal strike of the mid-1980s was precisely about state subsidies for pits that lost money, while strikes and violence met French attempts to cut subsidies for steel and coal. There has also been some dawning realization that, even in sunrise industries, pumping money into national champions might not work.

With EC-92, problems with national subsidies multiply. They distort trade among EC countries, in effect working to export unemployment (which is

Table 5-13-State Aids in the EC, 1981-86

Overall state aid	Italy	Germany	France	U.K.
Total billion ECU	27.7	19.1	16.7	9.4
Percent GDP	5.7	2.5	2.7	1.8
Per employee, ECU	1,357.0	761.0	792.0	396.0
Percent public expenditure	15.0	10.0	11.0	5.0
Aids to manufacturing				
Percent gross value added	16.7	3.0	4.9	3.8
Per employee, ECU	6,226.0	982.0	1,649.0	971.0
Excluding steel and ship-building				
Percent gross value added	15.8	2.9	3.6	2.9
Per employee, ECU	5,951.0	940.0	1,223.0	757.0
Aid to steel and ship-building				
Steel, percent value added	71.4	8.6	58.3	57.6
Ships, percent value added	34.2	12.3	56.6	21.6
Forms of aid, percent of total				
Grants/direct transfers	79.0	95.0	24.0	71.0
Equity participation	18.0	0.0	26.0	18.0
Soft loans	3.0	0.0	45.0	8.0
Guarantees	0.0	5.0	5.0	1.0
Aid by sector and function, percent of total				
General, industry and services	32.0	13.0	20.0	16.0
Sector-specific	16.0	5.0	20.0	17.0
Regional aids	21.0	18.0	15.0	13.0
of which, EC-approved	5.0	18.0	0.0	11.0
Agriculture, fishing, transport, coal, EC-approved	30.0	64.0	56.0	44.0

SOURCE: Based on Commission of the European Communities, First Survey of *State Aids in Member Countries* (Brussels, Belgium: 1989).

contrary to the Treaty). And in practice the subsidies can simply cancel each other out, creating distortions between subsidized and nonsubsidized industries without offsetting increases in economic activity.[186]

The fairness doctrine makes subsidies a priority target for EC action. The Treaty empowers the commission to act against subsidies without the need for approval by the Council of Ministers, and Commission decisions are subject to review only by the European Court of Justice.[187] New subsidies must be reported to the Commission for prior approval, and the Commission is empowered to demand changes in existing aid schemes and to force companies to repay aid that it deems unacceptable.[188]

None of this means that European subsidies are at an end. The EC's own policies accept subsidies for important trans-Europe projects (e.g., Airbus), regional development, economic stabilization, and "such other categories of aid as may be specified by decision of Council acting by a qualified majority on a proposal from the Commission. ' '[189] These exceptions add up to very large loopholes.

It is not yet clear how vigorously the Commission will act to end national subsidies. Enforcement so far has not been strong and countries are still approving various kinds of subsidy; France, for example, recently announced a large new program to build a high-speed train system, which it wishes to subsidize.[190] However, EC action against subsidies has picked up somewhat in recent years. The Commission has acted in two celebrated cases. Renault was forced to return some FF6 billion in subsidies to the French Government and to cut production of cars by 15 percent and trucks by 30 percent.[191] And in Britain, the Thatcher Government was forced to revoke about half the subsidies given to British Aerospace when it bought the failing Rover auto company.[192] On the other hand, the Commission has approved subsidies for some R&D projects that are or might become quite close to the market, such as Dutch support for high definition television (HDTV).[193] Also, European subsidies are quite a different matter from national ones; they are much more likely to get EC approval. Nor have the large and long-continued subsidies from the four national governments supporting Airbus excited any opposition from the Commission.

So long as subsidized private companies have to face real competition (as Airbus does from two U.S. firms, Boeing primarily and McDonnell Douglas secondarily) and the subsidies are intelligently applied, state aid may boost a company's competitiveness. (See ch. 8 for an analysis of Airbus subsidies.) However, the lengthy history of European subsidies to national champions, together with protection from outside competitors, strongly suggests that this combination does not work. EC efforts to control national subsidies and limit their duration holds some promise for making European companies tougher competitors in the long run.

***State* Ownership--Public ownership of manufacturing firms in Europe dates back to the 1930s. Countries first** nationalized natural monopolies like electricity or gas. Later, some firms were nationalized because they were seen as strategic, e.g., steel, coal, shipbuilding, and electronics. The British and French both favored this approach. But governments have also nationalized failing firms that they could not politically allow to collapse. Industries that dominate a geographical region have been prime candidates (e.g., French steel).[194] The state sector is so large in some countries (still, even after a decade of privatization) that any significant improvement in the performance of the sector will have an effect on national competitiveness as a whole.

State ownership in Europe has created few internationally successful fins. It usually implied a domestic monopoly, as state ownership is hard to justify where there are other private domestic companies in the same sector (although there were exceptions like British Airways). Monopoly status and access to the national treasury tended to promote inefficiency.

The conservative governments that came to power in European countries in the past decade or so privatized dozens of companies. But there are limits. Thatcherite ideas about privatizing the British National Health Service have come to nothing. The French Government seems determined to maintain ownership over a number of important manufacturing firms,[195] although state-owned firms like Pechiney and Rhone-Poulenc have had such serious capital needs that partial privatizations have since become quite common.[196] Were a deep recession to occur, some form of lemon socialism could return.

While the Treaty specifically states that the EC must be neutral between public and private ownership, state aid for government-owned companies is now under attack as it can give these companies an unfair advantage over private sector competitors.[197] The EC is digging into the behavior of state-owned firms to root out "unfair" practices. For example, the EC's telecommunications directive ends national PTT monopolies over end-user telecommunications equipment, provides for above-board, nondiscriminatory treatment (transparency) in procurement, and requires that PTTs separate their regulatory and commercial roles. This should loosen tight national government control over telecommunications, which has been used to favor domestic suppliers.

The Commission is trying to establish the principle that state-owned companies should behave as commercial companies normally do, by investing on the basis of risks and probable returns and purchasing on the basis of cost and quality. Yet much of the point of state ownership in Europe is to encourage behavior that is not commercial, keeping certain plants open and operating in some ways as a public service. Government subsidies are required to make that possible. The Commission is now seriously questioning some subsidies to nationally owned companies (e.g., the subsidy France proposed for Groupe Bull for 1991).

Perhaps the logic of liberalization and equal treatment under the Treaty means fundamental changes in the long run for public sector companies; it is even possible their raison d'etre will disappear. That time has not yet come. Meanwhile, European state-owned firms have some advantages in that they are subsidized, but the disadvantages of insulation from genuine competition in the commercial world is a handicap of considerably greater weight.

1 The Commission is the executive arm and civil service of the European Community.

2 General Agreement on Tariffs and Trade.

3 Not necessarily in the EC. The EC and the European Free Trade Association (EFTA) countries have a free trade arrangement under which tariffs are set at zero and there are no quotas. EFTA's members are Austria Finland, Iceland, Liechtenstein, Norway, Sweden, and Switzerland.

4 The problem of standards seems to have been reduced over the past 2 years, although it remains high among the concerns of U.S. manufacturers.

5 Paulo Cecchini, with Michel Catinat and Alexis Jacquemin, ***The European Challenge: 1992: The Benefits of a Single Market*** (Aldershot, UK: Wildwood House Press, 1988), p. 27.

6 Commission of the European Communities, ***Completing the Internal Market: White Paper from the Commission to the European Council***, COM (85) 310 final (Brussels, Belgium: 1985).

7 Article 30 prohibits "quantitative restrictions on imports and all measures having equivalent effects."

8 In Denmark, for example, there are luxury taxes on autos that range from 100 percent of the value upwards.

9 France, Italy, and the other Mediterranean countries have been given a transition period for implementation, although all will have to comply before 1993.

10 Stephen Woolcock, Michael Hodges, and Kristin Schreiber, *Britain, Germany, and 1992, the Limits of Deregulation (New York, NY:* The Royal Institute of International Affairs/The Council on Foreign Relations, 1991), ch. 6.

11 See also Commission Regulation @EC) 1612/68 Article 1.

12 For at least for 3 months, citizens may reside in another EC country while looking for work.

13 William Drozdiak, "As Europe '92 Nears, Rift on Aid Widens," *The Washington Post,* Apr. 21, 1991, p. H1. At the same time, however, another Japanese electronics giant, NEC, was reported to be angling for a 5 or 10 percent share of Groupe Bull, and the French Government was considering the proposal. Fujitsu began its buyout of ICL with a similar minority share. Alan Cane, William Dawkins, and Stefan Wagstyl, "NEC in Talks on Groupe Bull Stake," *Financial Times,* Apr. 24, 1991, p. 1.

14 Richard Baldwin, "The Growth Effects of 1992," *Economic Policy,* October 1989, pp. 248-281. Baldwin estimates that EC-92 might add between 0.2 and 0.9 percentage points to the EC's long-term growth rate, rather than simply conferring a one-time rise.

15 Merton J. Peck, "Industrial Organization and the Gain from Europe 1992," in William C. Brainard and George L. Perry (eds.), *Brookings Papers on Economic Activity 2* (Washington, DC: The Brookings Institution 1989).

16 Six of the world's top 10 chemical companies (ranked by chemical sales) are EC fins, 1 is Swiss, and 3 are American. Chemical sales by EC firms in 1989 were $312 billion, and by U.S. firms, $274 billion. U.S. International Trade Commission, *The Effects of Greater Economic Integration Within the European Community on the United States: Second Follow-Up Report,* US ITC Publication 2318 (Washington% DC: September, 1990), pp. 22-23 ff.

17 Ibid., pp. 22-27.

18 There are some complicating factors; for example, deregulation, which EC-92 favors, could create tough price competition among European airlines and cause them to postpone purchases of new aircraft (which occurred with deregulation in the United States).

19 Kenneth Flamm, "Semiconductors," in Gary C. Hufbauer (ed.) *Europe 1992: An American Perspective* (Washington, DC: The Brookings Institution 1990), p. 244,

20 Commission Regulation (EEC) 288/89, February 1989.

21 Michael Borrus, director, Berkeley Roundtable on International Economics, personal communication.

22 U.S. International Trade Commission, *The Effects of Greater Economic Integration Within the European Community on the United States,* US ITC Publication 2204 (Washington, DC: The Commission July 1989), pp. 4-14.

23 Aviva Friedman, "EC Takes Giant Step to Open Public Procurement Markets," *Atlantic Trade Reporter, Mar.* 1, 1990, p. 1.

24 Ibid., pp. 4-7. These estimates apply to all U.S. firms, whether exporters or located in the EC.

25 U.S. International Trade Commission, op. cit. (July 1989), pp. 4-12; CEC, *Public Procurement and Construction—Toward an Integrated Market,* CB-PP-88-002-EN-C (Luxembourg: Office for Official Publications of the European Communities, 1989), p. 15.

26 A major thrust of EC-92 is to open up these public purchases to all EC fins, not just national champions.

27 EC Commission, *Eighth Annual Report on the Community's Anti-Dumping and Anti-Subsidy Activities (Brussels: The Commission 1989),* Table 1; EC Commission, *Ninth Annual Report on the Community's Anti-Dumping and Anti-Subsidy Activities (Brussels: The Commission,* 1990), Table 1.

28 Of 149 actions initiated in the 4 years 1987-90, 46wereagainst Japan, Korea, Hong Kong, and Taiwan; 3 were against the United States. (Ibid., annexes.)

29 Statement of Michael C. Maibach to Subcommittee of the House Committee on Foreign Affairs, Mar. 23, 1989, cited in U.S. International Trade Commission, 1992: The Effects of Greater Economic Integration within the European Community on the United States: First Follow-up Report (Washington DC: March 1990), pp. 14-18, and Michael C. Maibach, personal communication. See also Kenneth Flamm, op. cit., p. 276, footnote 77.

30 coremission Regulation (EEC) 2071/89 of July 11, 1989.

31 For example, the essential requirements contained in the 'l'by Safety Directive state that toys "must not jeopardize the safety or health of the user, they must not strangle or suffocate children, they must not be highly 'inflammable, they may not contain excessive quantities of dangerous chemicals or radioactive elements, they must be properly insulated against electric shock and they should ensure sufficient hygiene and cleanliness to prevent conlamination, infection, and sickness. " Diane Good, "The Implications of 1992 for U.S. Manufacturers: Products (product Standards and Product Liability) and Environmental Law," *International Quarterly,* vol. 2, July 1990, p. 109.

32 This principle comes from the historic *Cassis de Dijon case* decided by the European Court of Justice in 1979; the decision stated that French cassis could not be barred from sale in West Germany merely because it was manufactured to non-German specifications. CEC, *Europe Without Frontiers—Completing the Internal Market,* Periodical 3/1988 (Luxembourg: Office for Official Publications of the European Communities, 1988).

33 Under EN 45000 standards for lab practices conforming to international standards (which the United States accepts).

34 The European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC), and the European Telecommunications Standards Institute (ETSI). CEN and CENELEC are private umbrella organizations, comprising standards organizations of the various members. ETSI membership is made up of manufacturers, administrators, and users.

35 U.S. International Trade Commission, op. cit. (September 1990), pp. 4-21 to 4-14; U.S. International Trade Commission, 1992: The Effects of Greater Economic Integration within the European Community on the United States: Third Follow-up Report (Washington, DC: March 1991), pp. 4-11 to 4-14.

36 Ibid.

37 EC Office of Press and Public Affairs, "U.S.-EC Joint Communique Resulting from their Meeting on Standards and Conformity Assessment, June 21, 1991." No. 20/91, June 24, 1991.

38 U.S. International Trade Commission, op. cit. (March 1991), citing EC Commission, *Green Paper on the Development of European Standardization: Action for Faster Technological Integration in Europe,* COM (90) 456 final, Oct. 8, 1990, pp. 31, 33.

39 This was a draft policy in ETSI, governing telecommunications standards, in the spring of 1991.

40 Flamm, op. cit., p. 268, table 5-4.

41 By Fujitsu, Mitsubishi, and Hitachi. "The Last Hurrah for European High Tech?" *Business Week,* Apr. 29, 1991, p. 44.

42 "Spare the Rod and Spoil the Child," *The Economist,* Apr. 20, 1991.

43 Ibid.

44 See Drozdiak, op. cit.

45 For example, the EC trade deficit with the United States in computers and office machines was $8.5 billion in 1989 (table 5-2). For a concise history and analysis of government support of the computer industry in the United States, Europe, and Japan, see Kenneth Flamm, *Targeting the Computer: Government Support and International Competition* (Washington, *DC: The* Brookings Institution, 1987). Trade protection and government procurement were even more prominent in Japan than in Europe for three decades, beginning in the 1960s, but the Japanese were far more insistent on maintaining competition among domestic firms; see ch. 6.

46 Flamm, "Semiconductors," op. cit., p. 232.

47 "National Champions Become Laggards," *Financial Times,* Apr. 29, 1991.

48 This does not exhaust the list of actions taken against foreign, especially Japanese, electronics producers. France (acting for itself, not the EC) imposed the ingenious requirement in 1982 that all imported VCRs should go through customs at a small, lightly staffed office in Poitiers, located in the middle of the country; this tactic made processing quite time-consuming. EC-wide import restrictions were adopted in 1983, when the Japanese Government promised voluntary export restraints on VCRs for 3 years.

49 Commission of the European Communities, *Eighth Annual Report* and *Ninth Annual Report,* op. cit. (1990 and 1991), table Annex F and G, respectively.

50 Organized EC action against Japanese producers of office equipment began in 1984, when the Commuoity set up a committee to investigate electronic typewriters; committees for photocopiers and printers followed in 1985 and 1987. Dumping levies were fixed for typewriters in 1985, for copiers in 1987 and for printers in 1988. The Long-Term Credit Bank of Japan, Ltd., 1992 *and* Euro-Japanese *Economic Relations (Tokyo: The* Bank, 1990), pp. 7-10.

51 Ibid. and Commission of the European Communities, *Eighth* Annual *Report* and *Ninth Annual Report,* op. cit., several annexes.

52 This pattern is described in Ivo Van Bael, "EECAnti-Dumping Law and Procedure Revisited," *Journal of World Trade,* April 1990, pp. 5-1o.

53 The dumping margin is the difference between the price charged by the importer and some "fair" price, either that charged by the importer in some other market or a price calculated by trade authorities. The margin can be exaggerated in several ways, including the attribution of artificially high selling, administration, and general expenses to "normal" imports, and the addition of an unrealistic profit margin.

54 Van Bael, op. cit.; also, Brian Hindley, "Dumping and the Far East Trade of the European Community," *World Economy, vol.* 11, No. 4,1988, pp. 445 ff.; Christopher Norall, ' 'New Trends in Anti-Dumping Practice in Brussels," *World Economy, vol. 9, No.* 1, 1986, pp. 97 ff.

55 Jean-Francois Bellis, "The EC Antidumping System," in John Jackson and Edwin Vermulst (eds.), *Antidumping Law and Practice: A Comparative Study* (Ann Arbor, Ml: University of Michigan Press, 1989), pp. 60-61,63-64.

56 Flamm, op. cit., p. 279.

57 The basic EC antidumping provisions are in Regulation 2423/88.

58 The ruling was on narrow grounds, holding that antidumping duties levied on parts and materials at the point of sale within Europe amounted to an internal tax, not a duty, and therefore violated GATT's national treatment provisions. GATT Document L/6657, Mar. 22, 1990.

59 Long-Term Credit Bank, op. cit.

60 Ibid., p. 9.

61 *The Economist,* Jan. 14, 1990. "Turn of the Screw," *The Economist,* vol. 318, No. 7690, Jan. 19, 1991.

62 "Four Manufacturers Starting Pattern Printing Line in 1992," Nikkei *Microdevices,* July 1990, pp. 44-54. Translated in *JPRS Report: Science and Technology Japan,* "Rush to Secure EC Market," Mar. 8, 1991.

63 Analog Devices, AT&~ Digital Equipment, Hughes, IBM, IT&T, LSI Logic, Motorola, and Texas Instruments all had wafer fabrication plants inEC countries in 1989. - op. cit. (1990), p. 268.

64 Maibach, op. cit. (1989).

65 See "Statement by Mr. Nakao, Minister of International Trade and Industry," mimeo, Tokyo, July 31, 1991; "Statement by Mr. Andriessen," Vice-President of the CEC, mimeo, Brussels, July 31, 1991; and Martin DuBois and Mark M. Nelson, "Tokyo, EC Reach Agreement on Sales of Japanese Cars," *The Asian Wall Street Journal Weekly,* Aug. 5, 1991, p. 8.

66 Much of the material in the section on the auto industry is drown directly from James P. Womack and Daniel T. Jones, "European Automotive Policy: Past, Present, and Future," contractor report to the Office of Technology Assessment, February 1991. Additional sources include Alastair Smith and Anthony J. Venables, "Automobiles," in Hufbauer, op. cit.; the Commission of the European Community, A *Single Community Motor Vehicle Market,* December 1989; U.S. International Trade Commission, op. cit. (July 1989 and July 1990); James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine that Changed the World (New* York, NY: Rawson Associates/Mac_ 1990); OTA interviews with representatives of the motor vehicle industry in the United States and Europe.

67 According to Womack, Jones, and Roos, the ". . . 'free trade' countries, led by Germany and Sweden, have periodically indicated that their continued support of an open market for Japanese cars is predicated on 'appropriate' behavior by the Japanese firms, meaning in practice that their market share should only grow very slowly and without serious threat to the home country producers." Ibid., p. 288.

68 Womack, Jones, and Roos, op. cit.

69 Defined as the number of manufacturing defects in cars reaching customers, not as durability or luxury.

70 U. S. International Trade Commission, op. cit., March 1990, pp. 11-15.

71 DuBois and Nelson, op. cit.

72 EC sales of Japanese cars were about 12 million in 1990. The EC-Japan agreement is based on estimated sales in 1999 of 15.1 million units, meaning growth of nearly 2.6 percent per year. Japanese sales of 2.4 million in 1999 would amount to 16 percent of that market.

73 Richard Johnson, "EC Limit on Japanese Transplants," *Automotive News, May* 6, 1991; and DuBois and Nelson, op. cit.

74 The official explanation given for the British local content requirements was that other European nations with Japanese quotas (notably Italy and France) would count British assembled vehicles against their own Japanese import quotas unless the vehicles had a high level of European content. Another likely motive was to protect British components manufacturers. Womack and Jones, op. cit. (1991).

75 The figure for local content in Japanese cars made in America is uncertain but is probably about 50 percent, according to James P. Womack, automotive industry consultant and former research director of MIT's International Motor Vehicles Program.

76 These figures include passenger cars only, not trucks. Japanese light trucks were also gaining in U.S. market share until 1987, when the U.S. tariff on light trucks was hiked to 25 percent (passenger cars carry a 2.5 percent tariff). Data provided by James P. Womack, based on *Ward's Automotive Reports, various issues.*

77 Honda has already announced plans to export about 6,000 Accord station wagons from Ohio to Europe. "U.S. Honda To Ship Wagons to Japan," *The New York Times,* Jan. 8, 1991, p. D4.

78 Womack and Jones, op. cit., p. 34.

79 Deborah Smith, International Trade Officer (EC), Small Business Administration, personal communication Jan. 13, 1990.

80 Wayne Sandholtz, "New Europe, New Telecommunications," paper presented at the annual meeting of the American Political Science Association, San Francisco, CA, Aug. 30-Sept. 2, 1990.

81 An ECU, European Currency Unit, is now worth about $1.18. The ECU 5.7 billion for Framework programs is all public money; it is generally matched by the projects' participants, except for certain nonprofit organizations such as universities, which can receive up to 100 percent of project costs from the European Community. EUREKA is primarily funded by the private sector; less than 10 percent of its funding is public money. A rough calculation, assuming that 10 percent of EUREKA costs are public and that both programs spend about the same amount of money each year, yields annual public funding of cooperative research amounting to ECU 1.6 billion, or about $1.9 billion. Source of funding numbers is U.S. International Trade Commission, 1992: ***The Effects of Greater Economic Integration Within the European Community on the United States: Second Followup Report,*** US ITC Publication No 332-267 (Washington, DC: U.S. International Trade Commission, September 1990) pp. 16-6 and 16-10.

82 For example, the Commission states ". . . the [European] Community's influence has grown to such an extent that it affects almost all areas of business and society, ***so that it is now obliged to grapple with the problems of securing and maintaining our living conditions.*** Viewed against this background, science and research have taken on a key role which the Community cannot ignore. . . . The main aim is to maintain the international competitiveness of European industry in high technology sectors, in the face of competition in global markets, above all from the USA and Japan" (emphasis added). See Commission on the European Communities, ***EC Research Funding: A Guide for Applicants*** (Brussels, Belgium: 1990), p. 3.

83 Office for Official Publications of the European Communities, ***Research and Technological Development Policy,*** Luxembourg, 1988, p. 8. Some technologies are dominated by two countries together, which accounts for the figures adding to more than the total. This was cited in U.S. International Trade Commission, op. cit. (September 1990), pp. 16-23.

84 Japanese patents were most likely to be granted (in descending order of importance) in photocopying, dynamic information storage or retrieval, dynamic magnetic information storage or retrieval, photography, radiation imagery chemistry, recorders, typewriting machines, static information storage and retrieval, pictorial communication and television, and motor vehicles. Germany's patents were mainly in chemistry, materials, and printing; they included fertilizers, organic compounds of different types, ammunition and explosives, solid material comminution or disintegration, plastic article or earthenware shaping or treating, synthetic resins or natural rubbers, and, finally, brakes. France's list is more diverse: induced nuclear reactions, systems, and elements; clutches and power-stop control; ammunition and explosives; pulse or digital communications; rotary kinetic fluid motors or pumps; brakes; pipe joints or couplings; organic compounds; aeronautics; and electricity, electrical systems, and devices. National Science Foundation ***Science and Engineering Indicators-1989*** (Washington, DC: U.S.Government Printing Office, 1989), pp. 358-360.

85 Commission of the European Communities, ***Evaluation of the First BRITE Programme [1985-1988],*** EUR 11782 EN (Brussels, Belgium: July 1988), p. 15.

86 With the ECU worth about $1.18, Framework funding was worth about $6.7 billion over the period 1987-91.

87 This does not count projects like DRIVE (Dedicated Road Infrastructure for Vehicle Safety in Europe) and BRITE/EURAM (BRITE is Basic Research in Industrial Technologies for Europe, and EURAM is European Research in Advanced Materials), which fund several high-technology projects. It also does not count projects aimed mostly at improving science or learning.

88 Tables 5-2 and 5-8 show the breakdown of funding and project descriptions of the Second Framework Program, scheduled to last from 1987 to 1991. Some of the preexisting projects from the first Framework carried over, and the Third Framework Program, approved in April 1990 and lasting through 1994, overlaps the second program. The third program was approved while the second was still in effect because rapid changes in technology necessitated an increase in funding (ECU 400 million) and a shift of priorities. The tables show programs of the Second Framework program rather than the third because more detail on individual projects is available for the second program. The third program has three areas of emphasis (which encompass the eight of the second program) and reallocation of funds to emphasize new areas such as microelectronics and networks connecting information systems. Source: U.S. International Trade Commission op. cit., pp. 16-18.

89 U.S. International Trade Commission, ***1992: The Effects of Greater Economic Integration Within the European Community on the United States: Second Followup Report,*** USITC Publication 2318 (Washington DC: U.S. Government Printing Office, September 1990), pp. 16-10.

90 Commission of the European Communities, ***EC Research Funding,*** op. cit., p. ***20.***

91 EUREKA Secretariat, ***EUREKA: Together for the Future*** (Brussels, Belgium: EUREKA Secretariat, 1989), passim.

92 J.F. Blackburn, "Overview of European Technology in Computers, Telecommunications, and Electronics," ***ESN Information Bulletin, ESNIB 90-04,*** 1990, p. ***24.***

93 Siemens' decision to license Toshiba's technology initially concerned both Philips and the German Government. Philips would have preferred developing the technology in Europe even if that meant delaying a successful completion of the project, while the West German technology minister was reportedly so angry with Siemens that he considered withdrawing government backing of the Mega project. Robert S. Williams, "JESSI," Harvard Business School Case 9-389-135, Rev. May 9, 1989.

94 Planungsgruppe JESSI, "JESSI Program: An Initiative of European Institutions and Companies, Results of the Planning Phase," ***Itzehoe***, Feb. 1, 1989.

95 Flamm, "Semiconductors," op. cit., pp. 247, 262. The Mega project was a cooperative project of Philips and Siemens, along with the governments of the Netherlands and West Germany, to improve semiconductor manufacturing technology. The Mega project aimed at developing technologies to manufacture 4-megabit D RAMs (Siemens) and l-megabit SRAMs (Philips). Flamm's statement also accords with the experience of Siemens A.G. An executive of the company stated that Europe must be competitive in wafer steppers and lithography technology, which he regarded as strategic technologies, because the Japanese do not sell the latest technology or the first machines to Europeans. Hartwig Bierhenke, Corporate Research and Development Siemens A.G., interview with OTA staff, Oct. 10, 1990.

96 Claire Shearman, "Science and Technology in Europe," mimeo, pp. 3-21.

97 OECD figures quoted in ***The Economist,*** "European Community: A Power in Its Own Right," July 7, 1990, p. 6.

98 Wayne Sandholtz, "New Europe, New Telecommunications," paper prepared for the Annual Meeting of the American Political Science Association, San Francisco, CA, Aug. 30-Sept. 2, 1990.

99 Ibid., p. 12.

100 Commission of the European Communities, ***Research and Technological Development for Europe (Brussels,*** Belgium: December 1987), p. 3.

101 See, for example, Sylvia Ostry, "Beyond the Border: The New International Policy Arena," paper presented at the OECD Forum for the Future, Paris, France, Oct. 30, 1990, and Shearman, op. cit., p. 5-1.

102 Gallium-Indium-Arsenide, project 2035.

103 Interview with Fred A. Meyers, Senior Manager, GaAs IC Research Department, Plessey Research Carswell Ltd., with Todd Watkins, Harvard University: interview no. 4, pp. 3-4.

104 "III-Evaluation of the BRITE Programmed," mimeo, p. 17.

105 Jens Moritz, Corporate R&D, Joint R&D-Projects and Research Funding, Siemens A.G., interview with OTA staff, Oct. 10, 1990.

106 Commission of the European Communities, ***First Report on the State of Science and Technology in Europe,*** mimeo, no date.

107 Commission of the European Communities, ***EC Research Funding,*** op. cit., p. 40. There are 10 criteria for selection of Framework projects listed in this document; one is "cross-border character." The others are compliance with the aims of the program, scientific and technical quality and originality, innovative potential, industrial relevance and influence on competitiveness, feasibility of implementation, scientific qualifications of the applicant, pre-competitive character, amount of EC funding, and composition of the partnership.

108 According to Flamm, "[A]s entire proprietary designs for electronic systems are transferred onto a single chip, retaining control over that design becomes increasingly intertwined with finding chip suppliers who will not appropriate key elements and use them to manufacture competitive product of their own. Access to a state-of-the-art chip supply, which combines leading-edge manufacturing technology with reasonable security for key elements of proprietary systems designs, has become a strategic issue throughout the global electronics industry. " Flamm, "Semiconductors," op. cit., p. 229.

109 Ibid., pp. 228-229.

110 Commission of the European Communities, "Communication From the Commission to the Council and the Parliament Concerning a Review To Assess the Performance and Results of the Programme ESPRIT," Brussels, Belgium, Sept. 7, 1989 (mimeo), p. 13.

111 Ibid., p. 22.

112 III-Evaluation of The BRITE Programme, op. cit., p. 17.

113 JESSI Program, An Initiative of European Institutions and Companies: Results of the Planning Phase," Itzehoe, Feb. 1,1989, p. 22.

114 Commission of the European Communities, ***RACE '90: Research and Development in Advanced Communications Technologies in Europe,*** op. cit., p. 1.

115 Commission on the European Communities, ***Programme Management Audit of RACE, DRIVE, DELTA, and AIM: Report of an External Audit Team*** (Brussels, Belgium: October 1989). On page A3-2, the team reports that 'RACE participants are mostly content; their main concerns are the monthly reporting and the concertation meetings.' Results of this audit should be used very cautiously, however, because it is based on a survey whose response rate was low. The audit team sent out 1,650 questionnaires to participants in RACE, DRIVE, DELTA, and AIM, and based its assessment of the management of these programs on 348 returned questionnaires—a 21-percent response rate. The management audit document does not say what procedures were used to obtain responses, or if they were all entirely voluntary. If the latter, then it is possible that these response were atypical.

116 Comrnissionofthe EuropeanCommunities, "Communication from the Commission," op. cit., p. 14.

117 Ibid., p. 16.

118 See, for example, Martin Fransman, ***The Market and Beyond: Cooperation and Competition in Information Technology Development in the Japanese System*** (Cambridge, U.K.: Cambridge University Press, 1990).

119 Daniel I. Okimoto, ***Between MITI and the Market: Japanese Industrial Policy for High Technology*** (Stanford, CA: Stanford University Press, 1989), p. 71.

120 III—Evaluation of the BRITE Programme, op. cit., pp. 21-22.

121 AEG, Bull, CGE, GEC, ICL, Nixdorf, Olivetti, Philips, Plessey, Siemens, STET, Thomson.

122 Commission of the European Communities, "Communication from the Commission," op. cit., p. 11.

123 Many European writers view U.S. universities as making material contributions to the nation's technology base, as well as to basic science; and they view Japanese universities as effective training grounds for professionals.

124 Commission of the European Communities, ***First Report on the State of Science and Technology in Europe (Brussels,*** Belgium: mimeo, no date), pp. 92-93.

125 Mary Tyszkiewicz, "Research Collaboration in the European Community: The Lessons for the United States," mimeo, April 1990.

126 Commission of the European Communities, ***Evaluation of the First BRITE Programme,*** op. cit., p. 25.

127 Commission of the European Communities, ***First Report,*** op. cit., pp. 91,93.

128 Commission of the European Communities, "Communication from the Commission," op. cit., p. 20.

129 Commission of the ***European Communities, Evaluation of the First BRITE Programme,*** op. cit., p. 25.

130 Commission on the European Communities, ***EC Research Funding,*** op. cit., p. 25.

131 Commission of European Communities, ***Evaluation of the First BRITE Programme,*** op. cit., p. 12.

132 Harry Beckers, Shell, Group Research Coordinator, and Chairman, IRDAC, interview with OTA staff, Oct. 2, 1990.

133 Hartwig Bierhenke, Corporate Research and Development Siemens AG, interview with OTA staff, Oct. 10, 1990. There may not be as much of an inconsistency in the perceptions of Bierhenke and Becker as it appears. JESSI is a EUREKA project, and EUREKA is not an EC program and therefore not constrained by precompetitivity. However, through ESPRIT, the EC is putting money into JESSI; 30 percent of the funding of the microelectronics portion of JESSI comes from ESPRIT The applications people in JESSI are not very satisfied with ESPRIT, so while the overlap between the two programs is growing, so is the tension. See Henk G. Boddendijk, ManagingDirector, Philips International B.V., interview with OTA staff, Oct. 12, 1990.

134 J.J. Kaptein, Former President, Oce, and member of the EUREKA advisory board to the Minister of Economic Affairs of the Netherlands, interview with Todd Watkins, Harvard University, summer 1990.

135 For example, Jens Moritz of Siemensbelieves that Framework projects should go no closer to the market than they are. Jens Moritz, Corporate R&D, Siemens AG, interview with OTA staff, Oct. 10, 1990.

136 J.F. Blackburn, "Overview of European Technology in Computers, Telecommunications, and Electronics," ***ESN Information Bulletin,*** April 1990, p. 12.

137 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. 161-167.

138 An SME is anenterprise thatemploys 5000rfewerpeople, has an annual net turnover of less than ECU 38 million, and has not more than a third of its ownership held by a parent organization or a financial institution. CEC, ***EC Research Funding,*** op. cit., p. 14.

139 Commission of the European Communities, "Communication From the Commission," op. cit., p. 12. The report also notes that the share of the Big Twelve dropped when Spain and Portugal joined the community.

140 Commission of the European Communities, ***Research and Development in Advance Communications Technologies in Europe: RACE '90*** (Brussels, Belgium: March 1990), p. 93.

141 Commission of the European Communities, ***Evaluation of the First BRITE Programme,*** op. cit., pp. 22-23.

142 SPRINT is the Strategic Programme for Innovation and

Technology Transfer. Its funding in the Second Framework Program was ECU 90 million, and its mission is to promote the dissemination of innovation and new technology. Commission of the European Communities, *EC Research Funding,* op. cit., p. 138.

143 Ibid., p. 24.

144 Jean-Jacques Duby, Group Director, Science and Technology, IBM Europe; interviews with OTA staff, Oct. 8, 1990.

145 W.A. Ledeboer, European Affairs Coordination Manager, Corporate Product Development Coordination Philips, interview with OTA staff, Oct. 12, 1990.

146 Jean-Jacques Duby, interviews with OTA staff, Oct. 8, 1990 and Nov. 2, 1990.

147 One participant from a prominent American company with substantial presence in Europe added another caveat to these-a low profile.

148 One source states that Japanese firms have been rigorously excluded. See Charles Smith and Tony Major, "The Stakes Rise,' *Far Eastern Economic Review,* Aug. 12, 1990, pp. 46-47.

149 Jean-Jacques Duby, interview with OTA staff, Nov. 2, 1990.

150 Mary Tyszkiewicz, op. cit., p. 16.

151 Other projects related to standards include an effort to setup a network of public and private research centers across Europe using open systems interconnection (0S1, which is not based on the characteristics of the products of a single manufacturer) as a basis for communication and a project that studies the feasibility of digital audio broadcasting. EUREKA: *Together for the Future, 1989 Progress* Report, p. 8.

152 See the discussion of standards earlier in this chapter.

153 It is worth bearing in mind that existing evaluations are not robust. Both the RACE and BRITE evaluations are based on limited sampling. The evaluation for RACE, DRIVE, DELTA, and AIM programs together was based on results of 348 questionnaires returned by participants, out of a total of about 1,650 sent, for a 21-percent response rate. BRITE was evaluated on the basis of 177 questionnaires out of 450 sent, 9 plenary meetings, and over 100 interviews with senior officials of national ministries, industrial managers, leaders of projects not selected for inclusion in BRITE, and academics. Among some of the statistical problems of the BRITE survey are the following: the criteria for selecting interviewees were not explicitly identified; the mail survey had no way to know which of the 174 projects were represented in the survey response; there was no analysis of nonresponse bias; the attributes of the sample were not compared with those of the population; and industrial organizations were underrepresented and academic and research institutions overrepresented. The ESPRIT evaluation was based on 949 questionnairee responses and meetings that included input from 210 participant organizations-a significantly higher number than R4CE or BRITE, but there is no indication in the evaluation document of what the response rate was. This caveat is in no way intended to question the sincerity of the evaluators or of the EC in conducting the evaluations, but without more attention to the design of the evaluation surveys it is hard to know what biases are included in the survey. OTA staff noticed that, with the partial exception of the BRITE evaluation, all the evaluations mentioned above are more positive in tone and contain fewer criticisms of the programs than did staff interviews with representatives of companies and organizations participating in them. OTA interviews have no statistical validity; but there was no attempt to select interviewees based on their opinions of Framework projects.

154 Commission of the European Communities, "Communication from the Commission," op. cit., p. 20.

155 Outfried Voigt, Executive Director, and Wolfram Rath, Siemens AG, Power Generation Group, interview with Todd Watkins, Harvard Business School.

156 Shearman, op. cit., p. 9-6.

157 Roger Woolnough, "Breakthrough in Esprit's Deep UV Project," *Electronic Engineering Times,* Dec. 3, 1990, p. 24.

158 Project P 1085, "Development and Application of Low Cost High Performance Multiprocessor Machine."

159 Blackburn, op. cit., p. 13.

160 Guy de Jonquieres, "ESPRIT, JESSI Come Under Attack," New *Technology* Week, Nov. 5, 1990.

161 Commission of the European Communities, "Evaluation of the First BRITE Programme," op. cit.

162 Boddendijk, op. cit.

163 "JESSI, Sematech Forge First Link," *Electronic Engineering Times,* Dec. 3, 1990, p. 2. This first project is an assessment of how European and American integrated circuit manufacturing stacks up against world standards; the two projects are expected to sign a cooperative agreement on development of semiconductor production equipment in the near future.

164 Commission of the European Communities, "Communication from the Commission" op. cit., pp. 7-9.

165 Roger Woolnough, "ES2: Still a Unique ASIC Player," *Electronic Engineering Times,* Sept. 10, 1990.

166 Commission of the European Communities, "Communication From the Commission," op. cit., pp. 14, 15,21,31.

167 For some insight on the direction EC competition policy may take, see Alexis Jacquemin, Pierre Buigues, and Fabienne Ilzkovits, "Horizontal Mergers and Competition Policy in the European Community," *European Economy, No. 40, May 1989.*

168 Sir Leon Brittan, "1992: Priorities in Competition Policy," *European Access,* Apr. 2, 1989, p. 20.

169 In principle all proposed ties between competitors must be reported to the EC, including joint ventures and strategic alliances. In practice, the Coremission cannot possibly handle that much information and will probably limit its demands.

170 See *WoodPulp case,* December 1988, described in Douglas E. Rosenthal, "Competition Policy," Gary Clyde Hufbauer, op. cit., p. 325.

171 Guy de Jonquieres, "EC To Exert New Powers," *Financial Times,* Oct. 18, 1990.

172 Ibid.

173 Reported *inEurope 1992 Law andStrategy,* vol.1, No. 6, June 1990, p. 7.

174 Jacquemin et al., op. cit.

175 Ibid., p. 42,

176 Translink *International, European Deal Review,* Fourth Quarter, 1989, p. 5.

177 Purchases in France were 6.3 billion pounds, compared to 6.1 billion pounds in the more traditionally liberal United Kingdom.

178 CEC, quoted in Michael R.Calabrese, "Merger Law Develops," *Europe 1992: Law and Strategy,* vol.1, No.6, June 1990, p. 3.

179 Quoted in Nicholas Colchester and David Buchan, *Europower* (London: Economist Books, Random House, 1990), pp. 145-146.

180 RobertFord and Wim Suyker, "Industrial Subsidies in OECD Economies," OECD department of Economics and Statistics, Working Paper No. 74. OECD Paris, January 1990; CEC, First and Second. Brussels, 1989 and 1990.

181 The ECarguesthatmost U.S. support for industry is concealed within the defense budget, making the comparison unequal.

182 Commission of the European Communities, *First Report on State Aids,* Luxembourg, 1989.

183 Commission of the European Communities, Survey, op. cit., p. 17.

184 EC, *Subsidies,* op. cit., table IVA, p. 14.

185 Niall O'Neill, J.M. Didier & Associates, "StateAids: TheLast Frontier?" 1992: *The External Impact of European Unification*, vol. 2, No. 10, Aug. 10, 1990 p. 9.

186 Commission of the European Communities, Survey, op. cit., p. 2.

187 Articles 92-94.

188 For a concise description, see David A. Deacon, "Current State Aid Policy in the EC and the Implication of 1992," in Ronald Gerritse (cd.), *Producer Subsidies* (London: Pinter, 1990).

189 Treaty of Rome, Article 93 (3)d.

190 France plans to spend about $33.5 billion on 2,175 miles of high speed network. *Atlantic Trade Reporter*, June 21, 1990, p. 7. As noted earlier, France has also proposed large new subsidies for its state-owned computer company, Groupe Bull.

191 "France, EC Reach Compromise on Renault Subsidies," 1992: *The External Impact of European Unification*, vol. 2, No. 5, June 1, 1990, p. 2; *Europe 1992 Law and Strategy, vol.* 1, No. 6, June 1990, p. 5. The CEC compromised from its original position which demanded FF12 billion, but France also promised to provide no further subsidies in 1990, and to implement its promise to remove Renault's *regie* (state-owned) status, which effectively protected it from takeover.

192 Colchester and Buchan, op. cit., p. 151.

193 The Dutch support, ECU23.6 million for Philips, was specifically approved under this exception. *Europe 1992: Law and Strategy*, vol. 1, No. 6, June 1990, p. 5.

194 Politically, the pressure to nationalize came in Britain mainly from the Labour Party and trade unions. In France, it came partly as workers coerced the government through crippling strikes and violence. In Italy, there was pressure from trade unions and the Communist Party (as in France), but the dominant Christian Democratic Party also benefited from the enormous possibilities for political patronage that nationalization offered. Even Germany has a surprisingly large nationalized sector. By the time nationalization peaked, governments owned large manufacturing concerns in every major European country.

195 Mitterrand formalized this approach in his 1988 election manifesto, calling for a policy stance of neither more nationalization nor more privatization.

196 George Graham, "Companies Learn to Live Within Bounds," *Financial Times*, Sept. 6, 1990. From September 1988 to September 1990, public sector firms had received FF183.4 billion in fresh capital: FF13.8 billion in cash from the state, FF21.1 billion in state write-offs, FF34.4 billion from the financial markets, and FF85.7 billion from reinvested profits.

197 Sir Leon Brittan, the EC Commissioner for Competition Policy, argues that state-owned firms should be funded on commercial terms, not dipping into government coffers through soft loans or subsidies. See "State Aid Policy and the Publicly Owned Companies: Are There Limits to What The State Can Do?" address to the Conseil de la Concurrence, Mar. 9, 1990; "Developments in EC policy towards public companies," address to the Confindustria Conference, Sept. 22, 1990.