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The Implications of 'EC 1992' for US Electronics Companies & Workers

National economies, by their nature, compete with each other. International trade and investment are the instruments of that commercial competition. Success of one economy compared to another is determined by a complex mixture of worker productivity, industrial and financial structures and the commercial policies of the governments involved. In a capitalistic trading system, perhaps the single most important competitive factor is productivity; that is, "working smarter, not harder." This is not to say that productivity alone will determine success: no matter how productive a given national economy is, lack of access to certain large markets, for example, may deny the economies of scale and return on investment needed to sustain that productivity. Nevertheless, productivity in manufacturing and services has significant ramifications for all national economies.

Given this reality, we need to be clear about what drives productivity increase in the Information Age that is now upon us. In the Machine Age, productivity was increased by substituting gears and levers, drills and pistons for workers' arms and legs. Workers' brawn was mechanically injected into work, freeing workers to do other things- to apply their minds to enhancing management techniques, improving the use of economic policy and financial instruments, devising more sophisticated methods and products, and advancing science and technology in such fields as electronics.

In this matter, the Machine Age set the stage for the Age of Information and the electronics that puts this new knowledge and technology to work. Specifically, the invention of the integrated circuit (1959) has allowed for the next level of productivity increases in the international trading system. Computer chips allow the injection of *brainpower* into work. Now machine tools not only do the drilling and cutting and assembling that workers used to do by hand, they do so today at a computer's command. This new form of productivity frees workers for even more advanced study and tasks.

With this in mind, one can understand why some have called semiconductors (i.e., integrated circuits or computer chips) "the crude oil of the Information Age." Just as iron ore, timber, rubber, and petroleum were the natural resources of the Machine Age, so are the logic and memory chips made by Intel, NEC, Samsung, and Siemens the stuff of commercial success today. The difference, of course, is that the former was endowed by nature; the latter are created by innovators freed from drudgery by the Machine Age.

It is in this context that the policies of EC 1992 will be examined. Clearly, the impact of the EC's microelectronics policies will be substantial on the United States and its domestic semiconductor industry and workers. Moreover, the impact of EC 1992 will be both positive and negative and will affect every aspect of the electronics industry from technology to trade and investment. The focus here will be on jobs; specifically, whether EC 1992 will mean the exportation of more U.S. semiconductors or more U.S. semiconductor jobs.

Importance of the U.S. Electronics Industry

In the Age of Information, the strength of the U.S. manufacturing base and the U.S. economy as a whole depend on the health and vitality of the U.S. electronics industry. As pointed out, that industry is the driver of all forms of productivity increases, whether electronics is put to work in the office, laboratory, factory, or farm.

The U.S. electronics industry includes computers, consumer products, electronic parts, instruments, semiconductors, and telecommunications. It had worldwide sales of $650 billion of 1989, excluding sales to the Sino- Soviet bloc countries. U.S. electronics accounts for one out of every nine U.S. manufacturing jobs. It also provides more than 7 million secondary jobs in support of U.S. electronics.

Indeed, the U.S. electronics industry provides more manufacturing jobs- 2.6 million- than the U.S. chemical, automotive, and steel industries combined. It also employs one and one- half times as many people as either the food or printing industries. Today, some 155,000 persons in the United States work in the manufacture of steel, while more than 280,000 workers fabricate computer chips. (IBM alone employs 200,000 workers in the U.S. electronics industry). These figures give a sense of the quiet tidal wave U.S. manufacturing has seen as thousands of U.S. jobs have moved from "smokestack industries" to electronics.

Within the U.S. electronics industry, the semiconductor sector plays a singularly critical role. Although semiconductors account for only 10 percent of the industry's worldwide sales and U.S. employment, these tiny chips are the heart of all electronics systems. They are the vehicles for the transmission of innovators' logic and memory into productive work.

The European Semiconductor Market

The EC is the most important export market for the U.S. electronics industry- and particularly for the semiconductor industry. In 1988, for example, the EC absorbed 46 percent of the United States' exports of computers and parts and 35 percent of its scientific and controlling instruments exports. The EC was also the largest export market for U.S. electrical machinery and parts, including semiconductors.

In fact, with a 42 percent share of the EC's $9.7 billion semiconductor market in 1989, U.S. companies are more successful in Europe than either the Japanese (21 percent) or even the Europeans (37 percent).

The success of U.S. semiconductor companies in the European market creates U.S. jobs. It also helps to generate the profits needed to fund the research and investment that will create the next generation of semiconductors. In addition, the U.S. semiconductor industry's success in the European market enables it to achieve economies of scale, something the closed Japanese market does not. Highly capital and research- intensive semiconductor companies depend on scale economies to increase their worldwide competitiveness. (Intel, for example, invests around 30 percent of its net revenues into R&D and new plants and equipment annually.)

Electronics and EC 1992

There is good reason to believe that European Community's "single market" effort will benefit the U.S. electronics industry. The elimination of physical, technical, and fiscal barriers to trade within the Community will lower the cost of doing business in Europe, thereby increasing the demand for goods and services by an estimated $260 billion. U.S. electronics companies are well positioned to take advantage of this increased demand, having proven themselves capable of supplying European consumers with the products they want in the quantities they need.

U.S. semiconductor manufacturers are deeply concerned, however, that actions the Community has taken to advance its information technology agenda will have adverse consequences for non- EC manufacturers. Their concerns can be summarized as follows: More and more, U.S. firms wishing to sell semiconductors in Europe will have to manufacture them here.

Europe's Information Technology Agenda

The EC has long viewed information technology industries as an integrated whole, worthy of financial and political support. There is even a directorate for information technology (DG-XIII), which covers telecommunications, semiconductors, and other information- related electronics products. (While the U.S. government has, for example, agriculture and energy departments, it has no department for electronics or information technologies.)

The EC's focus stems from the belief that without strong indigenous capabilities in electronics, Europe will not remain economically competitive, becoming dependent upon Japan and the United States for critical technologies. In light of the argument that electronics drives productivity increases, this belief appears to be well founded. To be sure, the vast majority of the EC's research and development programs (e.g., JESSI, ESPRIT, BRITE, RACE) are focused on electronics.

Such cooperative efforts to promote technology have the potential for becoming a major centripetal force uniting the EC member states. Indeed, a growing number of countries around the world- from South Korea to Argentina- have targeted selected segments of the electronics industry.

Recognizing that access to state- of- the art semiconductor technology will determine Europe's success in a variety of downstream sectors, including data processing, consumer electronics,

manufacturing, and communications, the Community is particularly interested in promoting its microelectronics sector.

Currently, Europe views its semiconductor industry as lagging far behind its U.S. and Japanese competition. Not only is the European semiconductor market the smallest of the "big three," but European companies also have a much smaller share of their own market (37 percent) than U.S. and Japanese companies have of their markets (66 percent and 88 percent, respectively). In addition, the European companies' 37 percent share, though second within the EC, constitutes 66 percent of their worldwide sales. In the global chip market, they hold a weak 10 percent of total share (Japan holds 50 percent, the United States 37 percent).

The Community and its semiconductor industry have often stated an intention to eliminate the disparity between the semiconductors Europe produces and those it consumes. (The EC imported $3.6 billion more semiconductors in 1989 than it exported; see figure 4.1) To do so, the EC has taken action against Japanese dumping of microelectronics and is putting in place trade and technology provisions that are shaping up to be a microelectronics industrial policy.

In recent years, the erosion of Europe's global market share in semiconductors has come at the hands of Japanese producers. Japan's behavior in the microelectronics sector is characterized by a closed home market, vertically integrated electronics manufacturers, closed public procurement, predatory pricing (dumping), and semiconductor R&D often funded and/or coordinated by government.

To prevent the further decline of its semiconductor industry- indeed, to inspire its resurgence- the EC is determined to respond in kind to Japanese trade practices of the past and present. Europe's reaction to these practices includes, but is not limited to, the following:

- *Tariffs*: 14 percent on semiconductors, 4 percent on computer parts (the United States and Japan have no such tariffs).

- *Rules of Origin*: In 1989 the EC changed its 22-year old rule of origin for semiconductors, now requiring wafer fabrication (instead of assembly and test) to confer EC origin.

- *"Screwdriver" Law*: Use of value- added rules of origin (e.g., the proposed 45 percent EC content rule for printed circuit boards) to implement the EC's "screwdriver assembly" antidumping regulation.

- *Local Content Requirements*: Several EC governments have strict local content requirements for telecommunications, automotive manufacturing, and government procurement (water, energy, and transport).

Effect of EC Policies on U.S. Industry and Workers

Unfortunately, EC policies designed in response to Japanese targeting are adversely affecting the U.S. semiconductor industry as well. This is because they operate within a General Agreement on Tariffs and Trade (GATT) regime requiring "most favored nation" policies that affect all trading partners equally.

Most important among the EC's microelectronics policies is the 1989 change in the rule of origin for semiconductors. This change has made it much more difficult (i.e., expensive) for U.S. companies to have the "Made in EC" label on their chips. Before the change, U.S. and Japanese companies would fabricate integrated circuits in their respective countries and assemble and test either in Europe or in less developed countries. (EC firms act in a similar manner). A typical test and assembly facility requires an investment of around $40 million. Now, however, for the chips to be considered "Made in EC," U.S. and Japanese firms must fabricate the wafers within the Community. Such fabrication requires at least a $300 million investment. Moreover, the wafer fabrication is characterized by leading-edge, high-cost equipment and a significant concentration of the most highly skilled and compensated IC manufacturing jobs.

The ability to secure "Made in EC" designation has become important because various "local content drivers" are causing European customers to phase out U.S.- made chips. In addition to granting a 50 percent EC- content preference in its proposed directive on government procurement and telecommunications, the EC has permitted individual member states to include local content requirements as a condition for receiving investment subsidies. (For example, the United Kingdom's grant to Nissan's plant in that country was tied to a 70 percent local content goal. Automotive firms are substantial consumers of electronics, totaling more than 10 percent of the total EC chip market.)

The Community has also used strict anti-circumvention measures to encourage manufacturers of products subject to anti- dumping orders to increase the European content of their products. In 1989, because of a British rule conferring EC origin on printed circuit boards with at least 45 percent EC content, Japanese printer companies with dumping findings against them replaced U.S.- made semiconductors on their printed circuit boards with EC- made semiconductors to avoid antidumping duties. This U.S.- to- E.C. switch was made without decreasing the level of Japanese content in these printers, and only the U.S. industry lost sales.

Thus, tariffs and an array of local content requirements, combined with the 1989 decision to require European fabrication to confer EC origin on integrated circuits, have set the stage for a gradual design-out of non-EC made chips. In so doing, these Community policies have increased pressure on U.S. semiconductor companies to build wafer fabrication plants in Europe to avoid discrimination and subsequent lost sales.

U.S. manufacturers who cannot justify or afford a $300 million wafer fabrication investment presently stand to lose sales in the European market as downstream industries (e.g. automobiles, computers, and telecommunications equipment) seek to increase the level of EC content in their products. Significant sales losses will hamper the ability of those companies to achieve scale economies and do advanced R&D, which, in turn, will damage their global competitiveness and compound the loss of U.S. jobs.

Furthermore, even U.S. companies with the customer base and resources to invest in Europe may be exposed to undue risks because their investment decisions will be based on EC *policies* and Texas Instruments have announced plans to expand capacity in Europe- all since the 1989 rule of origin change:

- Because of "Made in EC" customer requests, Intel is building both a wafer fabrication and assembly and text complex in Dublin, Ireland, rather than expand existing U.S. sites.

- LSI Logic is starting up production in Sidcup, England, even though it had to turn its Santa Clara, California fabrication plant into a research and development facility because of excess capacity.

- Texas Instruments is building a DRAM (dynamic random-access memory) fabrication facility in Avezzano, Italy, despite reports that major DRAM customers are experiencing an inventory overhang. Forced investments in Europe represents a loss to the United States of hundreds, if not thousands, of jobs that might have gone to American workers had U.S. semiconductor companies not felt pressure to invest in the EC or risk losing sales.

Moreover, if the European market fails to grow at rates sufficient to absorb the new capacity (a possibility given that three Japanese competitors, Fujitsu, Hitachi and Mitsubishi, all have announced plans to build wafer fabrication plants in Europe), then pressure on the EC to protect its industry from international competition could increase. Given that global overcapacity has vexed the semiconductor industry for decades, expansion of capacity for reasons unrelated to the market may lead to increased commercial trade friction, profitability dips, and significant layoffs in the future. In addition, EC semiconductor overcapacity could lead to domestic price- cutting not curbed by dumping laws- with the newest plants, flush with state aid and advanced equipment, gaining the advantage.

Finally, companies investing in the EC in response to a perceived "buy European" bias may well expect tariffs and local content requirements to continue. These expectations may limit the EC's ability to lower such barriers, establishing it as an island of high prices based on tariff protection and inefficient local production. EC electronics manufacturers seeking export opportunities may be vulnerable to either dumping charges or lost sales overseas.

Offensive vs. Defensive Strategies

Clearly, the semiconductor strategies of Europe are fundamentally different from those of the United States and Japan. Europe has been practicing what might be termed a "defensive strategy," one aimed at protecting the home market rather than penetrating markets abroad. As noted, this strategy consists of a whole menu of measures including tariffs, local content requirements, and attempt to use customs rules of origin to drive domestic purchasing decisions. Moreover, the EC chip industry has pursued a well- known European industrial approach often referred to as "national champions." The idea is to have a single large global competitor in each significant field. We see this in semiconductors, with Siemens alone manufacturing DRAMs, Phillips focused on SRAMs, and SGS- Thomson leading the way in EPROMs. The weakness of this strategy is that Europe loses vital internal competitive pressures. In contrast, the United States and Japan have several domestic competitors in each of these IC subgroups as well as in logic chips (e.g., Motorola vs. Intel).

U.S. and Japanese semiconductor strategies can be depicted as "offensive" in nature. Both assume and welcome fierce competition at home, and both are strengthened by it. From this vigorous domestic base come export drives into other regions. Until the 1985- 1986 period, the United States gained the most from this strategy, based upon design innovation and marketing as well as a relatively large domestic market. Since 1986, Japan has gained the most, based on the relative growth of its home

market. In addition, Japanese low capital costs allow both sales below fair market value (dumping) and the substantial new investments needed to keep ahead of the technology "treadmill." The U.S. response to Japan has *not* been to raise tariffs or require local content. Rather, the United States has demanded greater sales in Japan (the U.S.- Japan Semiconductor Trade Agreement of 1986), plus continued access to Europe. The United States has also taken the offensive in the SRC and SEMATECH research consortia, something the EC has tried in JESSI. Finally, the U.S. industry not only convinced the governments of Canada, the United States, and Japan to eliminate their chip tariffs in 1985; it is now advocating a tariff- free semiconductor world in the current Uruguay Round GATT talks. While not a complete solution, the offensive trade approach is clearly better than a defensive one, especially in light of the movement of IC customers away from the United States and the EC and into Asia. Today, if you don't sell chips in Asia, your future customer base will erode relative to total global demand.

A U.S.- EC High- Technology Agenda

The complexity and range of public policy issues that affect the future of high-technology producers in both the United States and the EC call for a more concerted effort by governments, industries, and companies to coordinate policies and cooperate on specific projects. In a global trading system that is as inter-dependent as it is heterogeneous, the future success of that trading system will turn on governments' ability to enhance commercial civility and reliance on market forces.

At the government level, U.S. - EC tensions that have emerged over such issues as the 1986 U.S. - Japan Semiconductor Trade Agreement and EC local content requirements are indicative of the essentially reactive nature of the high- tech "dialogue" between the United States and the European Community.

These conflicts obscure the extent to which the United States and Europe have a mutual interest in promoting the interdependence and health of their electronics industries. One possible explanation for this is that the bitterness that has plagued U.S. - EC trade negotiations over agricultural issues has been allowed to infect the overall U.S. - EC relationship, even in areas such as high technology where the potential exists for cooperation. When so much of our prosperity now depends on technology- based industries, it does not seem too much to ask that U.S. –EC trade relations not be determined solely by the price of soybeans or the hormone content of beef! Signs of a new awareness of the need for cooperation can be seen in the following activities:

- The government- to – government U.S.- EC High Technology Working Group provides a forum for examining trends in technology- related areas such as high- definition television (HDTV), semiconductors, and biotechnology as they relate to governmental societies.

- Industry- to – industry consultations on trade and technology issues between the Semiconductor Industry Association (SIA), the European Electronics Components Manufacturers Association (EECA), EUROBIT, the American Electronics Association (AEA), and the Computer and Business Equipment Manufacturers Association (CBEMA)

- A variety of company linkups, most recently the IBM- Siemens joint venture to develop the 64-megabit DRAM.

These developments, as well as trade friction, point to the need for a policy- level initiative that would reduce protectionism, rationalize selected research efforts, protect intellectual property, and ensure that investments in plants and products are made with customer, not government, requirements in mind. There are some hopeful signs. For one, U.S. Trade Representative Ambassador Carla Hills and EC Vice President Frans Andriessen have agreed to develop a hihg0 tech public policy once the current GATT talks are concluded. The U.S. government received enthusiastic endorsement for the concept when it polled 17 U.S. trade associations- AEA, CBEMA, EIA (Electronics Industries Associations), NEMA (National Electrical Manufacturers Association), SIA, and TIA (Telecommunications Industries Association)- have fashioned a high- tech issues agenda for such talks. It includes the following points:

- Tariffs: Elimination of the EC's 14 percent tariff on semiconductors and 4 percent tariff on computer parts, as part of a worldwide effort to establish duty- free trade in high- technology products. Duty- free electronics trade already exists in the United States, Canada, and Japan.

- Standards, Testing and Certification: Transparency, access, and national treatment for products under U.S. and EC regulations.

- Local Content Requirements: Recognition that local content requirements, whether formal or informal, are contrary to the principles of an open trading system and should be eliminated.

- Rules of Origin: Agreement that rules of origin should be transparent, multilateral in scope, and based upon a change-in-tariff/substantial transformation approach.

- Government Procurement: Government procurement regulations should provide access on a reciprocal basis.

- Export Controls: A new EC-wide control system should not disadvantage U.S. industry.

- Intellectual Property: Enhanced U.S.- EC policy coordination to ensure the protection of intellectual property rights for high- technology companies

The Policy Process

There is likely to be much debate over how this agenda should be shaped and addressed. Some will question whether a US-EC initiative will detract from ongoing discussions of these matters in multilateral forums such as GATT and WIPO (World Intellectual Property Organization). The point to bear in mind is the common set of US-EC interests in high- technology industries. Moreover, addressing those issues on a bilateral basis may offer both regions useful results, as well as multilateral efforts a bit of competition. Such a bilateral forum might go a long way toward stimulating progress on what otherwise have often proved to be intractable multilateral problems.

A framework of this type would also encourage industry associations to work together to address public policy issues, particularly those in the trade and technology areas. Indeed, solutions are best fashioned first at the industry- to- industry level, with government providing needed support. The efforts by SIA to develop common positions with its European counterparts have already borne fruit, as

evidenced by the SIA- EECA statements on trade principles, antidumping reform, and the protection of chip designs.

Finally, the success of this process should be measured by the perception and actions of individual companies. There can be no doubt that recent strategic decisions by some U.S. companies have been influenced by a perception that EC policy is premised on the principle that to sell in Europe, a firm must manufacture in Europe. The most effective means of correcting this perception is to build on the commitment that EC Vice President Andriessen has already given to U.S. Trade Representative Ambassador Hills to create an ongoing mechanism for coordinating high- technology policies.

The United States and the European Community have much in common commercially in the Information Age. And because they share similar commercial cultures and underlying concepts of antitrust, intellectual property protection, comparative advantage, and "free market" forces, high-technology trade talks can begin to leverage these common principles for the improvement of the electronics industries of both important regions of the global economy.

Discussion: The Electronic Sector

Discussion of the Maibach paper, "Implications of EC 1992 for U.S. Electronics Companies and Workers," was led by Thomas Hickman of the International Brotherhood of Electrical Workers, Kenneth Flamm of The Brookings Institution, and Michael Gadbaw of the law firm of Dewey Ballantine and counsel for the Electronics Industry Association.

Thomas Hickman observed that to meet rule- of- origin and other market- based production requirements, U.S. firms have been establishing semiconductor production facilities within the EC despite the current excess production capacity in the United States and elsewhere. Although these investments might make sense to corporations that are trying to capture a hare of the lucrative European market, they do not serve U.S. workers' interests. First, products that would have been made in the United States with domestic labor for export to Europe will be made in Europe. Second, capital that would have been used to modernize and expand production facilities in the United States will instead be used to help develop a competitive European- based industry. Thus, in analyzing the effect on the U.S. economy of economic and trade policies induced by EC 1992, Hickman noted that a distinction must be made between actions that advance the interests of U.S. industry and those that advance the interests of U.S. workers. In some cases these interests may coincide, but in many other cases they may not- particularly in the electronics industry, which is dominated by multinational companies and entails production in many countries.

Hickman stated that the EC has encouraged and will continue to encourage mergers and joint ventures among electronics producers in Europe. This increased economic strength, together with shared research and development, will create formidable industrial giants against which U.S. firms will be hard-pressed to compete. Despite assurances from European leaders that EC1992 will not result in a Fortress Europe, U.S. labor is concerned that once the Europeans recognize their new economic strength, they will be tempted to exact harsh concessions from companies seeking access to the European market. Another complicating factor is the EC's possible adoption of standards for electronics products that are incompatible with U.S. industry standards. Closing European markets to imported electronics products

will not only harm U.S. exports but will place additional pressure on the U.S. marketplace to absorb products manufactured in Asia.

Returning to a theme from an earlier session, Hickman emphasized the importance of a well-educated and well- trained labor force for a competitive U.S. electronics industry, and he expressed concern whether the current educational and skills level of the U.S. work force can meet the challenges of the electronics industry tomorrow. He noted that some of the most successful retraining programs in the United States have resulted from cooperative efforts between management and labor; however, the U.S. companies that have excelled in retraining are primarily service- oriented firms that cannot "export" their work forces.

Kenneth Flamm suggested that, to a large extent, EC policies in the electronics sector are a defensive posture vis-à-vis perceived competition from Japan. Nevertheless, U.S. companies and workers are caught in a crossfire and are being affected by these policies.

Flamm cited two Japanese policies that are often perceived as affecting the global electronics industry: closed home markets and predatory pricing behavior (dumping). In an industry such as electronics- with short product life cycles and substantial learning and scale economies- it is often difficult to distinguish between dumping and normal pricing behavior. The issue of predatory pricing in the electronics industry is highly complex and deserves further study.

Although the U.S. electronics firms and workers have some reason to be concerned about developments in Europe related to EC 1992, Flamm also was hopeful that some of the policies being discussed might lead to greater global trade liberalization; for example, the Europeans are considering replacing national research and developmental efforts (now restricted to national firms) with EC-sponsored efforts that would also be open to foreign firms according to the principle of national reciprocity. In the long term, some of the policies under discussion in Europe might lead to a more level international playing field in electronics products.

Michael Gadbaw noted that the U.S. electronics industry and other high- technology industries have been given to agricultural issues in the current round of GATT negotiations (the Uruguay Round of multilateral trade negotiations) at the expense of the high- technology industries.

He observed that U.S. - EC trade relations in semiconductors could become as contentious as those in agriculture. Although the root cause of European policies might be defensive (that is, aimed at Japan), U.S. interests are being caught up in EC local- content regulations. All U.S. companies operating in Europe are well aware of local- content requirements, and many have corporate policies aimed at meeting those requirements. Compliance with these rules introduces political, noncommercial considerations.

Gadbaw called for new initiatives that would promote government- to- government cooperation between the United States and the EC to address potential conflicts (for example, a new U.S. - EC High Technology Working Group). For such a dialogue to prosper, however, it must be recognized that 1) certain policies in Europe (e.g., local- content requirements or the prospects of such requirements) may adversely affect U.S. companies, and 2) it will be more productive to build on complentarities between

the two parties rather than simply to react to problems as they arise. Industry- to industry discussions now taking place are an encouraging sign that areas of mutual interest exist and can be developed.

Dennis Chamot, AFL- CIO, suggested that it would be unrealistic and ethnocentric to expect the Europeans to develop their electronics sector policies based on their effects on U.S. companies and U.S. workers. In his view, the EC will put forth policies that advance European interests, with little concern about their effect on Japan or the United States; it is up to the U.S. private sector and the U.S. government to protect U.S. domestic interests.

Further, he suggested that the United States had lost its preeminence in semiconductor manufacturing because it ceded the consumer electronics industry to the Japanese several years ago. This may have been party the result of Japanese predatory pricing, but it also had to do with the decision of U.S. manufacturers to move their operations abroad while the Japanese kept theirs at home.

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