Title

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At the October 29, 1997, summit meeting between President Jiang Zemin of the People's Republic of China ("China") and President Bill Clinton of the United States, President Jiang announced his government's commitment to join the Information Technology Agreement ("ITA") and thereby eliminate China's tariffs on semiconductors, computers and other information technology products. President Jiang also agreed that, in the context of the negotiations concerning China's accession to the World Trade Organization ("WTO"), China would make further substantial tariff reductions.

A major issue that remains open both with respect to China's participation in the ITA and its accession to the WTO is the speed of tariff liberalization that China will commit to in these negotiations. We argue in this paper that, at least with respect to information technology ("IT")[(1)] industries, rapid elimination of tariffs and other barriers to trade are in China's own self-interest because recent changes in the structure and competitive dynamics of IT industries now demand open markets. Tariffs and other trade restrictions are incompatible with the new competitive dynamics for IT. Countries that continue to pursue policies of promoting "national champions" behind protected national boundaries will experience slower growth of IT activities while their domestic IT industries will be technological laggards compared to competitive IT industries operating in open markets.

The first two sections of this paper set forth our analysis of the new environment for IT activity worldwide and how this has affected policies in both developed and developing countries. We then discuss the implications of these changes for Chinese trade policy, especially in the context of negotiations regarding China's participation in the ITA and its accession to the WTO.

I. Changes in Competitive Dynamics and the New Structures of Information Technology Industries

The present trade environment in information technology industries is very different from both the long term and recent past. There is now a move by all parties -- users, producers and their governments -- to remove barriers to trade unilaterally in an effort to respond to the new market dynamics for IT products. These new market dynamics can be summarized under three general categories: (1) the growth of networked production; (2) the shift in power from integrated producers to major users; and (3) the new competition to set market standards.

A. The Growth of Networked Production

U.S. producers of information technology products took the lead in innovating, developing, and mastering networked forms of production. Under this system, an increasing number of core functions are contracted out by companies, including

production and final assembly itself. Indeed, specialized contract manufacturers -- firms that do manufacturing for other companies, and increasingly, even sourcing -- have grown in the last decade from trivial revenues to over $40 billion in 1995, and they are sustaining their growth rate[(2)] . World-leading integrated producers increasingly outsource one formerly core function after another. Newer and very successful firms producing such products as PCs, advanced workstations, networking equipment, automatic teller machines, telecommunications or semiconductor manufacturing equipment have relatively few manufacturing facilities of their own. Yet they are hugely successful in competing against traditional integrated electronics producers.

The growth of these new forms of production had several major effects on the competitive dynamics in the sector. It provided U.S. producers with low cost, high speed, high quality alternative sources of supply available at much reduced demands on their scarce and costly capital. As a bonus, it generated intense competition, and therefore lower margins, for the integrated, full-line producers of consumer electronics, and commodified a growing range of more advanced products, the profits from which had earlier served to propel large integrated producers into new product areas. The growth of networked production is disaggregating the organizational form of the major, integrated producers, beginning with the U.S. producers, as well as shifting the geography of production and capabilities. In doing so, it created an open supply base for all producers, as well as a legion of new competitors for the existing U.S., European and Japanese firms.

Networked production only works, however, if producers can be sure of swift and cheap access to know-how, components, and technology available anywhere in the world. Thus, a tariff-free environment is crucial to the success of this economic model.

B. A Shift in Power from Integrated Producers to Major Users

Major users, such as banks, insurance companies, and auto and chemical companies, have realized that information technology is no longer an esoteric and minor novelty. It is core to their competitive strategies, their form of organization and their ability to complete. It also dominates their investment budgets[(3)]. As a result, these major users have taken the lead in changing government policy as it relates to IT. For example, they have been the impetus in telecommunications deregulation. They have come to insist on interoperability of products and systems from their IT suppliers and refuse, where possible, to be locked into proprietary standards and systems as they once were in the heyday of telephone monopolies.

Deregulation of telecommunications has permitted the major users, and producer companies who have been able to stay very close to lead users, to develop new applications that have turned into large new markets in the area of data communications: intra-nets, exter-nets and internet, and their precursors. It has been these major users who have reaped their benefits in terms of efficiency, effectiveness and, critically, strategic and organizational possibilities that did not

exist before. In recent years it has been these new networked applications that have driven the PC industry and propelled the hardware and software companies which dominate that industry into massive new growth spurts. This is the model China and other developing countries should follow as they seek to develop competitive domestic IT industries.

C. The New Competition To Set Market Standards: Another Shift in Power Away From Integrated Producers

The third structural change is a shift in value-added (and power) in the production chain from integrated producers -- especially traditional final assemblers -- to holders of a standard located anywhere in the production chain. This can be seen in the development of a dominant standard operating system and accompanying hardware in the PC industry. Many companies, however, with more subtly held standards have sprung to great size, and enormous capital value, by successfully following a strategy of networking "production" and procurement and by focusing on standard setting and maintenance(4). New IT product markets are increasingly characterized by rivalry to set de facto market standards(5).

II. Experience in Developed and Developing Countries: Changing Trade Policy View toward Information Technology Industries

Those firms and countries that have recognized the changes in the industrial structures and competitive dynamics described above, and pursued policies consistent with them, have excelled in IT activities. The trade policy consistent with this new IT environment is one that facilitates the unrestricted movement of goods and services relating to IT products both within and between countries. This applies to developed and developing countries alike. Indeed the recent completion of the Information Technology Agreement (ITA) negotiated under the auspices of the WTO is the most apparent manifestation that many world governments now recognize the new international rules of the game for IT industries(6). The ITA radically speeds-up the elimination of tariffs on IT by scheduling their complete elimination for about 92% of world IT trade by 2000 and sets procedures for the inclusion of new products. Moreover, unlike previous GATT negotiations such as the Uruguay Round, the ITA negotiations were not primarily based on a balance of equivalent concessions, but were instead based on the recognition that that it was in the self-interest of the participating countries to eliminate their respective duties on IT products.

Adoption of the ITA signaled a fundamental shift by several key international players. The policy change concerning IT industries by the European Union ("EU") was most significant. The strategy in Europe toward information technology industries since the 1960s had been to promote "national champions" behind high tariff walls. Most observers have deemed this strategy a failure(7) . This all changed with the EU's decision to sign on to the ITA.

Pressure on EU governments at all levels from major users was the principal force in propelling Europe's bold program of IT deregulation. By the second half of the 1990s, the European Commission was convinced that it had to change its

strategy for the information technology sector in fundamental ways and accept the reality of the new competition paradigm. The big users, Europe's largest and most powerful firms propelled its change in conviction. But it got critical impetus from a new generation of successful young, fast growing European IT firms which began from this approach (networked production, competition in standard setting, etc.) as well as some old line producers who were determinedly and very successfully transforming themselves in this direction. Even the established integrated electronics producers were no longer united or even for the most part strongly convinced that the benefits of continued protection exceeded the costs to themselves; many actively campaigned for the ITA[(8)] . Networked production was now a competitive necessity, they argued, and it demanded an open market. They also argued that, in the final analysis, their biggest weakness was the relatively small size and slow growth of Europe's IT market. An open market would drive demand for IT.

Two additional indications of the EU's change in attitude with respect to IT tariffs were its willingness to phase-out its semiconductor tariffs on an accelerated schedule, with full elimination by 1999, as well as its recently reported consideration of unilaterally eliminating these remaining semiconductor tariffs by January 1998 -- an additional year earlier than the EU's original accelerated schedule for phasing out these tariffs under the ITA.

Equally interesting is the fact that these new market dynamics convinced many in the developing world to also sign on to the ITA. The most noteworthy convert in this camp was India, which, like the EU, had previously pursued a high tariff strategy. One factor in India's change in position was likely its growing competitiveness in software. To remain competitive, however, India's software industry could not remain cut off from the move to networked production by the major players in the world IT industry.

A brief review of recent competitive developments in IT sectors of both developed and developing countries indicates why there has been such a shift in sentiment toward open trade for information technology products.

A.Developed Country Effects: The Resurgence of U.S. Firms

Information technology is the archetype of a globalized sector and can only be comprehended in a global context. From the early 1970s through the late 1980s, integrated Japanese electronics producers were increasingly dominant. In short order, they had completely taken over consumer electronics, and gained the lead in world market share in semiconductor chips, materials and equipment. The prudent estimate from a mid-eighties vantage point was that they would extend their domination to office systems (e.g., copiers, faxes), customer telecommunications equipment, and take a widening lead in computers.

In response, the U.S. industry and government undertook a number of steps to promote the competitiveness of the U.S. IT sector. Over the objections of traditionalists who wanted to maintain protectionist duties, the United States, Japan and Canada agreed in 1985 to eliminate all tariffs on semiconductors and computer parts. This action, done at the request of the U.S. chip industry,

reduced unnecessary costs imposed on downstream U.S. consumers of semiconductors, boosting their competitiveness. While Japan also eliminated its tariffs, other market access barriers continued to deny Japanese electronics producers access to competitive foreign semiconductors.

By the mid-1990s, the U.S. electronics industry had staged a dramatic comeback. U.S. producers of office, telecommunication devices and systems, computers, data communications equipment and software were the clear world leaders. With the revival of the U.S. customer base, the U.S. semiconductor industry, which by the mid-1980s had lost significant world market share to Japanese competitors, had also regained world market share leadership.

Our thesis is that the two competitive changes described above -- one in the market and one in industrial organization -- were of paramount importance in this resurgence of U.S. competitiveness. The market shift encompassed both a transformation of the character of electronic systems products and a resulting sea-change in the industry's principal business strategies. New electronics product markets began to converge on a common technological foundation of networkable, quasi-open, microprocessor-based systems (e.g., the PC).

Such new product markets are characterized by a predominant form of market rivalry, namely competitions to set de facto market standards. Over the last half decade, the domestic U.S. market has been the principal launch market for such new products and the principle terrain on which the resulting standards competitions have been fought. With just a few exceptions, U.S. firms have defined the products, set and controlled the standards (especially in the broad and overlapping realms of computing and communications) and, consequently, dominated the market. It is this exploding market in computing and communications that turned out to be the new "killer application" and it dwarfs the VCR or Camcorder. It emerged first in the U.S. for many reasons, but mostly because of user-driven deregulation of telecommunications that made possible the rapid innovation and diffusion of new applications and equipment, as well as the zero tariff treatment accorded key components.

The industrial organizational shift was, however, just as significant and was also critical to the success of the new product-market strategies. The shift in production organization was the move away from traditional integration to network forms of organization -- especially, international production networks centered in Asia[(9)] .

By the firm's international production network, we mean the organization, across national borders, of the relationships (intra- and increasingly inter-firm) through which the firm conducts research and development, product definition and design, procurement, manufacturing, distribution and support services. As a first approximation, such networks comprise a lead firm, its subsidiaries and affiliates, its subcontractors and suppliers, its distribution channels and sources of value-added product or service features, its joint ventures, R&D alliances and other cooperative arrangements (like standards consortia). In contrast to traditional forms of corporate organization, such networks boost a proliferation of

nonequity, non-arms-length, cross-border, inter-firm relationships in which significant value is added outside the lead firm and entire business functions may be outsourced.

The move to Asia-based production networks during the 1980s had three significant consequences for IT firms. First, U.S. and other non-Japanese firms were able to relieve their dependence on Japanese firms for a wide range of component technologies and manufacturing capabilities because their Asian production networks become a competitive supply-base alternative to Japanese producers. Second and simultaneously, the networks helped the non-Japanese firms to reduce excessive demands on their very scarce capital, thereby freeing it for investment in new production, and helped to lower their production costs and turnaround times while permitting them to keep better pace than most integrated producers with rapid technological progress. Third, the networks spawned new direct competitors to Japanese firms in several of their stronghold markets (e.g., memory chips, displays and consumer electronics) both further opening up the supply base and, at the same time, substantially reducing profit flows to the major Japanese electronic producers, thus limiting their ability to finance moves into computing and networking.

Taken together, the market and organizational shifts enabled a new form of competition in electronics to develop, which is no longer confined largely to equity investments and outsourcing in the manufacturing stage of production. It now extends throughout the value chain and to an increasing variety of inter-firm relations. But it remains dependent on open markets to permit quick and efficient transfers of components and know-how.

B.Developing Country Effects: Open Economies Surge Ahead

A similar phenomenon can be seen in the developing world. Looking around the world, those developing areas with low or no duties on electronics components and systems over the past two decades (Hong Kong, Taiwan, Singapore) have been successful in developing strong, vibrant economies with dynamic IT industries. Meanwhile, those developing areas with high duties (Latin America, India) have not been successful in developing their domestic electronics industries[(10)] . A special case was Korea, which built a narrow semiconductor industry in spite of its 8 percent duty. Korea's growth was largely based on exports of a single commodity product, not in supplying the broad range of products to its domestic electronic systems producers. It however has recognized that a zero tariff environment will best foster its future growth, and has also signed onto the ITA. Moreover, Korea agreed to accelerate the phase-out of its semiconductor tariffs so that those duties would be fully eliminated by 1999.

India has implicitly recognized the importance of open markets to the new competitive environment for IT and the failure of highly protectionist policies -- it has signed onto the ITA. Brazil, however, has not, which suggests that it will continue to protect its IT sectors, even though that approach has not worked, and has left Brazil uncompetitive in world IT markets. The negative effects of the

Brazilian model have been recognized even by some of its own industry executives:

> *"We made PCs before the Taiwanese and the Koreans," says Touma Elias, president of Microtec [a Sao Paolo microcomputer company]. "But instead of being a $1 billion company, like [Taiwan's] Acer or [the U.S.'s] AST or Dell, we're a $35 million one hoping to be a $100 million one. Why? Because our market wasn't open, which made components more expensive."* [(11)]

III.Implications of New IT Structures and Competitive Dynamics for Chinese Trade Policy

The driving force behind IT activities is extremely rapid productivity gains achieved by the firms operating in this sector[(12)] . These productivity gains permit ever-greater functionality at continually declining prices. The price declines expand the market at the same time that competition drives firms to innovate faster and quicker. It is the intense nature of competition in the IT sector that explains its technological dynamism as well as its incompatibility with closed or restricted markets. The new competitive paradigm has increased that competition. Firms that are sheltered from the rigors of competition fall behind in performance and technology.

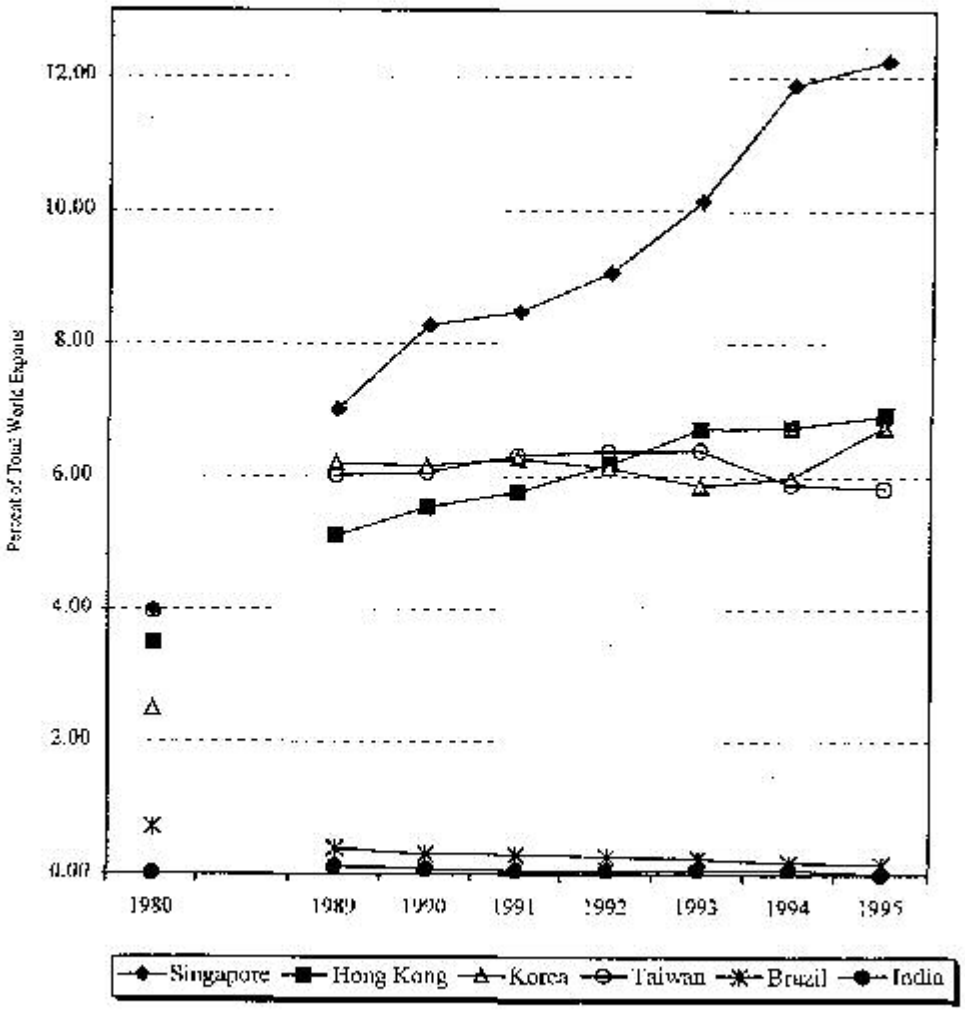
The ITA can be thus viewed as a free trade zone for the IT sector. Much as geographic free trade zones such as Singapore or the Waigaoqiao in Shanghai are promoting growth in certain regions, a sector free trade zone will help the entire world make the transition from an industrial to a global information society. If China wants to be a part of this global information society, it will need to follow through on President Jiang's commitment regarding the ITA as soon as possible and begin to eliminate rapidly its IT tariffs in order to become an

integral part of the free trade zone for IT that the ITA is quickly bringing about.

CHART 1

Percentage of World Exports of Office Machines and Telecommunications Equipment from Developing Economies

1980 and 1989-1995



Note: Exports for Singapore and Hong Kong include re-exports. Office machines and telecommunications equipment include SITC divisions 75, 76 and group 776.

Source: World Trade Organization, *Annual Report 1996*, volume II, table IV.38 and *International Trade 1995*, table IV.37.

Two major reasons are generally presented for maintaining tariffs on imported goods: (1) to protect domestic industries from international competition and, (2) to provide a source of revenue for the national government. Neither of these reasons are persuasive for IT industries operating under the new competitive paradigm we have analyzed in this paper.

The argument for protection rests on the premise that domestic industries are not competitive internationally and the tariff is needed to maintain a wedge between higher domestic prices and lower international prices. With respect to downstream IT products (semiconductors, computer parts, etc.) duties would have to be extremely high to offer protection because of the significant scale and learning economies involved in production. Where real cost declines of over 30 percent per year are the norm, competitiveness is determined by whether firms are on the leading edge of process and product technology. The current Chinese tariff of six percent on imports of integrated circuits ("ICs"), for example, offers little protection to domestic firms that are employing manufacturing technologies at the 2.0 level if the competition in other countries is using process technologies at the 0.5 level or lower. The six percent duty merely acts as a tax on downstream industries, such as personal computers, that are forced to pay more than their international competitors for leading edge ICs. The duties not only do not provide protection for the downstream IC industry, but they add an extra tax on the upstream PC and other industries making them less competitive.

More importantly, from the perspective of the new competitive paradigm based on networked production, tariffs act as a tax with respect to including Chinese firms within any IT production network. Tariffs are thus a strong disincentive for including Chinese firms in IT production networks compared to firms in other nations that have open trade for IT products.

It is true that tariffs produce some revenue for the government, but that could be easily offset by the effects of the tariffs on demand. As discussed above, one of the benefits of open markets for IT industries is that demand is stimulated for IT products. Productivity increases and the resulting lower prices propel demand that in turn drives new investment in IT sectors. When a government chooses to try to develop its IT sector behind tariff walls, the resulting higher prices domestically will lead to lower demand for IT products. Lower tax receipts from this reduced economic activity could easily offset the increased revenue from the tariffs.

Rapid tariff elimination would also reduce the incentive for importers to smuggle products from the Hong Kong Autonomous Zone, which is a goal of the Chinese government. Quick elimination of tariffs would leave only the VAT as a cost that smugglers would try to evade, and even that incentive would be reduced as the VAT is rebated. As more semiconductors are shipped to China directly from the U.S. rather than through Hong Kong, bilateral U.S.-China trade friction will be reduced as the trade imbalance is reduced by reflecting China as the correct ultimate destination for many U.S. exports to Hong Kong.

The issue of smuggling is especially important in high tech industries. China wants to increase technology transfer from the U.S., and often seeks to mandate technology transfer in connection with foreign investment. However, engineer to engineer contacts between suppliers and customers designing advanced semiconductors in electronics systems are the true primary means of technology transfer. The supplier selling directly to the customer enables these contacts. For

this reason, it is in China's interests to grant trading and distribution rights to foreign suppliers as well as reduce smuggling by eliminating tariffs.
In other words, mandated technology transfer depends on foreign computer makers transferring technology to Chinese computer makers, and foreign chipmakers transferring technology to Chinese chipmakers -- in both cases potential competitors. By encouraging supplier to customer contacts, foreign chip makers teach Chinese computer makers how to use advanced chips in computers, and foreign semiconductor manufacturing equipment makers teach Chinese chip makers how the equipment can be used efficiently -- in both cases valued customers.
Policy makers in China, having committed to joining the ITA, should also recognize that, if there is any variation in the staging of tariff reductions among the different products covered by the ITA, the tariffs on inputs should be eliminated first. This is because any tariffs imposed on inputs will be an added cost for every downstream product incorporating these components. As a result, tariffs on inputs have a negative impact on the competitiveness of downstream products, reducing the "effective" rate of protection on the downstream products[(13)] . For IT products, this means that the tariffs on inputs such as semiconductors and computer parts should always be lower than the tariffs on downstream products such as computers, peripherals and telecommunications equipment[(14)] . Accordingly, as China phases out its IT tariffs to implement the ITA, it should ensure that its tariffs on semiconductors and computer parts are eliminated first in order to avoid negative consequences for its downstream electronics producers[(15)] .

IV.Conclusion

The new competitive dynamics of the global IT industry -- networked production, the shift in power from integrated producers to major users, and the new competition to set market standards -- require countries that wish to maintain a competitive domestic IT industry to shift to a tariff-free, open market trade policy. This is the lesson of the ITA and the remarkable change in position of such key players as the EU and India. The end of the dominance of integrated producers has made the strategy of picking national champions and protecting them with tariffs thoroughly obsolete.
The negotiations concerning China's participation in the ITA and its accession to the WTO present Chinese policymakers with the opportunity to ensure that the Chinese electronics industry is able to prosper as an active part of the new globalized IT industry by following through on President Jiang's recent commitment by implementing the ITA as soon as possible. Only such a rapid move to a tariff-free IT trade policy will provide a positive economic environment for the continued growth of the Chinese electronics industry.

End Notes

1. We define information technology industries as that critical sector that extends from semiconductors and their means of fabrication, through electronic devices such as computers and peripherals, software, and telecommunications equipment and services -- the digitized information processing, storage and transmission sector that is the emblem of modern technology and the largest and fastest growing industrial sector and trade category.
2. Tom Sturgeon, "The Rise of Global Locality: Turnkey Production Networks in Electronics Manufacturing." (University of California at Berkeley, Ph.D. thesis, Forthcoming, 1998).
3. "IT spending in 1994 tripled that of basic industrial equipment," reports Paul Strassman in "Information: America's Favorite Investment," Computerworld, Vol. 30, No. 32, p. 64, August 5, 1996.
4. Michael Borrus and John Zysman, Wintelism and the Changing Terms of Global Competition: Prototype of the Future?, BRIE Working Paper 86B (Berkeley: BRIE, 1997).
5. Michael Borrus, "Left for Dead: Asian Production Networks and the Revival of U.S. Electronics," in Barry Naughton, ed. The China Circle: Economics and Technology in the PRC, Taiwan, and Hong Kong (Washington, D.C.: The Brookings Institution Press, 1997) at 141-142.
6. The Ministerial Declaration on Trade in Information Technology Products (ITA) was signed on December 13, 1996 in Singapore by 28 governments at the conclusion of the first WTO Ministerial Conference. It provides for the elimination of customs duties and other charges on information technology products through equal annual reductions beginning on 1 July 1997 and concluding on 1 January 2000. The ITA covers five main categories of products: computers (including printers, scanners, monitors, hard-disk drives, power supplies, etc.), telecommunications products (including telephone sets, fax machines, modems, pagers, etc.), semiconductors (including chips and wafers), semiconductor manufacturing equipment, software (e.g. diskettes and CD-ROMs) and scientific instruments.
7. See, e.g., Kenneth Flamm, Mismanaged Trade? (Washington, D.C.: The Brookings Institution, 1996) at 26:.

In brief, the basic European strategy from the late 1960s on was to protect national markets with high tariff walls, then select "national champion" firms who were given favored treatment within the protected national market (generally receiving both direct subsidies and preferences in government procurement). The major reasons for failure in the case of semiconductors were twofold: first, their sheltering from competition in the open market often meant that the European firms felt lessened pressure to stay technologically abreast in a rapidly changing marketplace; second, misguided and failed policies in the computer sector obstructed the development of a dynamic upstream market for chips used in computers like the one that was driving the IC industry in the United States.

See also Franco Malerba, The Semiconductor Business: The Economics of Rapid Growth and Decline (Madison, Wisconsin: The University of Wisconsin Press, 1985) at 178-181 where he discusses the experience of European computer producers in the 1970s. These firms purchased state-of-the-art LSI devices from U.S. firms or their foreign subsidiaries rather than less competitive devices from European producers in order to remain competitive in their business

8. See, for example, the role of Sr. Lamborghini, Board Member of Olivetti and key figure at the ConfiIndustria (Italy's Big Business Association) and Chair of Eurobit, (European Association of Manufacturers of Business Machines and Information Technology Industry), in lobbying for ITA: on Eurobit Web Site. See, also, American Electronics Association Europe Highlights, December 2, 1996. On Siemens' active support of ITA see Financial Times, March 27, 1997.

9. Michael Borrus, "Left for Dead: Asian Production Networks and the Revival of U.S. Electronics," in Barry Naughton, ed. The China Circle: Economics and Technology in the PRC, Taiwan, and Hong Kong (Washington, D.C.: The Brookings Institution Press, 1997) at 139-163.

10. Compare, for example, world export shares of India and Brazil to Singapore, Hong Kong, Taiwan and Korea for office machines and telecommunications equipment. Chart 1 shows that the latter four countries have increased their shares of total world exports since 1980 while Brazil and India have stagnated at very low levels.

11. Thomas Kamm, "Brazil Set to Lift Electronics Import Ban: Nationalist Laws Backfire on Computer Industry," Wall Street Journal (August 8, 1991).

12. See, for example, Kenneth Flamm Targeting the Computer: Government Support and International Competition (Washington, D.C.: The Brookings Institution, 1987) at chapter 2 for estimates of the cost declines for computing power since the late 1950s.

13. The effective rate of protection, a concept used often in both trade and development economics, incorporates the effect which tariffs on upstream products have on the cost structure of downstream products, and in so doing provides a more accurate measure of the actual protection offered those downstream products. The lower the nominal tariff on the inputs into the finished product, the higher the effective rate of protection afforded the finished product will be (all else being equal). Conversely, lowering the tariffs on downstream products while keeping duties high on upstream products decreases the effective rate of protection on downstream products. As the World Bank has noted in examining trade regimes:

Nominal rates of protection . . . often fail to measure the degree of protection actually received by domestic producers. This is because protection depends not only on the nominal protection given for the product itself, but also on any taxes or subsidies that there may be on inputs. For this reason, a different measure is more widely used to evaluate the orientation of trade regimes. The effective rate of protection is designed to capture the protection accorded to value added in

production, rather than to the finished product.

See World Bank, World Development Report 1987 at 79.

14. The current Chinese tariff regime within the high technology sector is generally progressive from a value-added perspective. For example, the nominal tariff on integrated circuits ("ICs") is currently set at 6 percent, while the tariffs on mainframe computers, personal computers, peripherals, and telecommunications equipment are between 9 and 20 percent. This regime affords the downstream industries a higher effective rate of protection than their nominal tariff rates would indicate. Even so a downstream industry with a current nominal tariff of 9 percent, for which ICs constitute 40 percent of the production costs, would enjoy an increase of almost 40 percent in its effective rate of protection (from 11 percent to 15 percent) if the tariff on ICs were eliminated.

15. A further important consideration specific to semiconductors is the fact that, given the rapid pace of technological innovation within that sector, it is quite possible, if not likely, that any nominal tariff imposed on semiconductor imports other than a prohibitively high tariff would simply result in a deadweight loss to downstream industries without any offsetting benefit to the domestic semiconductor industry. That is, the production costs associated with a given generation of integrated circuits tend to move rapidly downwards as economies of scale and scope and learning economies are achieved. Tariffs imposed on semiconductors thus become increasingly impotent as a protective device over time. Under such circumstances, downstream industries may find themselves paying for measures that offer little assistance to the upstream sectors they are designed to help and the duties are simply on tax on the downstream activities.