

BRAZILIAN INFORMATICS POLICY: WHAT PRICE SOVEREIGNTY?

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In recent years, Brazil has developed an advanced technological base and a strong computer and data services sector. Recent policies aimed at protecting its domestic market put it in direct conflict with U.S. policies which seek to open foreign markets to U.S. exports and investment opportunities. In this article, Jean Johnson examines how Brazil's concern for its national security, technological independence, and development into an "information society" has led to the imposition of a policy of strict protection for Brazil's computer, or informatics, industry for at least the next eight years. Although the policy stems from legitimate concerns about the need to preserve Brazil's sovereignty, and to further its economic development, there are considerable obstacles in the way of its success. Nevertheless, Brazil does have a strong political commitment to see it succeed, and as Ms. Johnson advises that strident opposition from the U.S. may only exacerbate the already strained diplomatic relations between the two countries. A successful Brazilian effort to promote its technological and economic development will benefit U.S. interest in the long run, she concludes.

With the passage of the Informatics Bill by the Brazilian Congress in October 1984, Brazil's measures protecting local computer and data processing industries were given formal legal status. This controversial and costly policy is aimed at retaining Brazilian sovereignty over its information resources as well as promoting development of the country's information sector. The bill reserved the Brazilian "informatics" market to local producers of computer hardware and software, data bases and products with digital components — virtually any product or service related to information processing with the exception of mainframe systems. The policy was not welcomed by the United States and other nations with strong informatics sectors, yet Brazil's leaders felt the policy was necessary to maintain "national security."

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The government holds to the assumption that the world is becoming increasingly divided between information producers and information consumers. Those countries which are solely information consumers will remain at a disadvantage in their attempts to achieve technological autonomy and economic development.¹ The longer this situation continues, the more dependent information consumers will become. The major goal of the informatics bill, then, is to reduce dependence upon information technologies developed for societies with different cultural backgrounds and economic needs from those of Brazil.

Local development of information technologies would be impossible under conditions of international competition. In view of this, the Informatics Bill guarantees the computer sector "infant industry" status for eight more years in addition to the eight years the *de facto* policy has already been in effect.

It is not surprising that the United States government objects to Brazilian protection of its informatics sector. For the United States, computers are a leading competitive sector in international commerce. The multinational computer firms have also complained about the need for "fairness" in gaining access to Brazilian investment opportunities. Informatics policy has thus become a key issue in U.S.-Brazilian relations.

If successful, the Brazilian example could encourage other newly industrialized and less developed countries to restrict their markets as well. In the Third World, local high technology capability takes on political significance; membership in the "computer club" symbolizes greater national power, even if economic costs are inordinately high.

Consumers of computers and related products bear the economic costs of informatics policy, because of the high costs of manufacturing computers in Brazil. Furthermore, the legendary Brazilian debt reduces national bargaining power and constrains local investors. The key question is whether a local informatics industry is viable and sustainable, given these economic drawbacks and the continuing pressure from the United States for greater access to the lucrative Brazilian computer market.

I. EVOLUTION OF INFORMATICS POLICY

Initial support for the informatics policy came from the Brazilian military. During the early seventies, the Brazilian navy recognized the need of maintaining computer systems on ships purchased abroad. The government created a state-owned holding company, "Digibras," to develop military computer technology independent of foreign manufacturers. Local production, it was felt, would ensure greater security.

1. João Oliveira Brizida, "Transborder Data Flows and Brazil," *The CTC Reporter* 13, p. 11.

At the same time, the government formed the Coordinating Commission for Data Processing Activities (CAPRE). CAPRE was created to streamline the use of data processing among government agencies, and to minimize unnecessary imports of data processing equipment by government agencies. The government hoped to counter the balance of payments difficulties caused by the 1973 oil crisis and the spiralling costs of computer imports.

In 1974, CAPRE began to require authorization for imports of computer parts and accessories. A lengthy bureaucratic review process, high import duties, local content rules, and balance of payments problems all helped to foster the growth of local computer component suppliers and the local computer industry in general.² Thus, though the informatics policy began through trade limitation measures, it eventually became a more focused industrial policy.

The Brazilian military had also successfully targeted the aviation and arms industries for protection, in the name of economic and military national interest. Using "market reserve" policies similar to those developed for informatics, the Brazilian arms and aviation sectors gained protection and eventual prominence in certain world market niches.³

The Second National Five Year Plan of 1975 emphasized the development of the information-processing sector. In 1976, CAPRE received its mandate to promote the development of a domestic computer industry. CAPRE set forth four objectives, defining its market reserve policy:

- To obtain technological capacity that would enable electronic equipment and software to be designed, developed and produced in Brazil;
- To ensure that national corporations play a dominant role in the national informatics market;
- To create jobs for Brazilians and more professional employment opportunities for Brazilian engineers and technicians; and
- To create the opportunity for the development of a Brazilian parts-and-components industry in informatics.⁴

2. Paulo Bastos Tigré. *Technology and Competition in the Brazilian Computer Industry* (New York: St. Martin's Press, 1983), p. 64.

3. The Brazilians have successfully exported small commuter planes manufactured by the state aviation company Embraer, and have even been successful in penetrating the U.S. market. Brazil is also the world's third largest arms producer.

4. United Nations Centre on Transnational Corporations. *Transborder Data Flow and Brazil* (New York: United Nations, 1983), p. 131.

The reserved market policy gave infant industry protection to local manufacturers of small computers. The government expects local firms to obtain technology through licensing agreements, and to adapt this technology for the Brazilian market.

CAPRE excluded foreign companies from computer-related sectors in which a Brazilian firm had an existing capability. After passing CAPRE review, foreign investors were permitted in sectors where there is little or no Brazilian interest such as the mainframe computer sector. The government expects to open the Brazilian market when local firms achieve competitive ability.

Owing to the absolute cost advantages multinationals enjoy, CAPRE barred foreign direct investment in the computer sector. Economies of scale, centralized research and development, management expertise, marketing and service networks, and trademark recognition all contribute to multinationals' ability to dominate local companies.

The government has also disallowed joint ventures between Brazilian and multinational firms, because the new ventures would enjoy many of the oligopolistic advantages of wholly-owned subsidiaries. Minority foreign control could defeat the purpose of the informatics policy, by allowing the foreign control of decision-making, and (typically) contributing little to local technological development. Any joint venture would have a competitive advantage over an independent local firm.

Influenced by "dependency theory," many government planners believe that multinational investment offers little economic or technological benefit. According to this view, local research and development (R&D) capability is necessary for economic development. Such a capability leaves the local economy less vulnerable to withdrawal of investment or imports. Government technocrats have strongly fought foreign investment in computers. The government was able to implement restrictive policies successfully, because there was little foreign investment in Brazil by multinational producers of small computers in the late seventies.

While formulating the informatics policy, the Brazilian government expected that foreign companies would be willing to license out their technologies. Short technology life cycles and high competition motivate the multinationals to amortize their large R&D expenses as quickly as possible. Small- to medium-sized Japanese and Western European companies in particular would be especially attracted to these means of penetration, since there are so few means of entry into the Brazilian market.

The Brazilian government expects local firms to adapt and improve technologies acquired abroad, and therefore avoid the time and expense of repetitive R&D. Brazilian industry is expected to progress by adapting

licensed technology to local needs, a strategy with which the Japanese succeeded during the seventies. The Japanese were able to catch up with the United States through government protection and financial support for local producers, while the producers copied and expanded the technologies of their competitors.

In 1979, the Special Secretariat of Informatics (SEI) replaced CAPRE. Controlled by the military and forming part of the National Security Council, the SEI reports directly to the President. The SEI's role is to: 1) establish national standards; 2) review import requests and fiscal incentives; and 3) define government procurement policies. The SEI offers few direct supports or subsidies. Procurement measures have been especially effective at promoting local development, because the government consumes about two-thirds of all informatics goods and services.⁵

When the government founded CAPRE in 1977, local industry had yet to produce a single computer. By 1983, however, the market reserve policy of CAPRE and SEI had enabled local producers to capture 46 percent of Brazil's almost two billion dollar computer market. Today over 150 companies produce micro- and mini-computers, modems, software, peripherals, and other equipment. An average of thirty new companies are formed each year.⁶

In 1983, President João Figueiredo sent the Informatics Bill to the Congress as a "priority measure." The President wanted to consolidate and formalize informatics policy before the new civilian government came to power in 1985. Codifying the *de facto* market reserve policy, the bill formally extended it another eight years. By institutionalizing the policy, the Government intended to provide greater stability for the local informatics industry, and to encourage further Brazilian investment in the computer sector.

Although passage of the Informatics Bill was assured, the media and over 200 cultural, scientific, labor, professional, and educational organizations launched a campaign in its support.⁷ Public discussion of informatics issues centered on technological development at the national level, rather than on the computer industry itself. The movement seemed to gain momentum in reaction to United States pressure against its passage; it took on an aura of national pride. Brazilians who spoke out against the bill became suspect as defenders of foreign capital interests. In addition to private groups and the right-wing military, nationalists

5. *Ibid.*, p. 72.

6. Edson Fregni. "O Computador e Nosso," *Veja*, 20 June 1984, p. 138.

7. Vera Rodriguez. "Campanha Apoia Reserva de Mercado," *O Estado de São Paulo*, 1 April 1984, p. 46.

of the Left were also instrumental in obtaining public support for the informatics policy.

The Congress passed the Informatics Bill almost unanimously, despite strong lobbying by a few multinationals and local firms dependent upon imported technology. Its main provisions were:

- Formalization and extension for another eight years of the reserved market in the areas of micro-, mini-, and supermini-computers and other digital equipment;
- A strict definition of "local ownership," to mean one hundred percent Brazilian ownership and control;
- Prohibition of joint ventures in the protected informatics sector;
- Reservation of informatics for private sector development;
- Semiautonomous foundation status for the government's computer research center, for greater operating flexibility (including less influence by the military);
- A system of fiscal incentives, including exemptions from import duties, accelerated depreciation, tax breaks and priority financing;
- Government procurement policies favoring national producers;
- Definition of the scope of "informatics" to include all development and production of computer components and hardware and any other equipment using electronic parts.

One of the main criticisms of the policy had been the role of the military in controlling the informatics sector. To reduce military power, the Congress further provided for the creation of the National Council of Informatics (CONIN). The Council will make broad policies through three year plans, and will report directly to the President. CONIN will consist of eighteen members, eight from the private sector and ten from among several government agencies, in order to address the diverse concerns of the private and public sectors. Based on considerations of reductions in product price, degree of local content, technological innovation, and export sales, CONIN will also establish the specific incentives and criteria for granting concessions.⁸

8. James Bruce. "Battle Lines are Drawn on Brazil's Computer Bill," *Journal of Commerce*, 2 June 1984, p. 1.

With the convergence of computer and telecommunications technologies, the Informatics Bill will give the SEI increasing jurisdiction over the communications field. In the past, the Ministry of Communications has controlled this field, and the Ministry has been much more flexible than SEI in permitting imports and foreign direct investment. Analysts expect infighting between the two agencies over control of the fast-growing communications sector.

II. POLICY STRENGTHS

Informatics policy has created a booming domestic industry, which would not have existed without the government's protection. Brazil now has the most advanced computer technology in the Third World. Since 1973, the base of installed computers expanded dramatically to over 200,000 in 1983. Over 18,000 people are employed by Brazilian computer manufacturers, while another 146,000 work in the computer service industry.⁹ Sales by local firms reached \$690 million in 1983, approximately thirty percent of the \$1.86 billion Brazilian informatics market. Already the eighth largest computer market in the world, Brazilian computer sales have grown thirty percent annually since 1981. Analysts expect that the market will soon become the fifth largest in the world.¹⁰ Computers were one of the few Brazilian industries to weather the 1983 recession successfully. Domestic participation has also grown from zero in 1977, to 23 percent in 1979 and 46 percent in 1983.¹¹

Brazil also has one of the largest and most highly skilled pools of scientists and technicians in the developing world; Brazilian R&D spending in the computer sector has averaged 8.7 percent of total national computer sales, compared with six percent in the United States.¹² Engineers in private firms, universities and government-sponsored institutions have developed several innovative products and processes. For example, the Brazilian automated banking system is among the most advanced in the world, an adaptation to Brazil's hyperinflation and its unique banking system. Brazilian researchers have also developed lasers, fiber optics, industrial robots, language recognition technology, and sophisticated telecommunications equipment. Most impressive is an innovative memory system, currently being used by several firms in the

9. ABICOMP, *A Política Nacional de Informática, a Indústria Nacional e o Desenvolvimento Tecnológico* (Unpublished, Sao Paulo: ABICOMP, 1984), p. 12.

10. Julia Michaels. "IBM Mounts Publicity Drive in Brazil, Hoping Computer Restrictions Will End," *Wall Street Journal*, 13 January 1984, p. 27.

11. ABICOMP, *Política Nacional de Informática*, p. 2.

12. Tigre, *Brazilian Computer Industry*, p. 14.

U.S., which allows several programs to run simultaneously on a personal computer.¹³

Local firms encouraged by the informatics policy appear to be making a greater short-term contribution to the Brazilian economy than that of multinationals. At a comparable level of sales, Brazilian firms employed twice the number of personnel, more personnel in high-level professional positions, seventeen times the number in research and development and eight times as many in service and maintenance as their multinational counterparts. The multinationals imported 22 percent of their factor inputs, while the Brazilian firms imported only seven percent. The multinationals employed fifty percent more personnel in sales and marketing.¹⁴

III. POLICY WEAKNESSES

The Brazilian informatics policy has been criticized both at home and abroad. Former Minister of Planning, Roberto Campos, is the most prominent Brazilian critic of the policy. He asserts that "Brazil has stepped off the racetrack of high technology. Limiting itself to a domestic market, it will always have more expensive products made with obsolete technology."¹⁵ João Camilo Penna, a former Minister of Industry and Commerce, supports the informatics policy, but believes that "it is necessary to obtain technological capability . . . from transnational firms under arrangements which afford sufficient control" and maximize local spin-off benefits, in order for Brazilian technology to keep up with that of the rest of the world.¹⁶ Foreign observers estimate that Brazilian computer technology may be five years behind that of the OECD countries. They also predict the gap will widen, given the rapid rate of information technology development abroad.¹⁷

Other critics point to a lack of innovation by Brazilian manufacturers. Since the inception of the informatics policy, many Brazilian manufacturers have learned mainly how to pirate technology and assemble hardware. Furthermore, widespread piracy puts firms that do invest in licensed technology or in their own R&D at a competitive disadvantage. Most personal computers for sale in Brazil are poorly disguised copies of Apple or IBM models.

13. "Santo de Casa," *Veja*, 16 January 1985, p. 185.

14. ABICOMP, *Política Nacional de Informática*, p. 9.

15. Alan Riding. "Brazil Curbs Computer Competition," *New York Times*, 10 October 1984, p. 45.

16. João Camilo Penna, "A Informática Sera Nossa?" *Veja*, 18 July 1984, p. 162.

17. Linda Bawer. "New Law Affects Brazil's Big Informatics Market," *Business America*, 10 December 1984, p. 45.

The SEI is unable to sufficiently police this theft of technology, because the agency lacks jurisdiction over companies that do not apply for import licenses, fiscal incentives, or government procurement contracts. With only seventy employees, it has the additional burden of reviewing hundreds of proposals each year.

Another serious problem is the substantial amount of contraband entering the Brazilian market every year. The SEI is scrupulous in its regulation, but lax and corrupt tax and customs officials subvert the SEI's efforts. Contraband accounts for at least twenty percent of computer-related sales in Brazil; often it is openly advertised for sale.¹⁸

A critical weakness of the Brazilian informatics industry is Brazil's almost complete lack of capacity to manufacture microelectronics. Brazilian producers cannot hope to become autonomous while they remain dependent upon foreign suppliers for integrated circuits (silicon chips), the central component of any computer system. Independence in microelectronics will depend greatly upon the progress of the three national microelectronics companies. The use of foreign silicon foundries to produce chips custom-designed in Brazil is also an alternative. Brazilian production of microelectronics components will probably remain minimal in the near future, a severe handicap to independence in computer manufacture. Development of chip-making capacity will be difficult, because the Brazilian market is too small to support economies of scale or a wide variety of design. Currently, Brazilian-made chips supply only about five percent of national needs, and are considered inferior in quality.

Informatics policy has focused primarily on the production of hardware, just when system use and cost are becoming increasingly dependent upon software. Furthermore, Brazil could gain independence less expensively in software than in hardware, because software development depends on human skills, rather than purchased technology. Locally produced software is scarce, while pirated copies of imported software are readily available.

Although the government is considering a national registry and market protection scheme for domestically-produced software, easy smuggling will make enforcement of these proposals difficult. Nonetheless, the registry proposal requires government agencies to use only registered software. Agencies will have to avoid using imported software, unless the needed program is unavailable from domestic producers.

Another constraint to informatics development in Brazil is the lack of domestic capital investment funds necessary for R&D efforts, expansion of factories, and increased marketing and distribution. Unlike in the

18. "A Macrovenda do Micro," *Veja*, 7 November 1984, p. 63.

United States, venture capital for the start-up and expansion of computer firms is rare in Brazil. The largest and most successful of the Brazilian computer firms are those associated with banking groups, which have ready access to substantial resources.

Local computer firms must charge high prices because of their lack of economies of scale, early position on the "learning curve," and high duties on imported factor inputs. Prices for domestic products may be as much as four times that of comparable models in the international market. The government accepts high prices as the cost of independence, and claims that prices will fall rapidly in the future. Since the current price of a personal computer is three times the average yearly per capita income, technological "independence" may adversely affect the distribution of computer resources; users are financing the growth of the sector. Producers, however, are not earning large profits due to their high manufacturing costs and intense domestic competition.

The informatics policy may also handicap other export-oriented sectors in Brazil. To the extent that exporters depend upon expensive locally-produced electronic components and upon domestically-produced equipment used to automate their production facilities, they may not be able to compete in the international market. This handicap is especially damaging, considering an increasing reliance by manufacturers upon automation and Brazil's compelling need for export earnings. The automobile industry, one of Brazil's major foreign exchange earners, may be especially affected. Perhaps worse, other foreign firms may hesitate to invest in Brazil, because of restrictions against importing needed electronic factor inputs and the time-consuming bureaucratic review process involved in obtaining an import license.

The Brazilian government has also been ineffective at encouraging cooperation in R&D efforts. The Center for Informatics Technology (CTI) was created in 1982 to coordinate research among the government, the universities, and the private sector. Despite its ambitious charter, CTI has had little success as either a research or a liaison agency.

IV. INTERNATIONAL REPERCUSSIONS

The U.S. government is giving increasing attention to the performance of its high technology sector which represents a major competitive strength for the United States abroad. With the huge U.S. trade deficit, high-technology protectionism by countries such as Brazil and growing competition from other foreign producers is becoming increasingly worrisome. The Under-Secretary of State for Security Assistance, Science, and Technology summed up the U.S. government's complaints:

The U.S. must seek — and should expect — opportunities for its industries to compete fairly. The U.S. cannot ignore the growing evidence of protectionist practices in various forms in many countries, a trend, which, if not checked, could limit the potential values of new technologies in all countries.¹⁹

The U.S. Department of Commerce criticized the Brazilian informatics policy as “an extreme form of protection, which includes a prejudice against multinationals and foreign investment.”²⁰ The United States finds the policy unfair, discriminatory, and nonreciprocal. The U.S. fears that the informatics restrictions will last beyond the eight years stipulated in the 1984 bill, because it doubts the Brazilian informatics industry can reach competitive maturity in that short period of time.

U.S. officials further claim that U.S.-Brazilian trade has been a “one-way street.” Much of Brazil’s 1984 thirteen billion dollar trade surplus is attributable to substantially increased Brazilian exports to the United States, and decreased exports from the U.S. to Brazil.

The U.S. government also sees the informatics policy as contradictory to traditional U.S.-Brazilian trade and investment relations. Brazilian industrial policy has relied heavily upon U.S. technology transfer through direct investment and other arrangements to build up its orientation toward export. Over 7 percent of the Brazilian industrial base is foreign-owned, yet Brazil restricts the U.S. companies from its fastest growing market.

The U.S. government has tried to convince the Brazilian government that its informatics policy will not prove successful. Brazil will remain cut off from international innovation, and will produce goods of lower quality and higher price than those sold abroad, the U.S. asserts. Michael Blumenthal, Chairman of Burroughs and former U.S. Treasury Secretary, warns Brazil that such protection of its informatics industry cannot foster a “distinctly national industry” because “Technology and computers are international in nature.”²¹

Brazil rejects the U.S.’s “free trade” argument, maintaining that the U.S. invokes this response only when it benefits the United States. Brazil has cited U.S. policies such as measures against steel imports to buttress its claim that the U.S. wants a one-sided free trade relationship.

There are many obstacles preventing the United States from responding to the Brazilian policy in a more than vocal manner, however. Brazil

19. U.S. Department of State, Office of the Under-Secretary. *International Aspects of Communications and Information* (unpublished) 2 February 1982.

20. “EUA Criticam as Restricoes do Mercado,” *O Estado de São Paulo*, 6 March 1983, p. 27.

21. Alan Riding. “Brazil’s Prickly Computer Policy,” *New York Times*, 26 April 1984, p. D12.

exports very little to the United States, and the informatics policy has not caused "substantial injury" to U.S. commerce. Presidential action under Section 301 of the 1974 Trade Act (discriminatory or unfair trade practices) has proven difficult to implement in similar cases.

Congressional trade and tariff legislation of 1984 offers a possible means of exerting pressure upon Brazil. Under the Act, the U.S. government could impose retaliatory action upon the imports of countries that do not allow the U.S. "fair" market opportunities. The Act also requires fair market access for U.S. goods in order for a country to be eligible for General System of Preferences (GSP) concessions. If her protectionist barriers persist, Brazil will receive only restricted duty-free access to the U.S. market.

The U.S. government is also concerned over the lack of copyright protection for U.S. software and the widespread piracy of U.S. hardware design. The U.S. has little legal recourse, unless the pirated products enter into the country. Individual companies have pursued their infringement claims in Brazilian courts with little success.

Other countries are opening their high technology sectors to international trade after experimenting with protectionist plans similar to the Brazilian informatics policy. France has been forced to drop its *Plan Calcul* — an effort to create a French supercompany, or "national champion," in the informatics area. In the face of an increasing technology gap with the United States and rising unemployment, France has opened up its computer industry and market.

A further constraint on Brazil's continued adherence to its informatics policy is its \$100 billion debt. The informatics restrictions contradict IMF guidelines for debt rescheduling aimed at encouraging foreign capital investment. There have been implications that future rounds of debt rescheduling might go easier for Brazil if the policy is repealed. In addition, World Bank project loans to Brazil will not cover informatics products, because, due to the informatics restrictions, they are not subject to international open bidding. Other Latin American nations have recently liberalized their foreign investment regulations in order to gain badly needed capital and prospective export earnings.

Brazil will also be faced with large losses in potential export revenue from informatic products. The President of IBM do Brazil claims that informatics policy will cost Brazil \$2.1 billion over four years in foregone export income from IBM sales alone.²² Brazilian computer manufacturers presently export little, because of their inability to compete with the prices and quality of the multinationals.

22. "SEI Widely Defends its Computer Policy," *Latin American Weekly Report*, 24 June 1983, p. 2.

V. THE ROLE OF THE U.S. MULTINATIONALS

The U.S. government's stance on the Brazilian informatics policy has resulted primarily from complaints by the multinational computer firms. The Multinationals contend that with fierce competition and near saturation of OECD markets, they are increasingly interested in the developing world's rapidly growing markets. Among these markets, Brazil is perhaps the most attractive, although the most restrictive.

Lobbying by the multinationals against informatics began with the policy's inception in 1976. A 1977 document from Data General to U.S. Trade Representative Robert Strauss expressed concern over ". . . the loss of Brazil's potentially promising market, the loss of U.S. jobs as a result, and . . . the effect that the success of this might have on inducing other countries to follow suit."²³

Multinational computer manufacturers are also concerned that Brazil might eventually produce computers more durable, simple and appropriate for the Third World. Most doubt that Brazil would be able to compete in OECD markets in the near future, as the technological challenge is too great.

So far, Brazil has exported little, mainly to Latin America and China. The Brazilian government maintains that export income is secondary to concerns of national defense, sovereignty, and economic and technological development. A successful informatics industry is vital to national security, and information goods and services are too important to be treated as simply commodities. Brazil regards the reactions of the U.S. government to its informatics policy as imperialist attempts to support "exploitative" multinationals who are oblivious to Brazil's national interest.

Brazilian determination to retain the informatics policy, despite U.S. objections, seems steadfast. It is unlikely that political and economic pressures will modify her position. As one Brazilian official remarked, ". . . so many people are against us that we think we must be doing something right."²⁴

Most multinationals have resigned themselves to another eight years of stiff protectionism. In the meantime, they are gaining whatever footholds and revenues they can through sales agreements, assistance in software development, technical assistance and, most commonly, licensing agreements. Companies have licensed technology in Brazil which has not been licensed to non-affiliates elsewhere, indicating the Brazilian government's bargaining strength.

23. "Brazil's Restrictions on Minicomputers are Here to Stay," *Business Latin America*, 18 January 1983, p. 22.

24. Riding, "Brazil's Prickly Computer Policy," p. D12.

A few subsidiaries, such as Philco's chip manufacturing subsidiary and GTE's digital switch manufacturing facility, have simply divested out of Brazil. Other companies may divest if the informatics policy becomes more restrictive. Only the foreign mainframe manufacturers, IBM, Burroughs and CII-Honeywell, and producers of equipment for which there is no available Brazilian substitute are likely to continue in the Brazilian market.

IBM do Brazil is in a unique position, because the company controls more than eighty percent of the Brazilian mainframe market. As one Brazilian official put it: ". . . if it wanted to, IBM could shut this country down."²⁵ IBM computer sales accounted for over half the national total of \$1.8 billion in 1983. The company is also Brazil's eighth largest exporter.²⁶ It is no surprise that IBM has been one of the greatest foes of the informatics policy; the restrictions have caused IBM's share of the Brazilian market to drop from 65 to 45 percent over the past four years. The company, the first IBM overseas firm, has slipped from sixth to eighth largest among IBM subsidiaries.²⁷

IBM has lobbied actively both the U.S. and Brazilian governments for a change in informatics policy. The company has also waged a publicity campaign stressing its many contributions to the Brazilian economy, as well as its local character. At the last two national computer expositions, IBM displayed its most futuristic products, in an attempt to show the public what the policy denies Brazil.

In a divergence from its usual strategy of total control, IBM has stressed its willingness to participate in joint ventures and to cooperate with local companies in their efforts to further technological development. The company further stresses that the domestic market is too small to sustain its own development, and that, in order to foster technological innovation, local companies should combine their "resources no matter where the capital comes from."²⁸ Several local firms are eager to form joint ventures with IBM. The SEI has rejected all such proposals, fearing an expansion of IBM's virtual monopoly over the mainframe market.

In an attempt to reduce IBM's power, the SEI has tacitly encouraged joint ventures between local firms and IBM's competitors. Honeywell Bull recently entered the mainframe market as a minority partner with the Brazilian firm ABC Sistemas. Sperry and Control Data also have

25. Rik Turner, "SEI: A Brazilian Acronym that Spells Headache for Many in the Industry," *Data Communications*, September 1983, pp. 60-61.

26. "Podemos Perder o Bonde," *Veja*, 5 September 1984, p. 3.

27. "SEI: Nao Pretende Mudar a Politca de Informatica," *O Estado de São Paulo*, 1 May 1983, p. 27.

28. Riding, "Brazil's Prickly Computer Policy," p. D1.

agreed with Brazilian partners to produce mainframe computers.²⁹ These ventures mark the first Brazilian entrance into the mainframe sector.

CONCLUSION

Brazilian informatics policy has created a local industry that would not have existed without market reserve protection. It remains to be seen whether the Brazilian computer sector will be able to achieve national technological independence and whether newfound technological progress will be able to make up for lost capital investments, foregone export earnings, and distortions in distribution caused by high domestic prices.

It is difficult to predict the degree of technological autonomy that Brazil will be able to attain, given Brazil's economic problems and the volatility of technological innovation. Brazil lacks the financial resources to emerge as an international competitor, and there are severe deficiencies in her software and microelectronics capabilities. However, Brazil does have the important advantages of a strong political commitment, a well-defined policy, a relatively advanced technological capability, and a booming market.

Most other Third World countries lack the resources and bargaining power necessary to pursue a similar development strategy. Brazil's example, however, is being closely monitored by other developing countries. Those with a developed technological infrastructure such as Argentina and Nigeria — are particularly poised to adopt similar strategies.

One of the objectives of the informatics policy is to promote the transformation of Brazil into an "information society." In some sectors of Brazilian society, this policy has succeeded. Brazil's economy is becoming increasingly computerized in banking, hospitals, supermarkets, government, and big business. Over seventy percent of the installed computer base is located in Rio, São Paulo, and Brasília. Small- and medium-sized firms and rural areas have so far received few of the benefits of computerization. A continued disparity in the distribution of the benefits of computerization could lead to a commensurate disparity among the information-rich and the information-poor within Brazil.

Brazilian policymakers have done little to foster an equitable distribution and an efficient utilization of information technology. Computer technology has the potential to improve health, agriculture, nutrition and education for all of Brazilian society. The effective scope of the informatics policy must expand to address these areas.

29. "Brazil's Computer Industry Booming," *Journal of Commerce*, 6 August 1984, p. 24.

U.S. criticism of Brazilian informatics policy appears too strident. The fear that this type of policy could spread to other countries may be justified. However, it is doubtful that developing countries other than Brazil have sufficient resources to implement a similar plan successfully. U.S. defensiveness is primarily due to a deteriorating balance of trade in high technology sectors. Political pressure and retaliatory measures against Brazil will neither resolve U.S. balance of trade problems nor encourage a more liberal international trade environment. By promoting its own short-term economic interests above Brazil's long-term political goals, the United States sacrifices its credibility with Brazil.

Given Brazil's commitment to the informatics policy so far, it would behoove the United States to base its relations on broader concerns rather than on a single trade and investment dispute. Brazil is a longstanding regional ally which is finally returning to democracy after twenty years of military rule. Improved U.S.-Brazilian relations can only strengthen this process.