

SOFTWARE PRODUCTION AND DEVELOPMENT POLICY ALTERNATIVES: BRAZIL AND SINGAPORE

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Accelerated growth in technology, particularly computer technology, has come to play a significant role in shaping national economic policy planning and development. As a part of this growth, the development of an indigenous software industry can provide a critical link between a country's production needs and available computer hardware. Ms. Rauenhorst presents case studies of software development policy in Brazil and Singapore — two regional technology leaders — including the influences of government ideology and foreign investment and the problems of piracy and copyright infringement. She concludes that the divergent paths followed by Brazil and Singapore vividly illustrate options available to developing countries intending to nurture such indigenous industry.

INTRODUCTION

Advances in high technology have changed the nature of economic development. High technology industries have accelerated productive possibilities in manufacturing, increased the flow of information within and among companies, and transcended traditional barriers to indigenous inventions and innovation. Today, in the world of high technology business, the computer industry occupies the first place in growth and technological innovation.¹ National economies, motivated by this growth, are becoming increasingly integrated. Within the context of the global marketplace, industrialized economies are rapidly changing to meet the demands of the newest "industrial revolution".

Less developed countries (LDCs) also face the globalization of the computer industry and must factor the accelerated growth in technology into their political strategies. Despite the international character of high technology industries, decisionmaking within those industries is primarily a domestic exercise, as governments continue to formulate policy within a national framework.² LDCs can use the progress in other countries, such as technological resources through imports, foreign investment, and training. A country's

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1. Kenneth Flamm, *Targeting the Computer, Government as Support and International Competition* (Washington, D.C.: The Brookings Institution, 1987), 8.
2. John Diebold, "The Information Technology Industries: A Case Study of High Technology Trade," in *Trade Policy in the 1980s*, ed. William R. Cline (Washington, D.C.: Institute for International Economics, 1983) 647.

reliance on foreign capability, however, does not preclude independent domestic advances in the computer industry.³ Several developing nations have indigenous technical capabilities which, buttressed by external technology, can serve as a catalyst for economic growth. As governments commit to promoting economic growth, many are turning toward the computer sector as an effective means of achieving national goals.

This article will focus on one segment of the computer industry — that of software development and application. The term 'software' will be used in reference to all types of programs of available software technology. As a growing segment of computer technology, software provides the flexibility to match specific production needs with available computer hardware capability. Countries integrating computers into industrial growth seek to customize software programs for their specific economic needs, languages, and industry demands. Because of the technical demands inherent in its development process, software traditionally has been produced in countries with advanced industrial technology. Less developed countries, however, are increasingly promoting domestic software production.

LDCs view software as a means of carving a niche in the dynamic and diversified computer industry. Developing economies can attract multinational corporations (MNCs) by promoting an accommodating domestic climate. In turn, such companies can bring their software technology into the market. Alternatively, a strong software sector can decrease reliance on first world technology flows as domestic knowledge in the field becomes increasingly independent and self-generating. Regardless of national goals, this poses a dilemma for developing countries. Should a government seek to create and support a domestic computer software industry, or should a government rely on transferred technological advancements from developed economies through MNCs?

Countries are faced with numerous options for national software development. The experience of Brazil and Singapore provide two rich, yet divergent, examples. This article will contrast software development policies in these countries and then compare the roles of the strong national ideological premises which influenced the formulation of those policies. Both Singapore and Brazil are committed to supporting a domestic software industry, but each has chosen a separate road to pursue its development. Brazil is highly protective of its native software sector, while Singapore has followed an open door policy toward foreign investment. This is particularly apparent with respect to the issue of software piracy and the copyright law procedures which have gained considerable attention recently.

What causes two developing nations which share similar goals to pursue opposite means to achieve these goals? Several factors, such as country size and geography, economic strength, and ideology, play a role in determining national policy. Software policy in both Brazil and Singapore is influenced by

3. Carl J. Dahlman, *Foreign Technology and Indigenous Technological Capability in Brazil* (New York: St. Martin's Press), 317.

unique national characteristics, giving rise to two distinctly different approaches to software development. Both countries are successful in their own programs, as such, and they serve as models for other LDCs.

SINGAPORE'S OPEN DOOR

"To maintain our high rate of growth, we have to move to higher technology based industries and services. The key to success in the switchover to new industries lies in preparing our people to acquire the new skills that are required. The most vital new skill is the use of information technology, or computers."

Dr. Tony Tan Keng Yam

Minister for Trade and Industry

Singapore is committed to using computer technology to promote domestic growth. Specifically, the government has announced its intention to make Singapore the regional center for computer software development and services.⁴ Singapore has chosen reliance on foreign firms to give local producers access to technology and markets. The National Computer Board (NCB), established in 1981, has stated:

Foreign expertise and investments are necessary to help the software sector become export-oriented. Their technology, advertising, and marketing outlets overseas will help local vendors to reach out to markets outside of Singapore.⁵

Singapore's recent and rapid growth, coupled with colonial experience and exposure to outside influence, were crucial factors in the decision to court foreign investment in the software industry.

Singapore, located at the tip of the Malay Peninsula, is a group of sixty islands with a population of 2.6 million. A former British colony, Singapore became self-governing in 1959 and gained independence in 1965. For a short period in the mid-sixties, the government implemented an import substitution policy to encourage domestic industrial growth. This plan intended to draw on the large market of the Malaysia-Singapore Federation, but the plan became impractical with the dissolution of the Federation in 1965. Independent Singapore did not have a large enough domestic market to support an import substitution policy, so the government shifted to export-led growth policies with minimal protectionism.

Export promotion policies have contributed to strong and rapid economic growth since independence. According to recent World Bank reports, Singapore is estimated to be the 19th richest nation, and had a 1986 per capita income of \$7,410. The World Bank identifies economic policy, particularly

4. Informatics '83: The Souvenir Guide to Singapore's Information Week, May 9-15, 1983.

5. National Computer Board, *Singapore Computer Industry Survey; Industrial Development Department*, (Singapore: National Computer Board, Oct., 1983).

the emphasis on external trade, as a crucial factor contributing to this growth.⁶ Singapore is, in economic terms, rapidly advancing into the circle of highly developed nations. Singapore's political and economic stability has played a significant role in assuring strong and consistent growth. The stable political climate has allowed the government to carry out its agenda with minimal resistance. This climate can be traced to Singapore's colonial underpinnings, which established the country's political and economic structure.

Singapore inherited a centralized bureaucracy from the British and has since used this apparatus to encourage the economic development upon which it could anchor its legitimacy. When Singapore achieved total independence from the Malaysian peninsula in 1965, it was cut off from mainland markets and raw materials. Led by a single, authoritarian political party, Singapore turned to an export-driven policy. It renewed efforts to attract foreign investment and expand the role of the state in the financial system. Such a policy

As markets become interconnected, the challenge for Singapore will be to develop and install software capable of keeping pace with worldwide developments.

avored the private sector, and foreign firms were given powerful incentives to play a role in the country's economic development. However, manufacturing and industrial capability was young and underdeveloped.⁷ Most production was labor-intensive, offering little added value to export goods such as textiles, clothing, and footwear. Singapore's technological growth was stunted by the weakness of its indigenous industrial sector.

In a government move to encourage growth, the National Wages Council was formed in 1972 and promptly began to allow a steady increase in wage rates aimed at pressuring foreign firms to shift investment out of the traditional manufacturing facilities.⁸ In 1975, Singapore announced that it was entering a "Second Industrial Revolution," and selected twelve industrial sectors, including software, for concentration of resources to generate economic growth. Several factors forced the government to reevaluate its economic policies. Faced with increased competition from other developing Asian economies (such as Hong Kong, Republic of Korea, and Republic of China, which had lower minimum wage rates), and a threat of protectionism against labor-intensive products abroad, Singapore moved to promote higher value-added

6. *World Development Report, 1987*, (Washington, D.C.: The World Bank, 1987), 203.

7. Stephen Haggard and Tun-jen Cheng, "State and Foreign Capital in the East Asian NIC's," in *The Political Economy of New Asian Industrialism*, ed. Fredric C. Deyo (Ithaca: Cornell University Press, 1987), 84.

8. *Ibid.*

production in capital-intensive and labor-intensive industries.⁹ With unemployment eradicated and continued growth in gross national product (GNP) throughout the mid-1970s, Singapore was able to move to this more sophisticated strategy of industrial development.

Christened the "Second Industrial Revolution," Singapore's economic growth continued to rely on foreign investment and an implicit development bias against local firms.¹⁰ Although the government made no formal distinction between local and foreign-owned companies, most of the incentives for investment were beyond the reach of the small local producer. Government incentives included low taxes and tax holidays, limited controls over operations, and no local ownership requirements. In addition, Singapore placed substantial emphasis on basic infrastructure construction to attract the foreign investor. Singapore's incentive program in practice was biased towards the largest investors, which were likely to be multinational corporations. A statement by Prime Minister Lee Kuan Yew suggests the government prefers larger foreign firms to invest and operate in the country:

The bigger and more established an MNE (Multinational Enterprise) is in his field, the higher his success rate and the bigger his contribution to jobs and GNP. . . . The less experienced the industrialist and the less advanced his technology, the higher the failure rate.¹¹

In 1986, some features of the "Second Industrial Revolution" were changed in response to declining economic performance tied to world recession and pressure from local firms for increased government support. The overall thrust of this plan, however, remains in place to form Singapore's policies toward foreign investment and to promote its computer software industry.

In an effort to make Singapore a regional "brains" software center — a Silicon Valley of the Pacific rim — a combination of government incentives and software copyright protection laws recently has been implemented.¹² In 1987, the Economic Expansion Incentives Act established the Economic Development Board (EDB) to administer the granting of "pioneer status." Pioneer status is a government incentive given to foreign manufacturing and service companies, including computer software firms, to pursue innovative activities in Singapore. In order to qualify for this status, companies must employ a high percentage of local, skilled workers. Technology transfer to the local industry is an implied, if not stated, objective.¹³ Companies granted pioneer status are exempt from the corporate taxation rate, and they are given a five year tax holiday. Burroughs-Cyberware was the first software firm to receive pioneer status.

9. Donald Lecraw, "Singapore," in *Multinational Enterprises, Economic Structure and International Competitiveness*, ed. John Dunning, 390.

10. *Ibid.*, 119.

11. *Asia Research Bulletin*, January, 1980, 528.

12. International Data Corporation, *Report on the Computer Market in Singapore*, (Hong Kong: International Data Corporation, (Asia) Ltd., December 7, 1987), 70.

13. *Ibid.*, 9.

Other efforts to make Singapore attractive to investors include additional amendments to pioneer status, such as the reduction of minimum capital expenditure requirements, and commitments to build local technology centers. The government also awards research grants to individual firms. Companies such as Cullinet Software, Inc., McCormack & Dodge, Microcomputer Software Association, and Software International recently expanded their offices in Singapore through grants encouraging software research.

Singapore has more than 150 software companies, the majority of which are developing software for personal computers. Approximately forty firms are producing software for mainframe or minicomputer systems.¹⁴ Software companies are attracted to Singapore by the sizeable market for their products created by the country's growth as a regional computer center. Furthermore, East Asia is home to some of the fastest growing economies in the world. Despite competition with countries that pay lower wages, such as South Korea and Taiwan, Singapore's high technology products are becoming attractive to the large Japanese market. In 1987, Singapore's total exports to Japan rose by 40 percent over the previous year. Many of these products are manufactured by Japanese firms which have established operations in Singapore to avoid the costs associated with a strong yen. These goods, originally intended for markets such as the United States, are finding their way back to Japan. Keikichi Honda, general manager of Bank of Tokyo's research division, has said: "Seeing the enormous gap in prices, Japanese consumers are becoming more price sensitive. The quality of [newly industrialized countries'] goods has also improved, so the Japanese attitude has changed."¹⁵

Most major computer companies have offices in Singapore, with International Business Machines Corporation (IBM) holding the largest share of the market. IBM is also a software manufacturer, but its software division traditionally has been weak and subject to competitive challenges from smaller, independent firms. Buyers in Singapore's market include international banks, manufacturers, and trading houses, many of which are choosing Singapore as a center for regionalization. A significant portion of new arrivals to Singapore are enterprises fleeing Hong Kong in anticipation of the consequences of its reversion to Chinese suzerainty in 1997. Japanese firms, in particular, are increasing their investment rapidly in Singapore in order to maintain their presence in the region as they leave Hong Kong. Twenty-two Japanese banks have branches in Singapore, and the largest Japanese securities firms, the Nomura Securities Co. Ltd., Daiwa Securities Co. Ltd., and Nikko Securities Co. Ltd., have plans to expand their current operations. Six more Japanese securities firms are expected to open offices in Singapore in 1988.¹⁶ All of these firms depend on support and customer assistance as essential components of software purchases, and, as a result, prefer to buy from vendors with a

14. *Ibid.*, 70.

15. Lisa Shuchman, "Japan Increases Imports from Four Asian Countries," *The New York Times*, 25 April 1988, D8.

16. Economist Intelligence Unit, *Country Report: Singapore*, 2 (1988): 14.

strong presence in the local market.¹⁷ Singapore has an additional advantage in having English as its native language; a majority of software products for foreign markets do not need to be translated, and workers do not require language training.

A considerable number of Singaporean students receive government support to further their education overseas. They then return to meet the country's growing need for technically skilled laborers. In 1987, 6,000 students were in the United States, 1,600 in Canada, and 1,300 in the United Kingdom.¹⁸ Access to institutions, rather than cost, appears to be the dominant criterion in most students' decisions concerning where to study abroad; and US technical school credentials are highly prized.

Singapore is also developing its own higher educational facilities. To stem the shortage of skilled labor, the government is investing in a long-term strategy for increasing worker productivity through a major computer education program. Secondary school education strongly emphasizes computer training as a means of preparing the next generation for an automated society.¹⁹ The Institute of Systems Science was established in 1981 at the National University of Singapore to "aid in the computerization efforts at the public and private sectors in the ASEAN [Association of Southeast Asian Nations] region."²⁰ A joint venture with Japan resulted in the formation of the Japan-

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Singapore Institute of Software Technology (a unit of the EDB) in 1980. Through the agreement, a resident team of Japanese experts provide technical assistance for the planning, establishment, and operation of the institute. This Singapore "science park" represents an important government investment in infrastructure to provide facilities for local research and development. Currently, twenty-three organizations have facilities in the park.²¹

Though Singapore's efforts to attract foreign investment have aided local firms, their presence remains small in the world market. One example of local software development is a computer-aided software engineering product, called Productivity Software Research, developed by Computer Systems Advisors. This software system automates many areas of systems design and application.

17. Robert Poe, "A U.S. Banker in Singapore: Playing it Safe with Big Blue," *Datamation*, 15 October 1987, 46.

18. Economist Intelligence Unit, *Country Report: Singapore*, (1987), 7.

19. Werner L. Frank, "Singapore Vying for Software Center Stage," *Computerworld*, 14 March 1983, 47.

20. *Informatics*; 1983.

21. International Data Corporation, 10.

Use of this package by large companies could result in savings up to 50 percent of the cost of labor spent on pencil and paper technical work. Computer Systems Advisors' chief executive, Johnny Moo, hopes to market this software package in the United States.²² Through entrepreneurs like Moo, and through the augmented capability for direct links to other trading centers, Singapore's increased software capability has brought the city-state into the international marketplace. In 1986, the Chicago Mercantile Exchange established an electronic futures trading link with Singapore. As markets become interconnected, the challenge for Singapore will be to develop and install software capable of keeping pace with worldwide developments.²³

Software Piracy and Copyright Protection

Despite the country's advances, however, certain attitudes, particularly those toward software piracy, expose Singapore's status as a developing nation in the high technology field. Local firms often attempt to acquire technology through piracy. Increasingly, Singapore has been cited as a major offender in the area of software technology theft, with the government frequently looking the other way.²⁴ However, attitudes and laws toward software piracy are rapidly changing due to pressure from major trading partners and internal reorientation of government policy and structure. A Singaporean manufacturer describes the local perspective on piracy:

Copyright has been pretty relaxed in Singapore. As a matter of fact, it has been quite new to us because duplications and copying have been very much a part of our lives. It is not unusual to buy a cheap pirated music cassette tape, photocopy a whole book, or even make copies of computer games and application softwares. But, with the passing of the Copyright Act, there will be many changes.²⁵

During the last few years, the government has been making an effort to appease dissatisfied trading partners, while also considering the profitability of domestic producers. The Copyright Act enacted in 1987, which substantially strengthens copyright protection, signifies the government's continued commitment to attract foreign investment in the software industry.

Prior to the enactment of this law, the government of Singapore had taken several steps towards stronger protective measures applicable to computer technology. The Copyright Act of 1970, a modification of the Imperial British Copyright Act of 1911, was a weak attempt to strengthen legislation against

22. Dan Burstein, "Johnny Moo: Can He Make it in the U.S.?" *High-tech Marketing*, January 1987, 20.

23. Diane Crawford, "How Automation is Fueling Intercontinental Trading," *Wall Street Computer Review*, October 1986, 32.

24. Ronald S. Posner, and George DeBakey, "Software Piracy Limits U.S. Export Growth," *Business America*, 9 June 1986, 12.

25. Li Ee Waugh, "A Manufacturer's View on the Domestic and Export Market for Computers Before and After the Passing of Legislation on the Copyright Act," in *What You Should Know About Copyright; the Legal and Commercial Implications of the Copyright Act, 1987*, (Singapore: SGS Singapore Ltd., 1987), 1.

general computer piracy, but no explicit provisions were made for software. The act virtually guaranteed that software copiers could continue to pirate without punishment.²⁶ As a result, the United States, Singapore's largest trading partner, pressured the government to strengthen copyright protection.²⁷ In 1982, US government officials began to monitor Singapore, pushing it toward protective reform. A new 1984 trade law granting the US President power to rescind the Generalized System of Preferences (GSP) status at will rendered US demands for reform more influential. Singapore was one of the leading beneficiaries of the GSP. In 1986, \$730 million of Singapore's goods entered the US under GSP status.²⁸ In addition, Singapore's own goals, enunciated in the "Second Industrial Revolution," made the government more open to copyright reform as a means to develop as a regional software center and to attract foreign investment.²⁹

The new Copyright Act, effective April 10, 1987, protects both locally and foreign produced software. This act provides the legal framework necessary for the development of a strong local software industry.³⁰ Multinationals and local companies now have legal recourse against piracy. This act represents a dramatic change by one of the most notorious centers of piracy toward a policy of software product protection. The government's commitment to attracting foreign investment was an important factor contributing to the copyright reforms. The influence of the United States was also a crucial factor. Singaporeans often refer to the visit by Secretary of State George Shultz in August, 1984, as a turning point in the government's decision to legislate new copyright protection. During the visit, Shultz reportedly showed Prime Minister Lee Kuan Yew a pirated tape that his wife had bought on the street, underscoring the extent of piracy.³¹ Singapore appears determined to enforce the Copyright Act to avoid such embarrassing public displays in the future.

The new legislation, with strict government supervision, has significantly diminished the piracy industry in Singapore. The government is also ready to enforce this radical turnaround and support intellectual property rights as dictated by international standards.³² Nonetheless, certain dimensions of the legislation, including industrial design, foreign exports, and parallel imports, remain in need of attention. Overall, the Copyright Act has been well received internationally. In fact, Singapore recently has been classified by the United States as a nonaligned, friendly country entitled to receive strategically sensitive products. It is the first Asian country to receive this rank. *The Economist* reported, "Playing by the rules brings rewards. Although not officially acknowledged, Singapore's generous GSP treatment is thought to have been a

26. Timothy J. Richards and Leigh A. Kenny, "Singapore," in *Intellectual Property Rights; Global Consensus, Global Conflict?* ed., R. Michael Gadbow and Timothy J. Richards, (Boulder: Westview Press, 1988), 311.

27. In 1985, Singapore's exports to the United States totaled \$4.8 billion, representing 27.2 percent of GNP, and 46 percent of all foreign investment commitments came from US companies.

28. Richards and Kenny, 321.

29. *Ibid.*, 313.

30. International Data Corporation, 10.

31. Richards and Kenny, 321.

32. *Ibid.*, 339.

reward from the U.S.A. for the recent moves to protect intellectual property rights."³³

With the United States facing a large trade deficit, however, GSP benefits to Singapore and the other "Four Dragons" of the Pacific basin were revoked in early 1988. Reaction to the loss of export relief scheduled to go into effect in January 1989 appears to be minimal to nonexistent, although the full impact of the revoked status remains to be seen. Still, the impressive 1987 growth rates in real gross domestic product (GDP) continued throughout fiscal year 1988.³⁴ Singapore is currently moving toward its goal of becoming a regional software center by 1990.

BRAZIL

The computer is like oil: it is dangerous to depend on others.³⁵

Advertisement for COBRA National Computers of Brazil

It has been said that "[a]mong Latin American countries, Brazil has given the most explicit attention to the role of technology in economic development and to the stimulation of technological development through government policy."³⁶ Much like Singapore, Brazil expects to benefit from the technology, education, and export potential which high technology, via the computer industry, will bring to its economy. In contrast to Singapore's approach, however, Brazil is concentrating on the reduction of dependence on foreign firms in developing an indigenous computer sector.

Multinationals in the past have been important actors in the Brazilian economy. Considered an "iron triangle," the government, bureaucracy, and foreign corporations have been tightly intertwined in most industries.

The government, supported by the majority of the business elite, recently formulated a policy to reduce the influence of MNCs in the computer industry. This policy aggressively protects domestic computer companies, while it loosely regulates software piracy. In Brazil, as in Singapore, the aim is to achieve status as a regional leader in software and computer development. But, the two countries diverge with respect to the role of foreign investment and the amount of influence wielded by MNCs in the software industry. Brazil's past experience with foreign investment and its ideological independence have helped to shape its new software policy.

Having gained independence from Portugal in 1822, Brazil declared itself a republic in 1889 by overthrowing the last remnants of a monarchy which

33. Economist Intelligence Unit, *Country Report: Singapore*, 1 (1987), 14.

34. Economist Intelligence Unit, *Country Report: Singapore*, 2 (1988), 3.

35. Jorge I. Domínguez, "Order and Progress in Brazil," in *Ideology and National Competitiveness*, ed. George C. Lodge and Ezra F. Vogel, (Boston: Harvard Business School Press, 1987), 265.

36. Carl J. Dahlman, "Foreign Technology and Indigenous Technological Capability in Brazil," in *Technological Capability in the Third World*, eds. Martin Fransman and Kenneth King, (New York: St. Martin's Press), 318.

had supplanted colonial rule. Following independence, the Brazilian government can be characterized as a centralized, hierarchical bureaucracy.

In Brazil, a strong state — or, for a long time, a state that hoped to be strong — invoked the national security and prevailed over the rival claims of individual rights. No matter how individualistic Brazilians are in their personal behavior, state dominance has prevailed in politics and economics.³⁷

Brazil's land mass is the largest in Latin America, ranking fifth in the world. It is a land with abundant natural resources, and its manufacturing output is greater than that of Singapore, Taiwan, South Korea, and Hong Kong combined.³⁸ With a population nearing 140 million, tremendous domestic market potential for software programs exists as industries and manufacturing companies begin to computerize. With the exception of the People's Republic of China, no major industrializing country has a faster growth rate.³⁹ Despite its rapid growth, though, many problems plaguing the Brazilian economy have hindered its technological advancement. Authoritarian regimes have alternated between policies of import substitution, export promotion, or a combination of both, as a means of providing "order and progress." The strong government, considering the place of foreign influence in the domestic computer industry, is currently shaping a policy which views indigenous development as essential to growth.

Brazil's exports have been a bright spot in a bleak economic picture colored by an overwhelming external debt and rampant inflation. The year 1987 was a "triumph" for exports, which increased 17 percent, as compared to an increase of 7 percent in imports. Brazil ended that year with a trade surplus greater than \$11 billion. Exports in 1988 were equally encouraging.⁴⁰ A policy of export promotion, including tax breaks to corporations which produce export goods, contributed to a \$1 billion surplus in 1988. The foreign trade department of Banco do Brazil, Carteira do Comercio Exterior or CA-CEX, was recently instructed to dismantle bureaucratic controls on a wide range of exports.⁴¹

Nonetheless, Brazil faces an economically and politically sensitive financial crisis. New fiscal reforms, such as increased taxation on specific income groups, have been put on hold for political considerations as Brazil enters 1989, an election year. Specific reforms aim to increase revenue by 1 percent of GDP and cut expenditures by 6/10 of 1 percent to deal with the fiscal problems. One of the proposed reforms to raise revenue would require companies to pay taxes on exports at a rate of 3 percent in 1988, rising to 6 percent in 1989. In contrast, the taxation rate on profits for domestic sales is 35 percent. The software industry benefits from the push to export and remains in a protected

37. Dominguez, 244.

38. Grady E. Means, "Brazil's High Tech Future," *High Tech*, June 9-22, 1986, 1.

39. *Ibid.*

40. Economist Intelligence Unit, *Country Report: Brazil*, 1 (1988), 8.

41. *Ibid.* p. 9.

position within the economy. The potential instability of the country's economic future, however, coupled with competition and limited markets abroad, poses the greatest threat to the industry.

The Brazilian government decided to invest in the computer industry in 1971. The impetus behind the decision sprang from a combination of changes taking place in the international computer industry and the desire to promote industrialization and technological advancement at home.⁴² MNCs already had established a position in the Brazilian computer market which presented a challenge for aspiring domestic software and related computer companies. Yet, "[t]he government was convinced that informatics was strategically important to the nation, and that, therefore, Brazil needed a policy which would enable it to acquire the technical capability necessary to reduce its dependence."⁴³

The decision to enact such a policy, however, came before IBM began producing macro- and micro-computers in Brazil. To policymakers, this represented an opportunity to sponsor and promote a cohesive national effort within a specific segment of the market.⁴⁴ Once the decision was made to enter the domestic computer market, the industry boomed. Within two years

As one US executive explained, "Brazil's bureaucrats don't like foreigners in high-tech ventures."

companies were producing software, along with hardware, modems, terminals, and peripheral components. By 1983 there were approximately 100 domestic computer companies. The largest of these firms was the state-owned Cobra SA, which held a 36 percent share of the market among domestic companies by 1982.⁴⁵

Domestic firms differ from MNCs in the amount of capital invested in the research and development of software. In 1980, Brazilian state-owned companies invested more than 14 percent of sales in research and development, while firms under foreign license invested less than 8 percent.⁴⁶ Strong government support of indigenous development is essential. Computer coursework is offered at major universities across Brazil, and twelve government research centers have been established. The first software was developed at the Pontifical University of Rio de Janeiro. COBRA led the effort to absorb foreign technology, develop local technology, and satisfy Brazil's growing needs.⁴⁷

42. Emanuel Adler, "Ideological 'Guerrillas' and the Quest for Technological Autonomy: Brazil's Domestic Computer Industry," in *International Organization*, (Boston: Massachusetts Institute of Technology, Summer, 1986), 686.

43. *Ibid.*, 686.

44. *Ibid.*, 685.

45. *Ibid.*, 680.

46. *Ibid.*, 681.

47. *Ibid.*, 688.

Brazil supports its computer industry by protecting the market from a stifling foreign presence, but it still seeks access to technology developed by MNCs. The Informatics Law, passed in 1984, solidified Brazil's position as one of the most protected computer markets in the world. The law sharply limits expansion by foreign computer companies already in the market, and it gives the Secretariat for Informatics (SEI) the final approval on joint venture partnerships. Non-Brazilian suppliers are barred from the software market, and foreign ownership of firms is limited to 30 percent ownership of joint projects, because, as one US executive explained, "Brazil's bureaucrats don't like foreigners in high-tech ventures."⁴⁸ This law typifies "Informatics," a series of policies which has set 1992 as a target year for realizing a significant increase in Brazilian ownership of high technology development capacity.

An unfortunate consequence of the country's import restrictions is the denial of Brazilian market access to the latest advancements in software technology. Yet, Edson Fregni, head of the Brazilian Computer Manufacturers Association says:

We don't care if we aren't state-of-the-art right now. What counts is that Brazilian engineers are learning how to design Brazilian computers. If we don't figure out how to do it ourselves, we will lose control of our destiny and be condemned forever as IBM salesmen.⁴⁹

Not surprisingly, the Brazilian approach to building an indigenous computer industry has affected the profitability of foreign firms operating in the country and has forced a shift in their market strategies. One example is Control Data Corporation's (CDC) decision concerning its Cyber 830 system. CDC decided it was "more profitable to transfer the technology to the Brazilian company, [Modata] than for CDC itself to sell Cyber 830s in Brazil because of import taxes there."⁵⁰ Several MNCs have decreased their Brazilian operations or are pulling out of the country entirely. From 1979 to 1984, the share of the computer market held by foreign corporations in Brazil fell from 77 percent to 54 percent.⁵¹ Meanwhile, the number of domestic computer companies rose to 150 by 1986.

Brazilian companies have a large and growing internal market, and some firms have begun to export as their production capacity and capability extends beyond current market needs. Over and above firms such as COBRA, Prologica Industria e Comercio de Computadores Ltda., and MICRODIGITAL, the domestic export leader is ELEBRA, whose foreign sales roster includes the United States. Other Latin American countries and East bloc nations have taken an interest in Brazilian products. According to US officials, the Soviet government has expressed a strong interest in computers and computer soft-

48. "The Steel Deal That Could Boost Big Blue in Brazil," *Business Week*, 19 April 1986, 66.

49. Lynda Schuster, "Brazil Protects Home-Grown Computers Despite the Drawbacks", *The Wall Street Journal*, 13 April 1985, 27.

50. *MIS Week*, 10 March 1986, 9.

51. "Brazil says 'No Thanks' to Foreign Computers," *International Management*, (UK: International Management, Europe Addition, September, 1984), 84.

ware, and these officials fear that Brazil may become a future center for Soviet technology absorption.

The technology [of Brazil] isn't up to that in the U.S., but it is useful to the technically backward Soviet civilian economy, and Brazil ignores U.S. efforts to limit the flow of technology to East Bloc countries . . . "Brazil's a little short of the technology right now," a U.S. analyst says, "but they'll get there and get there soon."⁵²

For the most part, though, the United States and other developed nations are too technologically advanced to generate significant demand for the Brazilian products. If and when Brazil's software does become more attractive to US buyers, there may be other barriers to overcome due to conflict over Brazil's policies towards intellectual property rights.

Piracy and Copyright Protection

Brazil's relations with the United States, its major trading partner, and other countries have been strained over the issue of software protection. Brazil protects and promotes its technological sector to such a degree that piracy is frequently overlooked, or even condoned, as a means to achieve its national goals.

Brazil's position on technology rights can be broadly described in the following statement: "Brazil advocates the universal right of use, reproduction and imitation, without remuneration, of scientific and technological discoveries relating to life, health and feeding of human beings."⁵³ This attitude toward technology transfer translates into a policy which refuses copyright protection to products which Brazilian companies are capable of producing.⁵⁴ A dispute over this policy arose in October 1987, when the Conselho Nacional de Informática (CONIN), the policymaking council for the computer industry, refused to sell Microsoft Corporation's MS-DOS software program. CONIN ruled that a Brazilian product, SISNE, produced by Scopus Tecnologia, S.A., was similar enough to block the entrance of MS-DOS. This action caused alarm in the United States, confirming fears that Brazilian regulators would interpret the "functional equivalent" concept in a broad, highly protectionist way.⁵⁵ President Reagan threatened to impose tariffs in reaction to a decision which he said, "effectively bans United States companies from the Brazilian software market."⁵⁶

52. Robert S. Greenberger, "Southern Exposure: Moscow is Increasing Visibility and Influence in Latin Democracies," *The Wall Street Journal*, 5 April 1988, 20.

53. This statement is from a proposal for a constitutional provision by the Committee on Sovereignty of Men and Women of the Brazilian Constituent Assembly.

54. Parenthetically, it should be noted that, at the same time, select foreign imports which serve Brazilian industry interests are granted protection.

55. Bradley Graham, "Brazil Bars US Computer Program," *Washington Post*, 2 November 1987, 26.

56. Clyde H. Farnsworth, "Software Curb Eased in Brazil," *The New York Times*, 23 December 1987, D5.

A few weeks after the decision against Microsoft, a bill proposing protection for both domestic and foreign software was passed by the Brazilian Congress, but import duties of up to 200 percent on software products were included in the bill. This was seen as a counteractive measure to the promised protection, and US trade sanctions seemed likely.⁵⁷ However, pressured by the fact that Brazil's total sales to the United States measure between \$700-900 million annually, President José Sarney signed into law a modified version of the bill which dropped the tariffs and imposed criminal punishment for the illegal use of software. This decision was reinforced by subsequent rulings towards other foreign software companies, and the United States postponed a decision on trade sanctions until the actual regulations were drafted in late spring 1988. The final regulations represent a tenuous — even questionable — compromise between Brazilian and US objectives. One unprotected copy of a program is to be provided to Brazil for the twenty-one day period in which the SEI decides if it is eligible for protective permits.⁵⁸ In essence, the conflict is far from being resolved.

How Brazil's policy on intellectual property rights eventually will emerge from the conflict is unclear. Advocates of resistance to US pressure are a strong voice in Brazil, but external markets and world opinion are considerations which also come into play. A critical distinction that may resolve the Brazilian case differently from the protection recently assured by law in Singapore is the limitation placed on US influence in Brazil. Given its large domestic market, Brazil is able to sustain its protectionist policies while catching up with world advances in software production.

The future of both Brazil's policy of independence and Singapore's dependence on foreign investment as an effective development strategy is unclear. Both share the world market as a common denominator in the success or failure of their national goals.

Ideologies and Influences

Brazil and Singapore have governments which can meet national goals by directing local industries. Several factors in Singapore influenced the city-state to turn to MNCs as the means to develop into a regional software center. The dominance of US firms traditionally has been strong in Singapore, making the government more sensitive to US pressure to reform certain areas, such as intellectual property rights violations. By fostering an open economy, Singapore places itself in the position of catering to the desires of its largest trading partners. It also links its national economy to the swings in the world economy, with little buffer against downturns and recession. Having a small domestic market, Singapore has opted to attract outside forces to aid in developing a computer software industry. The state policy has met little domestic protest in a country where "[t]he unwritten social contract in operation since the

57. John Barham, "Measure to Protect Computer Software Advances in Brazil," *Wall Street Journal*, 19 November 1987, 12.

58. *Country Report: Brazil*, 16.

1960s is quite simple: the government delivers the goods and the people deliver the obedience."⁵⁹

In Brazil, the artful ability to find legal ways of reaching a compromise acceptable to all interested parties is a highly valued skill. This practice even has a slang name, *jeito*, which means "I'll find a way."⁶⁰ The growth in the computer software industry is tied to huge, often inefficient, investments in large national firms. These large companies have become the means to meet a national goal that takes precedence over market efficiency and import substitution policies.⁶¹ The Brazilian government believes that state-owned companies are best suited to absorb foreign technology. In the past, the government has remained committed to the success of state-owned companies, even if it requires bankruptcy bailouts. Government boards, such as the *Comiss o de Coordena o das Atividades de Processamento Eletr nico* (CAPRE), have coordinated electronic processing activities since 1972. CAPRE and other boards formalized Brazil's independent, pragmatic tendencies which unify the state, business, and scientific communities.⁶² With the creation of such institutions, Brazil nationalized and protected a native software industry even before it had been created.

CONCLUSION

Despite differences in approach, Brazil and Singapore share a belief in staking economic prosperity on the success of their computer software industries. Both countries view themselves as regional leaders, while neighboring countries (e.g., Argentina and Malaysia) take note of the effects of such policies. Both nations have been able to pursue markets where their products have a geographic or strategic advantage. Appropriately enough, software embodies the flexibility necessary to accommodate individual computing needs. Whether produced for domestic use or for export, software can be tailored to a variety of markets. Reliance on advanced technology is increasing worldwide, and developing countries will have to formulate national computer strategies in order to function effectively in the global economy. Brazil and Singapore serve as examples of differing means to reach high technology goals. The successes and failures in their policies should be watched, for they outline paths which other developing nations may choose to follow.

59. Richards and Kenny, 340.

60. Richards and Kenny, 150.

61. Adler, 687.

62. *Ibid.*