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MEXICO'S TRADE AND INVESTMENT POLICY

IN THE COMPUTER INDUSTRY

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PREVIEW

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by

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PREVIEW

THESIS

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CHAPTER 1

INTRODUCTION

The evolution of computer technology in this century has had a tremendous impact in just about every area of activity in this ever-changing world. Since the initial development of computers, the science has advanced at great speed, causing much progress and improvement in numerous areas of science and technology, in business applications, in government activities, in agriculture and in countless other fields. Computers have been getting smaller, more powerful and less expensive over the years. As a result, computers have become much more available and their use has risen to the extent that practically every office in the industrialized world has become dependent on computerized systems, while countries in the developing world are constantly increasing their use. In today's world where technology plays a central role in development, the importance of computer technology has been rapidly increasing in developing countries.

The introduction of microcomputers has had a significant impact in the developing world, requiring adjustments much greater in fact, than in the industrialized world. Due to the fact that industrialized countries had become accustomed to the widespread use of mainframe computers, while developing countries had little exposure to any type of computer system. Many developing

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countries have found important uses for microcomputers and have done so with great success. On the other hand, other developing countries, for a number of reasons, have not been so successful in this endeavor. Often the software was not applicable to local conditions or it was too expensive. In addition, the lack of educational resources made it difficult to provide skilled workers for the maintenance of these systems.

After many years of emphasizing technology transfer from industrialized countries to developing countries, in the late 1970s the focus shifted to accumulating internal technological capabilities within developing countries. There were several problems due to new technologies which caused developing countries to look for internal technological capabilities (ITC). Because of the pressures of international competition, many believe that some degree of intervention (e.g. protection, subsidies, technical assistance) is necessary for ITC to take place. Therefore, it is very important for developing countries to implement appropriate policies, especially with regard to trade and investment.

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Purpose

The purpose of this thesis is to focus on Mexico's trade and investment policy, as it applies to the computer industry, and determine whether Mexico's computer policy is developing ITC, and, if so, whether the benefits exceed the costs. It is very important that the costs and benefits of such a policy are evaluated through economic analysis. There are several other countries in Latin America with such trade and investment policies and some of these policies will be compared to Mexico's to help shape the final analysis. The benefits and costs of the policy will be evaluated and adjustments to Mexico's policy will be suggested that would help improve the situation.

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Organization of the Study

To begin an economic assessment of Mexico's trade and investment policies for the computer industry, it is important to give some background on computer technology in developing countries and lay some theoretical groundwork.

The discussion begins with Chapter 2, which depicts the potential of computers for contributing to the economic development of developing countries. Several cases are adduced in which microcomputer systems have been used and adapted to local

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conditions in the Third World. Special consideration is given to the success and failure of these systems and the benefits that have resulted.

In Chapter 3, attention is shifted to relevant economic theories that shed some light on the costs and benefits of a relatively "closed" policy on computers. To begin the discussion, something is said about the orthodox, neoclassical trade theory delineating the general argument for free trade. Following this, the product cycle hypothesis is reviewed which leads to the question of why developing countries should adopt protective policies in trade. In addressing this question, ITC within the Third World is discussed with emphasis on how it is acquired. Then another economic theory, the infant industry argument is examined, first in terms of protection of domestic goods, followed by the application of this argument to technology. Another area of discussion is the generation of beneficial externalities due to home production with a focal point on the benefits from accumulating national technological capabilities. An analysis of the benefits and costs that arise from fostering ITC through protection closes the chapter.

There follows in Chapter 4, a description of the trade policies of Argentina and Brazil regarding the computer industry. The historical evolution of Argentina's computer trade policy and the salient features of her present policy are described. The same is then done for Brazil followed by a short comparison between the two. Relevant data on the two countries' computer industry are presented when appropriate.

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Chapter 5 provides a more detailed description of Mexico's computer policy along with some analysis. These policies are laid out in order to facilitate a comparison between Mexico's policy and those of Argentina and Brazil. The idea is to indicate the main similarities and contrasts among these countries, an exercise that will help provide a basis for making some concrete points in a final evaluation of Mexico's policy.

The concluding chapter attempts an economic evaluation of Mexico's computer policy. Building on the development of Mexico's computer industry in the previous chapter, the costs are estimated quantitatively and a rough judgement of a qualitative nature is made regarding benefits. In a payoff to the whole investigation, the chapter includes several observations and suggestions that carry policy implications for Mexico and/or other Third World nations.

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CHAPTER 2

COMPUTER SCIENCE AND DEVELOPING COUNTRIES: PROSPECTS AND PROBLEMS

Computer Technology

Computer science has been the fastest growing technology of this century. Computer technology has advanced at such a great speed since its beginning that it can even be said that this period in time will be known as the Information Revolution. Robert B. Textor, Professor of Education and Anthropology at Stanford University states:

> The information revolution - including computers, teleconferencing, remote sensing, satellite communication, fiber-optic communication, robotics, and the merging of computational and video capabilities - will some day be seen by historians as having been as fundamental in its human impact as the two great convulsions that preceded it, namely the agricultural and the industrial revolutions (Textor, 1985, 21).

The fast rate of development in computer technology has had its effect on computer capacity and prices as well. Computer prices have been dropping consistently and at a very fast rate since computers first appeared. At the same time,

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there has been a very large increase in computer hardware capability, thus causing the current trend in hardware: more capability for less money. This trend is accelerating and is affecting software as well. Software has become cheaper, more universal and easier to use. The increasing competition that has arisen over the years in software development has caused prices to go down wherever similar software packages have become numerous, such as electronic spreadsheets and word processors. The increase in demand by consumers has also allowed prices to fall as producers have realized economies of scale.

There is no field where the impact of computers has not been felt. Computers can be applied to all areas of activity in business environments, government planning, health care, etc. Geoff Simons describes how there are even computational aesthetics, computational art and computational linguistics. He goes on to say that in the future, genetic engineering will be regulated by computer facilities in laboratory and field trials. Equipment for energy generation or food production will increasingly be designed by computers. Computers will more and more frame the research programs for all the seemingly non-computing disciplines (Simons 1987, 3).

As computer technology has continued to advance, a trend to miniaturization has taken place. Computers have been getting smaller and smaller. Masses of data storage have been crammed into ever smaller spaces. Progress in fields of knowledge representation and alternative logics have allowed for these advances. Simons writes about the first microprocessor which was introduced by the Intel Corporation in 1970

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(Ibid., 20). It was based on a single one-fourth inch square silicon chip able to carry the equivalent of 2,250 transistors, all the necessary central-processor circuitry for a tiny computer. By the mid-seventies, chips of this size using large-scale integration would carry more than 20,000 components. Soon after this there was more talk about cramming more than one million electronic components onto a silicon chip.

As computers have been getting smaller and less expensive, they have also become very powerful. High levels of circuit integration achieved by electronics engineers have dramatically increased the computational power of computers. Impressive computer power can now be encapsulated in a host of products and serves also to enlarge substantially the scope of the computers. Increased circuit integration has yielded computer systems with advances in many areas such as logical theory, programming methods, electronics, sensor technology, etc.

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Computer Science and Developing Countries

The powerful computer capability of large mainframes had been present in industrialized countries for quite some time when the microcomputer first appeared on the market. Because of this, the impact of the microcomputer was not as dramatic there as it was in Third World countries. Developing countries had little or no computer technology and the impact and importance of microcomputers was much

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more profound. Today's powerful and inexpensive microcomputer represents a far greater qualitative change in developing countries than in developed ones.

One of the earliest office applications of the microcomputer was the spreadsheet. The electronic spreadsheet made the existing manual work much faster and easier to do on the computers. Not only did the microcomputer automate existing work, it was now possible to work on new tasks (Ruth 1987, 2). Management information systems became timely enough to permit correcting problems before they became acute. People soon moved beyond the initial usefulness of the microcomputer as it facilitated existing tasks. The application of the microcomputer expanded considerably in areas such as energy planning, government budgeting, financial management in agriculture, and health.

Applications of microcomputers have been in existence in developing countries for several years and the development of this technology has facilitated both the process of policy analysis and process of local participation.

The range of potential applications of microcomputers is quite large. One important application is energy planning. Active interest in national energy planning in developing countries dates from the early seventies when oil prices began to increase. Many developing countries have instituted national energy planning efforts since that time and it has become common for these to be based on the use of microcomputers.

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The Dominican Republic used a national investment planning project to compare energy supply projects and conservation efforts to relate macroeconomic and energy investment considerations to energy prices (Warner 1984). The use of microcomputers with this type of work allowed the national staff to participate effectively in the planning and analysis process. This also demonstrated that microcomputers are tools of sufficient capability to carry out complex analyses.

In Morocco, Development Sciences Inc. developed a software package to enhance the planning capabilities of the Ministry of Energy and Mines. This system links energy supply, demand, and other conditions to planners' expectations about the future and the investment portfolio. The results of this project strongly support the application of microcomputers as planning tools.

Microcomputers have played an important role in different aspects of government planning in developing countries; Kenya is a prime example. Kenya has introduced microcomputers to improve budgeting and financial management in the Ministry of Agriculture and the Government Budget for 1985/86 produced by the Ministry of Finance and Planning.

Kenya's use of microcomputers for financial management in agriculture proved successful (Munasinghe et al. 1985). In 1981, Kenyan officials realized that poor financial management was a major constraint to agriculture development. After a series of demonstrations on the possible uses of microcomputers to the Ministry of Agriculture (MOA) made by the U.S. Agency for International Development

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(USAID), the Ministry's financial managers decided to experiment with computerizing their expenditure monitoring system.

The problems of budgeting and financial management in agriculture in Kenya had grown to be insupportable in 1981. Government management advisors and the Ministry's senior financial officer had recognized the importance of these problems and began a series of reforms to correct them with the help of microcomputers. Microcomputers were used in the budgeting process for allocating expenditure, granting authority to spending stations, and monitoring expenditure. Since the 1982/83 fiscal year, the database management system dBase II has been used successfully for monitoring expenditures. Its flexibility has many advantages such as the ability to focus on any aspect of the system and produce whatever type of report is required. The reports produced by this system have been used to address problems of over and under-expenditure during the fiscal year, and used for budgeting and allocation of funds for the next fiscal year.

The microcomputer is also used to allocate spending units by the government directly to the districts of Kenya. The new method began in the 1982/83 fiscal year and it has solved problems of timeliness and misallocations by provincial directors. For this method to be completely effective, however, all district officers need to be involved in the budgetary process - something which has not yet occurred.

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In the budgetary process, the microcomputers have played a significant role only in solving the final problem area. There are other specific problems with budgeting in which microcomputer-based solutions have not been effective.

The success of these microcomputer applications began a new trend in Kenya. They were critical to initiating and executing a process of improvement in the financial management of agriculture. With these innovations, the possibilities for countless other computer applications have arisen.

The Ministry of Finance and Planning (MFP) of Kenya prepared the 1985/86 budget using microcomputers in this area for the first time as the government decided to use computers in budget planning (Munasinghe et al. 1985). The Ministry first acquired microcomputers in 1983. During this time, the government was facing many data processing needs as the volume of data was increasing and the available time to process the data and prepare the reports was decreasing. Kenya's expanding population gave the government more responsibilities, multiplied the volume of data that had to be processed, and increased the reporting requirements.

The computing technology that was currently being used by the government was not enough to keep up with the increasing data processing requirements. After the success of the experience at MOA, the MFP decided on the use of microcomputers for their needs. The objective of computerizing the National Budget of Kenya was to increase the productivity of the Budget Officers by simplifying the mechanics of budget preparation by performing all calculations automatically, lowering the error

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rate, reducing the need for retyping, and skipping the typesetting phase. Under the computerized system, manual work was automated which gave professionals more time and increased processing power to carry out budgetary analysis, to fine-tune budget structure and projections, and to make revisions of investment priorities to meet changing revenue situations.

The implementation of microcomputers in the budgeting process and other data processing activities within the MFP has successfully increased the productivity of staff members and technical assistance personnel. Complex reports can now be generated with great speed and with fewer errors and greater analytical content. Although there were a few problems, the Budget Department views the computerization of the 1985/86 Budget as a great success.

Another important area in which microcomputers are often used by developing countries is health care. India is the country that shows the most widespread use of microcomputers in public services applications including the area of health care. As noted by the United Nations Industrial Development Organization (UNIDO) consultants, S.C. Mehta and G.S. Varadan, the Indian industry is currently making available a wide variety of medical electronic equipment for patient monitoring, diagnosis and therapy (Mehta and Varadan 1984). There is an increasing demand for microprocessor based equipment in Indian hospitals. The current trend in India is to develop this type of equipment. An example of this is the development and introduction of the indigenous x-ray CT brain scanner. At the time of its

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