Trade and Foreign Direct Investment in Data Services

Karl P. Sauvant

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About the Book and Author

This book provides an in-depth examination of the growth and importance of data services—data processing, software, data bases, and telecommunication services—and documents trade and foreign direct investment in these services, particularly in Latin America. Dr. Sauvant's discussion of the international dimension of data-services transactions focuses on the difficulties in assessing transborder data flows, the impact of data technologies on international economic transactions, and the emergence of new forms of international trade. Dr. Sauvant also looks at the regulations governing international trade and foreign direct investment in data services, and he summarizes principal policy issues and implications, especially for developing countries. The text is accompanied by extensive statistical materials and an overview of international actions relating to transborder data flows.

This book was prepared by the United Nations Centre on Transnational Corporations for the Latin American Economic System (SELA) and published by Westview Press in cooperation with SELA.

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Foreword

Until fairly recently, the attention devoted in international forums to the subject of services has lagged far behind the emergence of the international service sector, except in certain sectoral activities. This point is particularly valid for the discussions that have traditionally taken place among developing countries. Yet, the global economic importance of the service economy, which has been developing separately from industry, has already surpassed that of the agricultural, mineral, and industrial sectors.

Since the United States tabled a proposal that trade in services should be liberalized at the November 1982 GATT Ministerial Meeting, the level of international attention being paid to the sector has increased remarkably. The implications of the U.S. proposal need to be examined fully, since they involve far-reaching consequences for other countries and especially for developing countries, where the sector is still in a relatively nascent stage of development. Consequently, services quickly have become a new item in the work program and agenda of discussions of regional and international organizations, and a number of countries have undertaken national studies of the sector as a whole.

In Latin America and the Caribbean, where services account for approximately 60 percent of the regional gross product, the subject received initial attention at the Latin American Co-ordination Meeting prior to UNCTAD VI, which took place in Cartagena, Colombia, in February 1983. Subsequently, at the Ninth Regular Meeting of the Latin American Council of the Latin American Economic System (SELA), which was held in Caracas in September 1983, Decision 153 (contained in Appendix A.1) was adopted requesting the SELA Permanent Secretariat to undertake a thorough study of the role of services and international service transactions in the development process and economies of member states. This decision not only defined the regional perspective from which the services sector is to be analyzed and discussed but also identified the forum within which future regional discussions on services

would take place. The importance of services was further emphasized at the Latin American Economic Conference held in Quito in January 1984 (see Appendix A.2).

In fulfillment of its mandate, the SELA Permanent Secretariat, working in collaboration with UNCTAD and other regional and international organizations, prepared a study entitled "Services and the Development of Latin America." This analysis was presented to the High-Level Latin America Co-ordination Meeting on Services, held at SELA headquarters in Caracas from 22 to 24 August 1984. On the basis of the conclusions and recommendations contained in the analysis, the coordination meeting agreed to a series of recommendations for action on the national, regional, and international levels, including a broad-based work program on services to be carried out by the Permanent Secretariat (see Appendix A.3). These recommendations were in turn adopted by the Tenth Regular Meeting of the Latin American Council, held in October 1984. Decision 192 (see Appendix A.4) adopted on that occasion mandated the Permanent Secretariat to study the situation of various service activities and to further "studies underway in the areas of informatics, insurance and reinsurance, banking, transport and consultancy and engineering. . . ."

The reference to studies under way stems from the fact that, for the preparation of the above-mentioned general study on services, it was considered essential to have available information concerning specific service-sector activities in Latin America and the Caribbean. In particular, the subject of data services and of the internationalization of data services (transborder data flows) was identified by the Permanent Secretariat as an area of the highest priority, in view of the position of data services as one of the most dynamic domestic industries, of their increasing importance in the production of both goods and other services in general, and of their role in increasing the tradability of other services. In this regard, it is worth mentioning that the Permanent Secretariat's decision to single out this subsector for special attention was subsequently justified by the explicit recognition of its special importance in a separate decision adopted by the Tenth Council Meeting, Action Committee on the Informatics and Electronics Industry (CASIE) (Decision 221) (see Appendix A.5). This decision requests that the SELA Permanent Secretary hold consultations with member states to identify ways to further the development of these joint activities at the regional level.

These are some of the reasons why the SELA Permanent Secretariat initially requested the UN Centre on Transnational Corporations (UNCTC) to prepare a general study on transborder data flows, outlining the nature of and technological changes occurring in regard to these phenomena, with special reference to their international trade and foreign-direct-

investment dimensions, as well as existing policy arrangements and policy considerations. This study was then submitted to the Latin American Co-ordination Meeting referred to previously.

The SELA Permanent Secretariat takes pleasure in making this study available to a wider readership, in the hope that it will contribute to a deeper awareness and understanding of the growing importance and complexity of data industries, the far-reaching changes they are producing in the international economy, and the resulting implications for developing countries and particularly those of Latin America and the Caribbean. Although the present report is intended as a general analysis of the internationalization of data services, throughout the work specific references are made to the Latin American and Caribbean region.

Finally, the Permanent Secretariat wishes to express its special appreciation to the UN Centre on Transnational Corporations and particularly to Karl P. Sauvant, whose responsibility it was to undertake the study. Without his kind collaboration and without the contributions from Henry Ergas (Chapter 3 and parts of Chapter 5) and Rodney de C. Grey (parts of Chapter 4 and 5), the study would not have been possible.

Caracas

Ambassador Sebastián Alegrett
Permanent Secretary
SELA Permanent Secretariat

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Introduction

Economic development is characterized by a constant restructuring of economic activities. Land, the basis of an agricultural economy, has become less important than capital, technology, skilled labor, and management, the principal bases of an industrial economy. Through differentiation, specialization, standardization of knowledge, and the development of economies of scale, a service sector has begun to emerge separate from the industrial sector. In most countries today, the service sector accounts for the largest share of gross domestic product; it is not surprising, therefore, that increased attention is being given to services.[1] In the international context, this awareness has led to rapidly spreading discussions about trade and foreign direct investment in services and the international policy framework most appropriate for these transactions.

Several international organizations are ready to initiate work programs on services, causing the discussions to enter a new phase. The organizations include the Latin American Economic System (SELA), an organization that brings together representatives from almost all countries in the Latin American region;[2] the UN Conference on Trade and Development (UNCTAD); and the UN Centre on Transnational Corporations (UNCTC). At the Ninth Regular Meeting of the Latin American Council (the governing body of SELA), in September 1983, the members requested that SELA's Permanent Secretariat carry out a comprehensive analysis of the role of services and international service transactions in the development process and the economies of Latin America (see Appendix A for the texts of the relevant resolutions). Accordingly, the Permanent Secretariat initiated a cooperative effort with UNCTAD, UNCTC, and other groups to undertake the necessary work. Special sectoral papers were prepared for insurance, banking, transportation, engineering, and consultancy services and for data services (transborder data flows). The sectoral papers formed the basis of a report on services

prepared by a SELA working group and submitted to a Latin American coordination meeting, held in Caracas, 22–24 August 1984.

UNCTC assumed the responsibility for preparing the sectoral paper on trade and foreign direct investment in data services (transborder data flows). The scope of the paper was to include an examination of the importance and impact of the emerging data-service industries, especially in Latin America; a clarification of conceptual issues related to trade and foreign direct investment in data services; a documentation of the dimensions of various forms of international transactions in services; an analysis of the determinants of these transactions; a review of the policies and issues relating to them; and an outline of possible actions at the national, regional, and international levels for dealing with questions related to data services. The present study contains the results of the work on these issues.

Trade and foreign direct investment in data services have not yet been the subject of multilateral attention. Rather, issues pertaining to them are embedded in the growing (broader) discussions of the role of the service sector in the economy and of the importance of trade in services in general. Because of long-standing neglect of the former subject, little firm understanding exists regarding trade in services: Only at the end of the 1970s, when the U.S. government was beginning to fear that restrictive measures involving U.S. export of services might become more frequent,[3] was more attention given to trade in services. As a result, much of the ongoing work has been undertaken from the view point of an international public policy framework for trade in services. As many services can only be delivered to foreign markets through foreign affiliates, the interest in trade in services is also spreading to foreign direct investment in services and regimes governing that activity. Naturally, many issues raised with respect to general services are also relevant to data services.

Technological developments, along with shifts in the structure of demand, have been the single most important factor in bringing about changes in the structure of economic activities. During the 1970s, technological innovation has centered on microelectronics, and it has given birth to data technologies—technologies that function on the basis of digital signals. Their key characteristic is that they offer vastly improved capabilities for the processing, storage, retrieval, manipulation, and transmission of data for a wide variety of purposes at generally decreasing costs. They are a core technology and as such form the nexus around which domestic economic and social activities will be restructured in the future, and on the basis of which an information economy is emerging. As in the course of earlier fundamental changes in the structure

of economic activities, the emergence of data technologies is having profound implications: It has led to the creation and growth of new industries, data industries; it is changing the modus operandi of existing industries; and it is changing the nature of international economic transactions.

Data technologies have led to the merger of informatics and telecommunication into a new activity, telematics. The principal services—data services—associated with telematics are data processing, software development, information storage and retrieval, and telecommunication services. Because such data goods as computers have a high data-services content in the form of software, attention is also given in this study to data goods, mostly for use as proxy-measurement devices. Besides the emergence, growth, and importance of the data industries (documented in Chapter 1), data technologies have also spread to other industries and in the process changed their modus operandi. This process is briefly described in Chapter 1 also because it is the basis for data-service trade and foreign direct investment that stems from the increased use of data technologies in traditional products, processes, and services. Tables supporting this text are contained in statistical Appendix B.

The extension of telematics into the international realm has given rise to transborder data flows, that is, the flow of data via computer-communication systems spanning two or more countries.[4] Transborder data flows can also be conceptualized as trade in data services, in that part of it is trade in a free good (for example, the communication industry). (The expressions transborder data flows and trade in data services are used interchangeably in this study.) Trade and foreign direct investment—the principal means of delivering data services to foreign markets—are the major mechanisms through which the changes set into motion by data technologies are transmitted from developed to developing countries.

In this process, international economic exchanges are also undergoing fundamental changes, the principal subject of this study. As documented in Chapter 2, the main changes are that trade and foreign direct investment in data industries have become an international economic activity in their own right; that the spread of data technologies to other industries has led to data-service trade and foreign direct investment derived from transaction in these industries; that the infrastructure for trade and goods and services is being changed; that the modalities for the operations of transnational corporations are being redefined; and that new forms of international trade are being made possible. The fact that data services not only form part of the infrastructure of other international economic exchanges but also permeate these exchanges gives data services a central

role in trade and foreign direct investment in goods as well as in trade and investment in services other than data services—regardless of whether participating parties are from developed or developing countries. These linkages, which are equally important in the domestic context, make data services a core service, a service that is changing the parameters of most other industries and services.

Data services are among the most dynamic components of international trade and foreign direct investment. Technical progress, changes in the economic sector, factors influencing the international specialization in data services, and the impact of obstacles combine to determine the growth of trade and foreign direct investment in data services. These factors are examined in Chapter 3 in order to understand what drives the expansion of these transactions.

The desire to have "rules of the road" for trade in data services is probably at the origin of the current international debate on services. But because data services form a core service, the policy implications arising from them affect not only their own sector, but also a whole range of other services, especially information-intensive service industries that are today largely dependent on data flows. In fact, the possibilities introduced by data technologies—including the possibility of transforming disembodied, traditionally nontradable services into tradable ones and the blurring of boundaries between service providers—are the most dynamic aspects of these other services and, together with the role of transborder data flows as the "lifeblood" of transnational corporations, may well play an increasingly important role of international service discussions.

The extent of the rules of the road for international trade and foreign direct investment in data services is the subject of the first part of Chapter 4, which is followed by an identification and discussion of the policy issues to be considered if international negotiations regarding international transactions in data services take place. This chapter is supplemented (in Appendix C) by a description of the current status of discussion regarding transborder data flows in various international forums.

Although the exact implications of the changes brought about by transborder data flows cannot be determined with certainty, it is important to ensure that all countries benefit from these flows as much as possible and that any negative effects associated with them are kept to a minimum. This approach assigns a key role to appropriate policies, especially for developing countries. Without such policies, the impact of data technologies on developing countries may be determined more by the uneven distribution of economic (and especially data) resources between de-

veloped and developing countries and less by a rational utilization of all resources and possibilities available worldwide.

Special attention is given throughout this book to developing countries in general and Latin American countries in particular. In the concluding chapter, the implications of the growth of trade and foreign direct investment in data services for developing countries are considered.

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The Emergence of Data Industries

Data Industries

Information industries have long been a part of the industrial and services sectors. These industries, which constitute the primary information sector, produce information goods and services normally bought and sold in established markets. Conventionally, the sector has included industries involved in the production of books, paper, printing machinery, radios, and television sets; the construction of offices, schools, and communication buildings; various aspects of finance, insurance, real estate, and business services; and motion pictures and television broadcasting. In many cases, these information goods and services can also be obtained in-house (that is, without going to established markets); industries with such in-house capabilities make up the secondary information sector.[5]

Recently, however, with the growth of microelectronics a new subgroup of information industries has emerged—the data industries. According to a study by the Organisation for Economic Co-operation and Development (OECD)—the organization created by all industrialized countries to discuss and co-ordinate their economic policies—these industries belong to the main growth pole around which investment and production capacities will be structured as part of a new industrial revolution.[6] Data industries differ from traditional information industries in that they use digital data technologies, the core of both data-goods industries and data-service industries.

Partly as a result of these developments, the information sector is contributing an increasing share to the gross domestic product (GDP) of many countries. As shown in Table 1.1, in all but one country for which data are available, the contribution to GDP of information goods and services bought and sold in established markets has increased notably over successive years. In 1980, this share was 14 percent for

Norway, 19 percent for Sweden, and 26 percent for the United Kingdom; the percentage of the British share was almost reached by the United States in 1972. In Japan, the share of the primary information sector in GDP increased from 8 percent in 1960 to 19 percent in 1970. These figures show that the production of information goods and services has come to play an important role in all economic activities. Not surprisingly, therefore, access to and the location of data resources are increasingly regarded as being of strategic importance for economic development.[7]

The Data-Goods Industries

Technological developments related mostly to integrated circuits have dramatically decreased the physical size of electronic data-processing devices, decreasing the price of computing power, and increased their robustness, computing speed, memory capacity, reliability, and accessibility. As a result, electronic data-processing devices have become more versatile and are being used for a rapidly increasing range of applications, in both manufacturing and services industries. The versatility and accessibility of computer systems have increased further with developments in telecommunications that have permitted remote input and output of data, first through the traditional telephone network, then increasingly through specialized terrestrial and satellite-based transmission networks for digital data.

The rapid microelectronics-based advances in both industries during the 1970s and early 1980s have led to their convergence into a new activity, telematics. This evolution is exemplified by the strategies of the two principal corporations in these industries: International Business Machines (IBM) and American Telephone and Telegraph (AT&T). IBM, the dominant corporation in the international computer market, is a partner (with Aetna Life Insurance) in Satellite Business Systems (SBS), a satellite-based communication system designed primarily for the transmission of data. In a strategic move, IBM acquired a share of Rolm Corporation, a major producer of private branch exchanges (which are increasingly being used in intraoffice and local-area communication) and announced in May 1984 that it intended to enter the local-area-network market. AT&T—until the end of 1983 known as the Bell System and the world's largest telecommunication corporation—agreed to divest itself on 1 January 1984 of about $120 billion in assets to seven regional telephone companies in order to obtain permission to participate in the data-processing market. Within four months, AT&T had developed for the computer marketplace a line of six computers and had arranged a cooperative agreement with Olivetti to produce office equipment and in particular to develop desktop computers.

Computer and data-processing equipment, which use integrated circuits (chips), form the basis of the data industries.[8] A data-processing system is composed of a central processing unit (CPU) (which can be contained in any of the wide range of available computers[9]) input/output and storage devices, and software (the set of instructions that controls the operation of the system). The equipment connected to the CPU can be classified in two categories: peripherals, which are physically close to the CPU (for instance, in the same room); and terminals, which are connected to the system through the telecommunication network.

The vast majority of computer and related-product manufacturers have their headquarters in developed countries, and by far the biggest segment of the market is located in those countries. Furthermore, the industry is concentrated in that a limited number of companies control each sector of the market. Almost all the leading firms are transnational corporations.

With the development of new technology, the computer and data-processing industry is becoming more and more intertwined with other sectors of the economy. On the one hand, the increasing amount of chip-level integration of computing functions is blurring the boundary between components and systems and, therefore, between the semiconductor and computer industries.[10] On the other hand, since data-processing systems can be specially tailored to different applications or completely embodied in more general equipment, it is increasingly difficult to identify pure data-processing goods or to restrict the analysis of the industry to systems clearly separated from their operating conditions; thus, boundaries are being blurred in this respect as well. Because of its central importance, data processing equipment can be regarded as a core technology on the cutting edge of economic restructuring.

In 1982, the market value for data-processing equipment in market economies was estimated to be $78 billion, of which 45 percent represented computers, 38 percent peripherals, and 17 percent terminals (see Table 1.2).[11] In each of these market segments, the United States accounted for over 50 percent of the world market, followed by Western Europe with an average of 30 percent and Japan with an average of 12 percent; other market economies, which include the developing countries, accounted on the average for 6 percent (see Table 1.3). The figures further indicate that computers represent less than one-half of the total value of data-processing equipment (see Table 1.2); their share is likely to decline further in the future because peripherals are expected to grow at higher rates. However, peripherals and terminals do not operate in isolation as stand-alone machines; they must be connected to central processors and into computing systems. Therefore, terminal

and peripheral manufacturers cannot grow independent of processor manufacturers: Peripheral devices are either supplied by computer manufacturers themselves or adapted to fit systems designed by computer manufacturers. In other words, great difficulties would arise if the manufacturers of peripherals, terminals, and computer services left the orbit of the leading manufacturers of CPUs.

Technological developments and competition have caused a shift in the composition of computer sales (see Table B.1. Tables with numbers beginning with B are in Appendix B at the end of the book.). During most of the 1970s, medium-sized and large systems (general-purpose computers) accounted for the bulk of installed equipment and annual shipments; however, during the second half of the 1970s, the production of minicomputers was expanded, and the 1980s have thus far been characterized by the rapid development of microcomputers. The number of microcomputers shipped by U.S. manufacturers is expected to show an annual growth rate of 36 percent between 1979 and 1985 compared with 19 percent for minicomputers and 2 percent for general purpose computers.

The distribution of general-purpose computers shows that the developed market economies in 1980 accounted for 87 percent of the value of these computers installed worldwide, compared to 4 percent for developing countries (see Table 1.4). The per capita density of CPUs per million inhabitants is therefore 176 for the developed market economies compared to 3 for the developing countries. For developing regions, Latin America has the strongest computer base, and accounts for more than one-half of developing countries' percentage points. Brazil alone hosts just over 50 percent of general-purpose computers (in value terms) in operation in the region. Brazil and Mexico contain computers with a value that is a little more than two-thirds that of the computer base (see Table 1.5). Yet, the installed base value to gross national product (GNP) ratio, 0.8 in Brazil and 0.4 in Mexico, is well below the industrialized countries' level of 1.8.

The size of the installed computer base in Latin America has increased substantially between 1973 and the beginning of the 1980s (see Table B.2). If GNP is used to standardize the total number of computers, it is apparent that the differences in density among Latin American countries are considerable, ranging from 25 computers per billion dollars GNP in Bolivia to 161 per billion in Argentina. By comparison, the density in the Federal Republic of Germany is 273. An important feature of the installed computer base is its fragmentation (see Table B.3). For instance, more than 140 of 235 models of general-purpose computers on the world market in 1979 were offered in Mexico.[12] Because of the small size of Latin American markets, the number of computers sold

of each model is very small. Since in many cases these models are incompatible among themselves, it is difficult to develop a domestic software industry for such a small customer base.

The fifty largest data-processing equipment manufacturers (see Table B.4) probably produce over 90 percent of the industry's sales in market economies. In 1984, two (Fujitsu and Olivetti) of the ten largest did not have their headquarters in the United States; seven of the fifty largest were not headquartered in the United States. IBM, which accounted for $26 billion of the $71 billion data-processing revenues of the fifty largest manufacturers in 1981, is by far the largest corporation of the industry, followed by Digital Equipment with $4 billion.

The geographical distribution of the stock of general purpose computers by corporation and region (see Table B.5) reflects the aggregate pattern observed earlier. At the beginning of 1981, IBM, the industry's leader, had $3.7 billion worth of such computers in developing countries, $2.1 billion of which was in Latin America. The total developing-country figure represented 5 percent of IBM's computer stock worldwide. The corporation with the next highest figure of general-purpose computers in developing countries was Burroughs Corp., with a stock worth $600 million, $400 of which was in Latin America. The total developing-country figure represented 10 percent of Burroughs' computer stock worldwide, the highest share in developing countries of any major computer manufacturer.

The Data-Service Industries

Data-goods industries have given rise to data-service industries, which include computer services, information storage and retrieval, and telecommunication services. These industries, in turn, have created international transactions in their own right, through trade, foreign direct investment, or a combination of both. These transactions are documented in Chapter 2.

Computer Services. The most important segments of computer services are software and data processing.[13] The various components of the computer-services industry are contained in Figure 1.1. In 1983, computer services provided at arm's length in the seven principal markets had generated revenues of approximately $43 billion, of which $32 billion were generated in the United States, followed by $4 billion in Japan and $2 billion in France. The growth rates in these markets between 1982 and 1983 ranged from 17 to 20 percent (see Table 1.6).

Data-processing systems are driven by software, including machine-readable programs, procedures, and rules (supplemented by hard-copy documentation) whose application causes the electronic devices making

up the computer system to perform certain tasks. The software industry is one of the most important components of the data-service industries. Originally, software was needed primarily to operate data-processing equipment. But because microelectronic devices are increasingly being used for other purposes, software is needed for other applications as well, including for telecommunication systems, industrial products based on microelectronics, and industrial automation systems.

In 1980, the software market in the OECD countries amounted to $4 billion, over one-half of which was located in the United States (see Table 1.7). In the United States, software sales increased from $2 billion in 1980 to $7 billion in 1984; in Western Europe, the market quadrupled during the same period from $1 billion to $4 billion. These figures do not include the value of firmware and in-house software production of, for instance, banks. For 1981, the value of these services was estimated at $43 billion, more than one-half of it in the United States.[14]

Several trends in the software industry are noteworthy. First, according to some estimates, software now accounts for more than three-fourths of the total life-cycle cost to the users of large computer systems, the balance being accounted for by hardware (see Fig. 1.2); this proportion is largely the result of decreasing hardware costs and increasing software costs. Second, the share of standardized application programs have increased in total sales of software, largely at the expense of operative systems and custom programs. Third, in the personal computer sector, software availability and new software capabilities have increased sales of microcomputers. Fourth, existing software and data-processing companies have attempted to expand the range of software products they sell to clients.

When software becomes a part of larger computer systems, it is called firmware and is sold as part of the total system. Because of this, the traditional distinction between data goods and data services becomes difficult to apply, and in some instances the designation of an activity as an industry or a service becomes a matter of choice. (The previously mentioned cost composition of computers is a case in point.)

In the software industry, the following types of suppliers can be distinguished.

Software Product Suppliers. These suppliers sell software packages priced and sold independent of computer hardware to end-users or to other suppliers. A software package is defined as any piece of computer software that can be purchased or acquired from a manufacturer or software or system house and can be run on a computer system with little or no modification of the fundamental software to fulfill the customer's requirements. The software package market (the most rapidly growing segment of the computer-service market) is generally subdivided

into the following general groupings: (a) operating systems: mainly supplied by computer manufacturers to perform general systems management and peripheral control; and (b) applications software: programs written to enable specific user functions to be carried out by the computer for example, commercial accounting and production monitoring and control. Application software is the largest of these two groups and includes both global (or horizontal) software packages (which can be applied to any industry without changes) and industry-oriented (or vertical) packages (which are specially tailored to the needs of a particular industry or activity). Software firms also sell programming languages and aids that permit program writing at high levels, as well as system utilities that give users and programmers general software to carry out standard functions not included in software.

Custom Programming Firms. These firms supply customized software designed to a user's specific requirements, such monitoring a manufacturer's production line.

Turnkey Systems Suppliers. These suppliers of equipment and software systems develop integrated systems (comprising both software and hardware) sold for specific applications or industry markets, such as medical or banking firms. The increased modular approach to hardware systems has led many software houses into the turnkey-systems business, combining multimanufacturer hardware systems with their own packages.

Consulting Firms. These firms advise, analyze, and/or assist corporate or data-processing management on software design, systems troubleshooting, or systems/software implementation.

Although some companies fall into only one of these categories, most firms, particularly those in developing countries, fall into several. Thus, given the presence of scale economies and the limited size of the computer market in Latin America, it is rare to find in the region a firm that specializes in only one activity.

The development of a software industry in Latin America is hampered not only by small market size but also by the fragmentation of the computer market in individual countries because of the multiplicity of models available. As a consequence, end-users tend to rely considerably on in-house development teams, whose expertise is difficult to find among consulting companies, and the domestic software industry in the region tends to be composed mostly of consulting companies and firms that develop customized software. In Venezuela, for example, end-users produce 45 percent of the software, local software houses provide 35 percent, hardware suppliers 15 percent and 5 percent is imported.[15] The fragmentation of the market can also lead to a far greater dependence on packaged software to avoid the need for large in-house design teams; in such cases, software is normally installed by consulting firms. In

general, larger systems users prefer to develop their own in-house programming ability because of their specialized needs; smaller users tend to rely more on the services of local software houses. However, in Venezuela, the systems software market (operating systems, assemblers, and compilers) is fully controlled by CPU manufacturers. The heaviest users of imported software packages are financial institutions, petroleum companies, and public utilities.

The most important component of the data-services industry is data processing, although its relative importance is declining compared to that for software. It includes time-sharing and involves the tabulation, analysis, and other transformation of data inputs into a computer. In 1980, the data-processing market in the OECD countries amounted to $21 billion, over one-half of which was located in the United States (see Table 1.7). Data-processing revenues nearly doubled in the United States from $12 billion in 1980 to $23 billion in 1984; in Western Europe, these revenues doubled from $7 billion to $14 billion. As hardware prices fall, making it less necessary for processing capability to be found externally, the relative importance of data processing in total computer services has declined and that of software increased. Processing services accounted for nearly 70 percent of computer-service revenues in 1978, with software providing only 10 percent.[16]

The following types of data processing are conventionally distinguished:

1. *Local Batch Processing.* This type involves the keying in, by a service bureau, of hard-copy manual data into the bureau's computer for transaction processing. The user has no direct terminal contact with the computer.
2. *Remote Noninteractive Processing.* This type involves the supply of remote batch or deferred processing by service bureaus. Users enter data in a noninteractive mode via a terminal tied to a bureau/network computer.
3. *Interactive Processing.* This type involves the supply of transaction processing or data base inquiries by service bureaus. Users interact via a terminal to access a remote computer.

By placing data processing within the grasp of smaller users, minicomputers and microcomputers may reduce demand for services by service bureaus. However, the larger and more professional bureaus seem to be maintaining a strong position in the market by offering services (notably those involving access to highly specialized software, data bases, or system configurations) that only the biggest computer users can match and by developing software packages, either by themselves or with the help of major computer and software firms. Other computer-service

activities include various professional services and the supply of turn-key computer systems.

In Latin America, a data-processing industry is beginning to emerge. In Brazil, total revenues from data-processing services amounted to $580 million in 1980, of which 90 percent were accounted for by domestic corporations (see Table 1.8). In addition, a number of corporations have in-house data-processing capacities. In 1980, nine of the twenty largest data-processing service companies (including the largest three) were state companies, nine were private national companies, and two were foreign affiliates of transnational corporations (see Table B.6). For all, software is only a secondary activity, although steps are being taken to stimulate this industry.[17] In 1980, the data-processing industry in Mexico was estimated to consist of sixty firms of which forty have one to twenty employees, seventeen between twenty and fifty employees, and three over fifty employees; total sales in 1977 were estimated at approximately $25 million.[18] In Chile, the data-processing industry has been declining since mid-1970 because of the diffusion of minicomputers and microcomputers. Service bureaus have begun to concentrate on such activities as the development of application software and hardware distribution. Although the data-processing industry continues to cater to users that lack in-house installations, this base has stagnated in the last five years.[19] Nevertheless, the industry, jointly with consultant firms and software houses, maintains a sizable dimension. Even though revenue figures are not available, the importance of the data-processing industry can be determined by the fact that it controls 26 percent of the Chilean computer park (312 units).[20] In Paraguay, the number of service bureaus seems to be decreasing because of their high fees and the proliferation of minicomputers.[21] In Venezuela, the data-processing industry is adapting to the diffusion of minicomputers by offering highly skilled staff, teleprocessing networks, excellent and flexible hardware, and time-sharing; in 1980, the industry controlled 5 percent of the computer park of the country.[22]

Information Storage and Retrieval. The information storage and retrieval industry, sometimes considered part of the computer-service industry, offers access to computerized data bases. The industry consists of data-base providers, vendors, carriers, brokers, and users.

The market for international on-line data bases alone has been estimated at from roughly $1.5 billion to $2 billion in 1979.[23] Although perhaps as much as 90 percent of these revenues accrue to corporations in the United States (see Table 1.9), revenues of Western European corporations operating in this market are growing faster (though on a smaller base) than those of their U.S. counterparts.[24] If projected growth rates (see Tables B.7 and B.8) prove to be correct, business and industry

data bases will gain relative importance, particularly in Western Europe. Revenues in industry and marketing data bases are projected to grow at over 90 percent annually between 1980 and 1985, followed by revenues of business and econometrics data bases (both at almost 80 percent). In the United States, the highest average annual growth rates over the period 1979–1985 are projected to be achieved by natural resources (35 percent) and news data bases (34 percent), followed by marketing and law and accounting (both 30 percent). As a result of these growth rates, it is estimated that the three most important market segments in the United States in 1985 will be credit information ($700 million), marketing ($510 million), and economics and finance ($450 million). In Western Europe, the leading areas are expected to be economics and finance ($320 million), industry ($224 million), and econometrics ($201 million).

The rapid expansion of the market is fueled particularly by the growing conversion of public data bases from an off-line to an on-line mode. The total number of on-line data bases worldwide rose from about 400 in 1979 to over 1,800 in 1983, an average annual growth rate of about 45 percent a year.[25] The completion of public data networks and figures on the growth of network termination points suggest that this growth rate will continue in the near future. In addition, the rapid spread of personal computers, word processors, and dedicated terminals, combined with new technological developments in data conversion, storage, manipulation, retrieval, and transmission will further fuel the growth of this industry, as will increasing awareness and understanding of the importance of information technology. An important impetus could also come from the standardization of data-base access and software, which would increase compatibility among different systems, facilitating communication and reducing learning costs users incur in utilizing new systems.

The data-base industry in Latin America is in its infancy. Brazil, in particular, is taking steps to build up such an industry. Data-structuring companies are being established, especially by the larger newspapers and electronic news agencies. The increasing sales of personal computers, the implementation of the experimental VIDEOTEX public network, and the establishment of a public packet-switching network are expected to lead to accelerated growth of data bases.[26] The government of Brazil is promoting this development in the framework of the largest state-owned data-processing service bureau, SERPRO. This firm is setting up a public economic data-base service, ARUANDA, designed to accommodate up to 200 data bases. In 1983, the data bases that could be used by the public contained information on indicators of the performance of the national economy (IDEN), exporters (EXPORTA), exports (EXP), imports (IMP), and services for business assistance.

Some government agencies also offer data-base services related to their own activities. For instance, the Brazilian federal senate furnishes access to juridical data bases through its informatics center, PRODASEN. The private sector is beginning to offer data-base services as well, with the Rio de Janeiro stock market playing a pioneering role. Public data-storage services are provided only by TELESP, a public telecommunication utility.

Telecommunication Services. Telecommunication technology is evolving rapidly with the increasing application of microelectronics and the development of new transmission infrastructures based on satellites and fiber-optic cables.[27] The ability to send many kinds of messages, including voice, in digital form, using increasingly sophisticated electronic switching is reducing the cost and increasing the variety of telecommunication services. By enabling computers to communicate with each other, new telecommunication services add an international scope to data services (see Table B.9).

Telecommunication systems are used for data services in three ways. First, data can be sent over an ordinary telephone network—the public switched telephone network (PSTN). Because most PSTN are still based on analogue technology, their use for transmitting data messages requires a modem (modulator-demodulator) at each end to convert messages from digital to analogue form and back. As the PSTN are gradually converted to digital technology, use of the PSTN for data traffic will become easier and less costly. Second, most developed countries have created advanced data networks that can transmit much greater volumes of data at higher speeds and accuracy than the PSTN. An eventual goal of many telecommunication authorities is to merge the PSTN and data networks into an integrated-services digital network (ISDN) over which all traffic, voice, and data would flow. The third method of data communications is the use of leased lines. Since public data networks are not universally available and often expensive, most large users of data communications develop private networks using lines leased from telecommunications authorities. Falling between the categories of the data-processing services and the basic transportation of data by telecommunications are value-added data networks. These networks, such as TYMNET in the United States, offer data communication capability, but the data may be processed to a certain extent between the end parts.

Countries in Latin America are establishing more public data-communication networks (Table 1.10).[28] The services offered include specialized data-transmission services, electronic mail, electronic fund transfers, and facsimile. Access to all these services is, of course, somewhat dependent on the availability of telephone circuits (the number of which

has grown steadily), although substantial regional and country variations exist (see Table B.10).

Impact on Existing Industries

Developments in microelectronics have not only led to the emergence of data industries but are also changing the modus operandi of existing industries.[29] Data technologies are finding a widening range of applications in traditional products, processes, and services. In each case, applications depend on data services, especially software, around which these applications are structured and through which they operate. Therefore, as traditional products increasingly incorporate data technologies, they become data goods, which in turn consist increasingly of data services. This means that an increasing volume of data-technology inputs is needed to produce goods and services not themselves primarily related to the distribution or manipulation of information.[30] Four principal consequences are particularly noteworthy.

1. Perhaps most important, the ability to use data technology and to adapt and develop it acquires a critical role in industrialization in general. Because industrial and service production is increasingly based on data technology, a lack of such ability is likely to impose serious constraints on a country's economic development and international competitiveness.

2. The utilization of electronics in traditional industrial and service production tends to reduce the share of the labor cost in the total value of this production. Thus, for instance, the costs of components and materials represented approximately 21 percent of electromechanical calculators; this percentage increased to 65–70 percent for electrical calculators in the 1970s. At the same time, the share of labor decreased from 23 percent to 5–10 percent.[31] This result, of course, has significant implications for all industries in which labor is an important factor of production and for all countries, especially developing ones, in which the labor price has traditionally helped make their industries internationally competitive.

3. Products, processes, and services using data technology frequently become integrated into larger systems of interlinked goods, processes, and services that function through data flows. For example, electronic cash registers in supermarkets have become data-entry terminals linked to a central computer for inventory control and to banks for money transactions. Naturally, all the various elements of such a system do not have to be located in one country.

4. As a result of this general tendency for the data-technology aspect of goods and services to grow, the distinctions between data services,

data goods, and other goods and services, becomes less and less clear. Thus a widening range of goods and services can be classified as data related, and a greater share of both the cost and the value to the user of the goods and services is accounted for by data services.

A striking illustration of this process is telephone switching equipment. Traditionally, such equipment consisted of electromechanical devices. With the advent of microelectronics, electronic switching equipment based on digital techniques was developed, and is now becoming the industry's standard. As the transition to fully electronic switching progresses, a rapidly increasing part of the cost of developing a telephone switching system is accounted for by software development costs, now generally considered to make up at least 60 percent of the costs of designing new systems. The purchaser of such a system obtains a special-purpose computer and associated peripheral equipment plus (and especially) a sophisticated set of operating system, application programs, and programming aids. The dominance of software costs is even more marked from the customer's view point because software maintenance (updating and revising the applications programs) makes up the bulk of postpurchase cost—which during the product's lifetime can equal or exceed the actual cost of purchase. In such instances, it could be argued that the product should be considered as falling within the data-service category. Although this study uses a more limited definition, the blurring of the boundaries between data services and other goods and services should be borne in mind.

This fading of the boundaries between the data-processing industry and other industries is accelerating. Upstream, semiconductor manufacturers (through microprocessor technology), as well as telecommunication equipment manufacturers (through networks and the expansion into informatics industries), are diversifying into the traditional markets of computer manufacturers. Downstream, an increasing number of manufacturing corporations are incorporating data-processing devices into their final products. In some cases, computer manufacturers have been induced to diversify into activities that use their computers and into upstream operations, notably semiconductor manufacturing. In other cases, manufacturing enterprises that use data-processing equipment extensively are moving into the computer industry. In a recent example of the latter, in June 1984 General Motors Corporation acquired Electronic Data Systems (a market leader in the computer-service industry), for $2.6 million—a move that will certainly strengthen the automobile company's data-processing capabilities.[32] Thus, the computer industry is becoming less and less isolated from other industries, and data-processing equipment is becoming less and less an individual piece of

equipment with specific tasks but is rather incorporated and mingled into a "computerized" good.

These transitions can easily be documented (see Table B.11). In the area of consumer goods, the introduction of such products as pocket calculators, home computers, and video games has received widespread attention. Other widely used examples are watches, clocks, home entertainment equipment, domestic appliances (microwave ovens, refrigerators) and cameras. Consumers can realistically expect that an increasing range of products will become computerized until the automated home is a reality.

In the industrial sector, the use of products and processes based on microelectronics is also increasing rapidly. The electronics, mechanical engineering, automobile, and machine-tool industries have been leaders in this respect, but almost all other industries—including such traditional ones as textiles, clothing, and leather—have also begun to incorporate microelectronic components (see Fig. 1.3). This process is aided considerably by the fact that data technologies can make short production runs economical, through flexible equipment such as numerically controlled machine tools and machine centers, robots, and computer-aided design and manufacturing (CAD/CAM). The growing use of such equipment in one of the principal markets, the United States, is documented in Table 1.11. This development was described in a recent OECD study: "Whereas ten years ago, computerized numerical control was an extremely costly technique, seldom found in numerically-controlled machine tools, it has almost become the norm now. Similarly, microprocessors are quickly coming into general use for robot control, and minicomputers in CAD systems."[33]

Data technologies are also having a major effect on service industries. Banking (automated teller machines, electronic funds transfer), the credit-card industry, retailing (electronic cash registers), and air transport (electronic reservation systems) are prominent examples in this respect; the automated office and teleshopping are examples of advances to come. The introduction of data technologies is generally expected to increase considerably the productivity of a range of services and perhaps to narrow the productivity gap between the industrial and service sectors.

The preceding paragraphs highlight another phenomenon: The introduction of data technologies has revitalized industries considered mature or declining, such as the telecommunication and automobile industries. In fact, even an industry like textiles is becoming competitive again in countries thought to have lost their comparative advantage: The textile industries in the Federal Republic of Germany and the United Kingdom are being rejuvenated partly by an increased use of automated processes. The use of data technologies allows better utilization of equipment

(obvious as regards robots), higher quality of products and lower labor costs. In spite of the capital intensity of automation, the last factor in particular has contributed significantly to a leveling of manufacturing costs (see Table 1.12), a development which induced an observer of the garment industry to conclude: "Although it has not happened yet, to a great extent, there is a feeling among the large producers that a large share of offshore production will be brought back" to developed countries.[34] The implications of the spreading use of data technologies, therefore, are far reaching and touch upon the processes of redeployment, the international division of labor, and the patterns of international trade.

Table 1.1 Share of the primary information sector in GDP at factor costs, by selected countries and years

Country	Year	Share (%)
Australia	1968	15
France	1962	19
	1973	19
Japan	1960	8
	1965	14
	1970	19
Norway	1975	16
	1980	14
Sweden	1970	17
	1975	18
	1980	19
United Kingdom	1963	16
	1972	22
	1980	26
United States	1958	20
	1967	24
	1972	25
Venezuela	1978	10

Sources: OECD, "Information activities, electronics and telecommunication technologies: impact on employment, growth and trade," DSTI/ICCP/84.2 of 7 February 1984, p. 8, and SELA, Permanent Secretariat, "The information sector in the Latin American economy," SP/CL/IX.0/DT no. 24 of 1 August 1983, p. 54.

Table 1.2 The market-economies market for data-processing equipment, by market segment, 1982

Market segment	Value (billion dollars)	Percentage of market value	Estimated annual growth rate a/ 1982-1987	1987-1992
Computers	35	45	10-12	5-8
Peripherals	30	38	8	8
Terminals	13	17	6	4
TOTAL	78	100	9	7

Source: Arthur D. Little, Financial Times, 21 March 1983.

a/ Based on constant dollars.

Table 1.3 The market-economies market for data-processing equipment, by region and market segment, 1982

Country/region	Market segment (%)			
	Computers	Peripherals	Terminals	TOTAL (%)
United States	50.1	50.5	58.5	51.7
Western Europe	31.1	32.7	21.5	30.1
Japan	12.8	10.6	15.4	12.4
Other	6	6.3	4.6	5.8
TOTAL				
Percent	100	100	100	100
Billion dollars	35	30	13	78

Source: Arthur D. Little, Financial Times, 21 March 1983.

Table 1.4 Distribution of general-purpose computers, by region, 1980

Region/country	Population 1980 (%)	GNP 1979 (%)	General-purpose-computer installed base, 1980		Number of CPUs per million inhabitants	Value of installed base/GNP
			Units (%)	Value (%)		
Developed market economies						
United States	5.4	24.4	34.3	42.6	248	2.5
Western Europe	8.4	31.3	27.9	28.3	131	1.3
Of which European Community	6.2	23.9	23.9	24	151	1.4
Japan	2.8	10.5	14.7	11.4	208	1.5
Other a/	1.6	4.5	4.3	4.8	104	1.5
Subtotal	18.2	70.7	81.2	87.1	176	1.8
Eastern Europe	7.5	8.7	13.1	8.7	54	1.4
Developing countries						
Latin America	8	6	3.3	2.3	15	0.5
Africa b/	7.4	2.2	0.3	0.2	2	0.1
Southeast Asia c/	52.3	9.6	1.6	1.3	1	0.2
Middle East	4.2	2.5	0.5	0.4	4	0.2
Subtotal	71.9	20.3	5.7	4.2	3	0.3
TOTAL worldwide	100	100	100	100	39	1.4

Source: Transnational Corporations in the Data-Processing Industry, UN publication, forthcoming.

a/ Canada, Australia, and South Africa.
b/ South Africa excluded.
c/ People's Republic of China included.

Table 1.5 General-purpose computers in Latin American countries, by region of origin, beginning of 1981 (million dollars and numbers of units)

Region	United States: IBM	United States: Others	United States: Total United States	Western Europe	Japan	TOTAL
Brazil						
Value	1,089	431	1,520	5	44	1,569
Number	1,698	704	2,402	21	59	2,482
Mexico						
Value	320	205	525	1	-	526
Number	779	385	1,164	10	-	1,174
Caribbean						
Value	110	56	166	17	-	183
Number	275	93	368	68	-	436
Other Latin America						
Value	585	241	826	4	-	830
Number	925	427	1,352	9	-	1,361
TOTAL Latin America						
Value	2,104	933	3,037	27	44	3,108
Number	3,677	1,609	5,286	108	59	5,453
TOTAL developing countries						
Value	3,661	1,646	5,307	287	113	5,721
Number	5,951	2,559	8,510	734	125	9,398

Source: International Data Corporation (IDC).

Note: Throughout this text "-" means zero or close to zero; "..." means not available.

Figure 1.1 The components of the computer-services industry

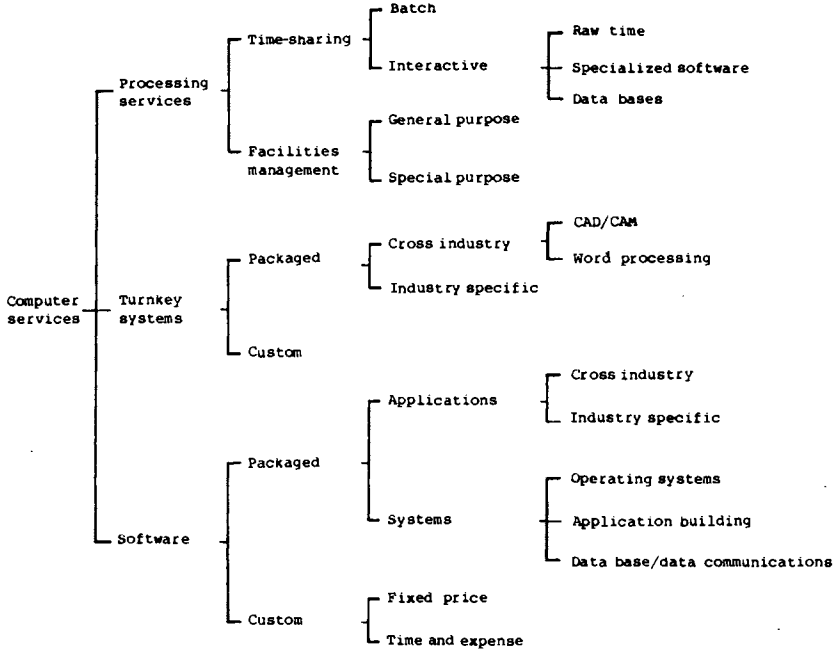


Table 1.6 Revenues of computer-services industries in major countries, 1982-1983 (million dollars)

Country	Year 1982	Year 1983 a/	Annual increase 1982-1983 (%)
United States	26,430	31,600	20
Japan	3,662	4,320	18
France	2,040	2,380	17
United Kingdom	1,490	1,730	16
Germany, Fed. Rep. of	1,220	1,350	11
Canada	956	1,140	19
Italy	818	960	17
TOTAL	36,616	43,480	19

Source: United States, Department of Commerce, U.S. Industrial Outlook 1984 (Washington, Government Printing Office, 1983), pp. 27-29.

a/ Estimated.

Table 1.7 International software and data-processing services, by country and region, 1980 and 1984 (billion dollars)

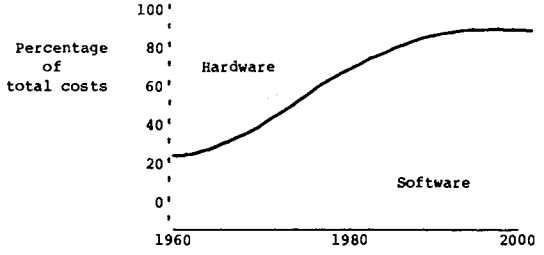
Country/region	1980 Software	1980 Data processing	1984 a/ Software	1984 a/ Data processing
Japan	0.65	2.1	...	...
United States	2.4	11.8	6.6	23.3
Western Europe	1.1	7.0	4.0	14.0
TOTAL	4.15	20.9	...	...

Source: Data from INPUT (based on unpublished sources).

Note: These estimates exclude sales of software included in the sales of hardware manufacturers and software developed by firms using computers and other automated devices (robots, automated teller machines, etc.).

a/ Estimated.

Figure 1.2 Relative hardware and software costs faced by users of large computer systems



Source: United States, Congress, Office of Technology Assessment, International Competitiveness in Electronics (Washington, D.C., 1984), p. 86.

Table 1.8 Revenues from data-processing services in Brazil, by group of corporations, 1980

Group of corporations	Revenues	
	Million dollars	Percentage
National corporations		
State	420	72.4
Private	100	17.2
Subtotal	520	89.7
Foreign affiliates	60	10.3
TOTAL	580	100

Source: Transborder Data Flows and Brazil: Brazilian Case Study, UN publication, Sales no.E.83.II.A.3, p. 216.

Note: Services include computer power, software, consultant services, and training.

Table 1.9 Revenues for the on-line data-base market, for the United States and Western European countries, 1980 and 1985

Country/region	Revenues (millions of dollars		Average annual growth rate, 1980-1985 (%)
	1980	1985 a/	
United States	1,170	4,227	30
Western Europe	124	1,398	62
United Kingdom	54	397	49
France	12	305	91
Italy	10	110	61
Germany, Federal Republic of	7	149	84
Other	41	437	61
TOTAL	1,294	5,625	34

Source: Transborder Data Flows: Access to the International On-line Data-base Market, UN publication, Sale no.83.II.A.I.

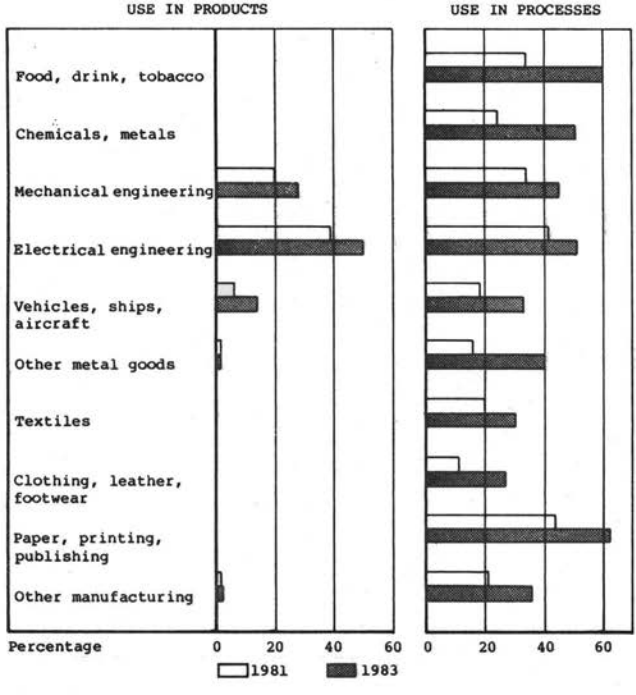
a/ Estimated.

Table 1.10 Public data-communication infrastructure in Latin America

Country	Network	Characteristics	Year established	International gateways	Number of nodes
Argentina	ARPAC	Packet-switched network	1982	Yes	4
Brazil	Transdata	Digital leased lines	1980	Yes	13
	RENPAC	Packet-switched network	1984	Yes	6
Chile	Red Publica Transmision de Datos	Packet-switched network	1982	Yes	9
Mexico	Telepac	Packet-switched network	1982	Yes	4
Paraguay		Leased telephone lines		...	
Panama	Intelpaq	Packet-switched network	1983	Yes	...
Uruguay		Leased telephone lines		Yes	

Source: UN Centre on Transnational Corporations, based on national sources.

Figure 1.3 The use of microelectronics technology in various industries in the United Kingdom, 1981 and 1983



Source: Jim Northcott and Petra Rogers, Microelectronics in British Industry: The Pattern of Change (London, Policy Studies Institute, 1983).

Table 1.11 Industrial electronic equipment markets in the United States, 1981-1986 (million dollars)

Equipment	1981	1982	1983	1986 a/
Numerical control systems	199	265	372	998
Automated testing equipment	969	1,109	1,421	2,676
Measurement systems	198	240	269	394
Process control equipment	1,289	1,481	1,604	2,529
Computerized energy management equipment	441	571	721	1,550
Industrial robots	191	217	290	537
Computer-aided design systems	312	451	745	1,801

Source: OECD, Software: An Emerging Industry (Paris, OECD, 1984), p. 101.

a/ Estimated.

Table 1.12 Manufacturing cost per electronic device (dollars)

Process	Hong Kong	United States
Manual	0.0248	0.0752
Semi-automatic	0.0183	0.0293
Automatic	0.0163	0.0178

Source: Global Electronics Information Newsletter (October 1982) as cited by Rada, "Advanced technologies and development: Are conventional ideas and comparative advantage obsolete?" Trade and Development: UNCTAD Review, No.5, 1984, pp. 275-297.

2

The International Dimension

Types of Data-Service Transactions

Services, like goods, can be brought to foreign markets through trade and foreign direct investment. Traditionally, attention in trade matters has focused on trade in goods. As defined by the International Monetary Fund (IMF), trade usually involves transactions between residents of a country and nonresidents.[35] Service transactions can actually cross borders (for example, passenger services, shipping, data processing, information storage and retrieval, advertising, motion pictures), or they can be undertaken within a country between residents and nonresidents (tourism and port and airport services). If trade in official services (for example, expenditures by diplomatic and military personnel abroad) is added to that for private services, one obtains a value for nonfactor services, as used in balance-of-payments statistics; this category, as defined by the IMF, constitutes trade in services.[36] Values for factor services—income derived from direct and portfolio investment abroad as well as interest received on loans—are normally not included in the trade-in-services discussions; they are linked to foreign direct investment, not trade.

In 1982, world merchandise exports amounted to $1,700 billion; they have increased at an annual average growth rate of 17 percent in nominal terms since 1970 (see Table B.12). In the same year, the export value of services amounted to $680 billion, having increased at an annual average growth rate of 18 percent since 1970. For developing countries, merchandise exports increased by 19 percent over the same period, and exports of services increased by 22 percent. In other words, the service exports of developing countries grew faster than those of the world as a whole. In the period from 1975 to 1982, merchandise exports grew at 13 percent, and service exports grew at 16 percent. Again, the developing countries' growth of service exports was greater than that of the world

as a whole. Thus, the share of services in total world exports has been increasing. It is, of course, possible that the increasing share of services does not reflect the growing importance of services (alone) but rather a relatively faster increase of prices for services.

In 1981, revenues for factor services amounted to $223 billion, with an annual average growth rate of 21 percent since 1970.[37] Nonfactor services consist of travel ($99 billion in 1981, having grown at an annual average rate of 15 percent since 1970), transport ($134 billion in 1981, having grown at an annual average rate of 16 percent since 1970), and other services. The last group includes a variety of services, such as banking and insurance, patents, assembly work and repair, licences, copyrights, construction activities, and data and data services. Trade in these services amounted to $128 billion in 1981, having grown at an annual average rate of 18 percent since 1970.

Those services that are not storable and do not lend themselves to transportation and trade (either cross-border trade or transactions within a country between residents and nonresidents) can be provided abroad through foreign direct investment (that is, services produced directly in a foreign market). Following the IMF definition, foreign direct investment is usually understood to mean "investment that is made to acquire a lasting interest in an enterprise operating in an economy other than that of the investor, the investor's purpose being to have an effective voice in the management of the enterprise."[38] Such investments usually are undertaken by corporations (which thus become transnational corporations) through the establishment of foreign affiliates.[39] This type of development is particularly the characteristic of such activities as banking, insurance, hotel services, and value-added networks, but it also applies to air transport, newspaper agencies, and engineering and software consultancies which, although involving tradable services, require facilities abroad to provide supporting maintenance and similar services.

During the period from 1980 to 1982, worldwide annual average foreign-direct-investment flows amounted to $38 billion, of which $11 billion went to developing countries—over one-half of it to Latin America (see Table B.12). Data on investment flows in services worldwide are not available; even for those countries for which values for investment flows in services are available (see Table 2.1), no separate data exist for investments in data services. For each of these countries, foreign direct investment in services has increased since the mid-1970s at a faster rate than did total foreign direct investment. In the United States, the total accumulated value of foreign direct investment rose by 8 percent between 1976 and 1982 and that for services rose by 9 percent. In the Federal Republic of Germany, total foreign-direct-investment stock grew by 19 percent between 1975 and 1980, and that for services grew by

21 percent. Given that foreign-direct-investment outlays in services are typically lower than those in manufacturing, stock figures are slow in showing changes in the pattern of investment. Flow figures are, therefore, more indicative. In fact, in the United Kingdom, foreign-direct-investment flows in the second half of the 1970s grew by 28 percent, and those in services grew by 41 percent. In the case of Japan, total flows rose by 13 percent, those in services by 19 percent. Except for Japan, the growth rates of services investment flows to developing countries in general and Latin America in particular were below the total growth rates of services, indicating that the principal expansion of services investments was taking place among developed market economies. For Japan, however, services investment in developing countries (33 percent) and especially in Latin America (39 percent) grew considerably faster than total services investment.

Trade and foreign direct investment in services are, of course, intimately linked with each other. One link has already been mentioned: Trade in services can lead to supporting direct investment in services. Second, trade and foreign direct investment in certain services (for example, data processing) can be substituted for each other. Third, foreign direct investment in one service can be linked with trade in another service (for example, investment in software abroad can lead to telecommunication-services trade). Finally, many service industries rely increasingly on data services like information storage and retrieval, which are either provided locally or traded; in the latter case, however, the service can only be provided if (in this particular example) access is granted to the local (telecommunication) infrastructure.

A paper prepared for the Canadian task force on trade in services captured this situation as follows:

> Trade in services can be simply defined as the purchase of a service by an entity in one country for which payment is made by an entity in another country. An example of this type of transaction would be the purchase by a U.S. corporation of a data processing service offered by a Canadian computer service bureau. The exact nature of the transaction will depend on the way the service is provided. One possibility would be for the Canadian service bureau to serve its U.S. customer entirely from a Canadian location through telecommunications lines. This is a "pure trade" situation and corresponds closely to the definition given above. Another possibility would be for the Canadian service bureau to establish a data centre in the U.S. and serve its customers exclusively from this centre. This would be a "pure investment" case. Only the patriation of returns on this investment and investment flows would appear in the trade picture here. A third possibility would be for the Canadian service bureau to serve its U.S. customers from a Canadian data centre

> but establish a U.S. office to provide local support. This situation would in fact be a combination of the trade case and the investment case, and both trade flows and investment-related flows are taking place here. This third case (or variations on it) tends to be the most common in practice.[40]

In this quotation, three ways in which international transactions in data services can be made are distinguished: Trade, direct investment, and transactions requiring market presence.

The noteworthy feature of the pure trade case is that the advent of transnational computer-communication systems permits a disembodied service (in this case, data processing)—which to be rendered normally would require (because of its nonstorable nature) a presence in the foreign market—to be provided through trade. The only thing needed to provide this service (but this is a precondition) is the permission to utilize the international telecommunication infrastructure—analogous to using the international railway or shipping infrastructure for the traditional trade in goods. Other examples of pure trade of this type are access to data bases, time-sharing, and utilization of telesoftware (the remote access to software).

Pure trade as a mechanism for reaching foreign markets is also an option for embodied data services, such as computer tapes carrying software, or any other good having a software component. However, the need to service equipment with a high data-technology content may necessitate some form of foreign direct investment.

The pure foreign direct investment case is, of course, an option available in all data industries to the same extent as it is an option in other industries and services. Instead of exporting embodied or disembodied services from the home country, foreign affiliates can be set up to service the local market. For certain disembodied services, however, the trade/foreign direct investment alternative does not exist. These services require, if they are to be rendered, foreign direct investment, although the asset value of this investment may bear no relationship to the volume of transactions to which it gives rise. For instance, software-consultancy services involve a classic nontradable service that, however, may be dependent on continuous access to data bases abroad to be effective. Similarly, the establishment abroad of value-added networks like TYMNET involves leasing lines from relevant suppliers (mainly post, telegraph, and telephone (PTT) authorities) and perhaps installing specialized network-management equipment. Since many services remain largely nonstorable, foreign direct investment in services remains the most important way for many service corporations to operate in foreign markets.

Another factor that makes pure trade transactions in the international sale of data services difficult is the growing importance of locally provided data maintenance and servicing operations for goods with a high data-technology content. Such a close interrelationship between foreign-direct-investment and trade transactions is, of course, not a new phenomenon. For instance, trade in automobiles has always depended to a degree on the establishment of an automobile servicing network. But with the growing complexity and especially the increasing software content of certain traded products, supporting investments appear to be becoming more important; this sequence has occurred, for instance, in the telecommunication and computer industries. Modern digital switching systems and computers generally need continuing servicing and therefore require the constant presence of the manufacturer in the market. Hardware and software maintenance costs as a percentage of systems costs are estimated to increase from 15 percent in 1981 to 18 percent in 1985 and to 20 percent in 1990.[41] The export of a product with a high data-technology content may require an investment in a local data industry and perhaps a continuing link to a central data base. In other words, in these situations trade in goods relies heavily on close and continuing contact between producers and consumers. Increased trade in goods with high data-technology (and especially software) content may make this type of situation more frequent.

The case of transactions requiring market presence combines foreign direct investment and trade in data services along the lines previously discussed. In the example given in the Canadian study, the purpose is to provide local support for a service bureau located abroad. It could also involve a situation in which certain activities are carried out by the foreign affiliate, whereas others (for instance, more complicated ones) are undertaken in headquarters. Perhaps a clearer situation exemplifying the close interrelationship between trade in data services and presence in a foreign market involves the provision of highly complex software packages. In principle, such packages could be exported as an embodied service; however, these packages usually require extensive adaptation or have to be designed locally. Thus, this service can frequently only be exported if the exporter is permitted to be present in the importing country and to establish a longer-term working relationship with the importer. Again, continuing on-line access to a central data base may also be required to ensure effective adaptation to local conditions and ongoing maintenance.

The distinctions between pure trade, foreign direct investment and transactions requiring market presence in data services—schematically presented in Figure 2.1—are not clear cut. To an extent, the various ways in which data services can be delivered to foreign markets can

be substituted for each other, although they may also be complementary. In addition, the need to be present in a foreign market to render a service (discussed here only in the context of the third transactions category) could easily be expanded into the category of pure trade. For, although the services mentioned in this category are tradable, they can only be traded if exporters can deliver them and importers can receive them; this sequence may require that the exporter install (and perhaps maintain) the particular type of equipment needed.

Most important, technological developments are pulling the services sector in different directions. On one hand, transnational computer-communication systems have made trade an option in areas in which the rendering of services required foreign direct investment in the past: In other words, some nontradable services have become tradable, and, as a result, foreign direct investment for them may become less important. On the other hand, the growing data-technology content of many traded products may well require increasing foreign direct investment for maintenance and servicing. In either case, technological developments appear to lead to increased possibilities for trade and foreign direct investment in data services and hence a stronger desire to be present in foreign markets or to establish facilities in them. Thus, although conceptually different, a continuum exists between foreign direct investment and trade in data services. This blurring of boundaries is likely to increase with the growing complexity of modern products and production and their rising data-technology contents, on the one hand, and the services and servicing requirements associated with them, on the other.

Emphasizing the links between foreign direct investment and trade is meant to show that measures in one area are likely to affect the other; it is not meant to obscure the clear distinction between these types of transactions. One type involves international trade issues, and the other ownership issues in a domestic context. Although from the corporations' viewpoint the strategy question may be whether (regulations permitting) to choose trade or foreign direct investment to serve a market, governments' considerations are different, depending on which type of transaction is involved. The policy and regulatory regimes differ accordingly, as do the underlying principles informing them. Thus, although the governing principle of the international foreign-direct-investment regime is that each country has the sovereign right to admit or not to admit foreign direct investment,[42] the policy of the international trade regime, as enshrined in the General Agreement on Tariffs and Trade (GATT), is that trade is to be admitted freely (subject to certain clearly defined conditions).[43] These differing principles on the "right of establishment" and the "right to sell" have to be taken into account

when discussing international policies applicable to services. The choice of the governing principle and the choice of the type of transaction may well influence the character of any international public-policy framework that may eventually emerge.

Difficulties in Assessing International Transactions in Data Services

Measuring trade in data services is difficult.[44] Trade in goods is normally recorded, for customs purposes, at the border. Since most data-service trade is not subject to tariffs, no such comprehensive recording mechanism exists and most data-service trade goes unrecorded.[45] The available data often have no historical depth (especially those for developing countries) and are highly aggregated. On the latter point, the IMF statistics do not distinguish data services as a separate category but include them in "other goods and services." This category contains a number of diverse services, including nonmerchandise insurance, communications, advertising, and management services. Since many of these belong to the category of dynamic growth services, their aggregation within such a broad category is proving to be a considerable obstacle to meaningful analysis. Finally, although it collects data on direction of trade in goods, the IMF does not provide such data for service trade.

Further limitation in assessing the importance of trade in data services is the difficulty of quantifying these transactions. An observation regarding general services applies fully to data services: "The measurement of price and volume changes for most services remains primitive and rudimentary. There is little understanding about the nature of the physical units in which most services should be quantified, and consequently their prices are also vague and ill defined."[46]

For example, software is increasingly incorporated in hardware and not sold separately, and the value of this software can only be estimated. Moreover, when software is transported across borders on disks or tapes, tariff is charged according to the value of the physical container, which, of course, bears no relationship to the value of software itself. When software is transported across borders via telecommunication lines (telesoftware), the transaction is recorded only in terms of the costs of the telecommunication service. For telecommunication services (for example, telephony), used between two countries between which the connecting agreements provide that revenues from border-crossing traffic are to be divided on a 50:50 basis, only net figures are reported. Moreover, it is practically impossible to separate data traffic from nondata (voice) traffic, particularly when both services are provided over the

PSTN. Finally, no indications are available for the volume of traffic over international leased lines. The fact that trade in data services is a new phenomenon (not more than ten years old) further explains why little statistical attention has been paid to it.[47] To deal with this situation, proxy measurements and qualitative evaluations have to be utilized.

Quantitative assessments of trade in data services are further complicated by the fact that only a relatively small share of this trade—perhaps less than 20 percent—occurs on a commercial basis (that is, at arm's-length prices in the market). At the present time, this market trade consists primarily of trade in data processing, software, and information storage and retrieval services. The same services are, of course, also rendered within transnational corporate systems, in the form of intrafirm trade. In fact, most corporations have their in-house computer service facilities and enter the market only to buy specialized services. In addition, the whole range of corporate functions within transnational corporations increasingly utilizes transborder data services. (As will be suggested, some of these services may have the potential to become market transactions themselves, but so far this involves merely exceptions, involving primarily a few closed user group networks.) No figures on the value of corporate transborder data services exist. An impression of their importance can perhaps be gleaned from the fact that Citicorp (the world's largest bank-holding corporation in terms of assets) is implementing a $500 million program to develop its own transnational computer-communication system, which has about 7,000 customer connections worldwide.[48] Under these circumstances, much of the assessment of international trade in data services has to rely on a qualitative rather than quantitative discussion of the importance of transborder data flows for transnational corporations.

A problem of a different nature is to distinguish telecommunication from data-processing services. Since these two industries are merging and an increasing number of activities depends on both, their designation as one or the other becomes almost arbitrary. The need to distinguish between the two is not only required for measurement purposes but, more important, for policy purposes, because telecommunication activities have traditionally been closely regulated, whereas data-processing services have not.[49]

Another problem is to measure embodied data services. As already mentioned, software is often provided as part and parcel of equipment and not sold separately. This lack of distinction, therefore, causes the figures on data services to be utilized. A related question is whether products whose software share is higher than, for instance, 50 percent of their value should actually be classified as a good or a service. In this book, the traditional approach is followed and those items are

considered goods, although some of them can serve as proxy measures of the data-service industries.

The situation is even more serious as regards foreign-direct-investment statistics. The IMF collects aggregate data from member countries on their total inflows and outflows of foreign direct investment. These data do not distinguish between investments in the goods and services sectors, nor do they furnish information on the direction of foreign-direct-investment flows. The OECD secretariat reports investment flows from each of the member countries of the Development Assistance Committee to individual developing countries but also without distinguishing between goods and services.[50] A researcher must, therefore, rely on national data, which are very incomplete. A general problem concerns the meaning of the value of a foreign-direct-investment outlay in services. The recorded investment value of a software consultancy firm established abroad, for instance, normally stands in no comparison to the actual importance of such an establishment in terms of the business it creates. This situation is complicated further by the growth of nonequity forms (management contracts, licensing agreements, subcontracting) of relations between corporations in different countries; although some of these forms may turn domestic corporations into quasi-foreign affiliates, little is known about their overall effects.

Since the importance of trade and foreign direct investment in data services has been recognized, efforts have been initiated to remedy this situation. The OECD, for example, has begun to develop statistical series on the data industries as part of the work program of its Committee for Information, Computer and Communications Policy. The Bureau of Economic Analysis of the U.S. Department of Commerce intends to include detailed questions pertaining to services in its annual sample survey of foreign direct investment; within this survey, computer and data-processing services will be identified as a separate industry.

At present, however, the status of statistics on trade and foreign direct investment in data services is dismal. Transactions are underreported by an unknown but probably significant factor or not reported at all. The available data indicate orders of magnitude at best. The paucity of data seriously limits any analysis of trade and foreign direct investment in data services.

Trade and Foreign Direct Investment

Microelectronics-based technologies have led to the emergence of data industries, and these have changed the modus operandi of existing industries. Both these impacts have implications for international economic transactions, although the problems reviewed in the preceding

section make it difficult to assess them in detail. As the use of computers spreads throughout economies, and the cost of computing and communications decreases, data services are becoming an increasingly important economic activity. But the international market for these services, although developing rapidly, is still small. The United States and Western Europe account for a large part of the market both in terms of supply—in some cases the United States is virtually the sole supplier—and in terms of demand. However, data services are an activity of growing interest to developing countries, not only in and of itself but also because of its impact on other economic activities, including international service transactions, trade, foreign direct investment, and the activities of transnational corporations.

In the next sections, the impact of data technologies on international economic transactions will be reviewed: The rise of trade and foreign direct investment in data services and, as a proxy measurement, in data goods; the incidence of derived data-service transactions; data services as the infrastructure for trade in goods and services as well as foreign direct investment; and the emergence of new forms of international trade.

International Transactions in Data Services

The emergence of data industries has, of course, given rise to trade and foreign direct investment in these industries. Both forms of international transactions, in which transnational corporations play a central role, belong to the most dynamic segments of trade and foreign investment, and a few developed market economies are particularly important as the originators of such transactions. Developing countries participate in international data-resource transactions mostly as consumers that import data resources through either trade or foreign direct investment, although a few countries have begun to export such data resources as software, data entry, and equipment.

Foreign Direct Investment. No systematic data exist on foreign direct investment in data services, and, hence, the magnitude of this form of international transaction is unknown. An impression can, however, be obtained from selected data on the foreign-direct-investment activities of transnational corporations in the data industries, especially on their revenues generated abroad and their foreign-affiliate networks. But these data do not distinguish between data goods and data services. Because in most cases data goods constitute the most important part of the activities of foreign affiliates, these activities are discussed in the next section. However, because the boundaries between data goods and data services are blurred, the figures on the activities of transnational cor-

porations abroad may give a good indication of the importance of international transactions in data services related to foreign direct investment.

Trade in Computer Services. The scale of trade in computer services is difficult to ascertain because few studies of this sector have been primarily concerned with trade. Those studies that do focus on trade normally fail to distinguish clearly between trade revenues and revenues of foreign affiliates of computer-service corporations, in many instances linking both categories together as operations in foreign markets. Partly for these reasons, researchers substantially disagree over the size of the total market for computer services and their estimates often range widely. For most countries, the share of the computer-service industry's revenues obtained from abroad seems to be below 10 percent, with the notable exceptions of the U.S. and French industries, both of which seem to accrue 15 to 20 percent of their revenues abroad (see Table 2.2). Statistics on trade in computer services also are underreported because most appear to exclude at least two relevant categories of trade-related sales: (1) Many firms sell software through licensing arrangements, and there is little information on fees or royalties earned through such sales; (2) a number of software firms, particularly those in Japan, have joint ventures with firms abroad that code and debug software programs.[51] Since such subcontracting can entail considerable cost reductions, it is likely to increase toward the end of the 1980s.

The size of international trade for the U.S. computer-service industry is perhaps the best documented; most data, however, are from industry sources because no official source for such data exists. In 1981, the Association of Data Processing Service Organizations (ADAPSO) reported in its annual survey of U.S. companies with over $10 million in annual revenues that U.S. exports of software and computer services amounted to $3 billion, up from $2.4 billion in 1980 (see Table 2.3). Exports of software products accounted for 22 percent of total software revenues, whereas exports in the other three categories accounted for only 12 percent of total revenues for those businesses. These data seem to indicate that for U.S. companies, language and cultural factors do not significantly impede software exports.

One problem with U.S. data is that they may not accurately report foreign sales of computer services by U.S. computer hardware manufacturers. In Western Europe, six of the largest ten suppliers of computer services are U.S.-owned firms, and three of these are major hardware manufacturers. According to a report by the U.S. International Trade Commission: "Of the estimated $17 billion in foreign computer and data processing services in 1981, an unknown, but possibly significant, amount is tied to the sale of computer equipment. Beyond the initial

provision for services in the sale of hardware, an unknown, but possibly substantial, amount of services is provided by the producer of the hardware or its affiliates."[52] The commission's report estimated foreign billings by U.S. firms in the computer-services sector to have been $2.2 billion in 1980, $3.0 billion in 1981, and $4.0 billion in 1982, based on discussions with industry and association representatives and secondary sources. These revenues could have been considerably higher if the size of the computer-services industry is defined differently. For example, Input, Ltd., valued the U.S. domestic market for computer and data-processing services at $17 billion in 1980, ADAPSO estimated worldwide computer-services revenues of U.S. firms at $15 billion in 1980, and a *Forbes* article estimated such revenues at $13 billion in the same year.[53]

Another problem in assessing the trade dimension in computer services is that foreign sales are composed of both exports from the home country and sales by foreign affiliates. That sales by foreign affiliates are considerable is reflected in the fact that (taking into account the software component of hardware sales) foreign transactions account for a considerable share of total firm revenues; they make up over 50 percent for such corporations as IBM, National Cash Register (NCR) Corporation, and Hitachi (see Table 2.4). Few countries collect separate data on these two categories of foreign sales. An exception are special studies done in France, although the data exclude computer-service foreign affiliates of computer producers and those computer-service firms that obtain more than 75 percent of their sales from their parent corporations. These statistics show that 20 percent of total of French computer-service revenues is earned abroad, with 12 percent from foreign affiliates and 8 percent from exports (see Table 2.5). The largest share of French foreign sales (57 percent) is in Western Europe, the closest foreign market; the second most sizable market is in Africa, a continent closely related to France in language (see Table 2.6). French firms are also making a substantial effort to enter the U.S. market through foreign affiliates. It appears that foreign sales will grow at about the same rate as total revenues or at a slightly slower rate (see Table 2.5).[54]

Developing countries' share in software trade is minimal, although some countries show considerable increases. Revenues from Indian exports, for instance, increased from $0.7 million in 1975-1976 to $24 million in 1982-1983 (see Table 2.7). Indian corporations with links to transnational corporations account for the lion's share of the exports: Of the two major software exporters in India, one is a subsidiary of an Indian corporation with a contractual arrangement with a number of foreign transnational corporations; the other is a joint venture between an Indian and a U.S. corporation—which indicates that linkups with

transnational corporations may play an important role in generating software exports. Nonetheless, the share of domestic corporations in software exports has increased steadily from 13 percent in 1980-1981 to 25 percent in 1982-1983. This increase is partly the result of a software export promotion scheme devised by the Indian Department of Electronics. Under this scheme, the Department of Electronics permits the import of computer systems if certain software export commitments are accepted. Products being exported include systems for financial institutions like banking and insurance; systems for airline reservation, cargo, check-in, crew scheduling, interairlines billing, and aircraft inventory; operating systems, including compilers for Basic, Pascal, Cobol, Fortran, as well as assemblers, linkage editors, utility software, data-base-management software, and query and report writers; and graphics software for layout of printed circuit boards and engineering design.

The major software markets for developing country industries are the United States, the countries of Western Europe, and the USSR. Between 1980 and 1982, for example, the USSR purchased Indian software for a total value of $5 million. In addition, during 1982 two subsidiaries of an Indian corporation received contracts totaling some $30 million for writing software for international banking computer programs.[55]

Software firms from developing countries use three basic approaches in exporting their products. By the first approach, programmers and analysts from a firm in a developing country undertake specified projects in a developed country for a given period. The second arrangement involves a developed country's contracting work to a developing country where the work is performed. Third, packages developed locally are exported. The maximum benefit for a developing country is realized when the work is done within its territory. The comparative advantage of developing countries in the production of software is discussed in Chapter 3.

Latin American countries are exporting software mostly by following the second and third approaches. For instance, in 1980 the University of Chile developed a data-retrieval package for Burroughs Corp., which is sold in the international market under the name of TEXTRIEVE.[56] Brazil and particularly Mexico are exporting software to other Latin American countries and Spain. A number of foreign affiliates of U.S. software houses—such as Cullinet and McCormack & Dodge—have been established in Mexico to develop software particularly suited for Spanish-speaking users; the affiliates export it to Spain and other Latin American countries.[57]

Trade in Information Storage and Retrieval. As discussed previously, the number of computer-readable data bases, of data-base records

contained in them, and of on-line uses for such records has increased dramatically during the early 1980s. However, little information exists on the value of trade in information storage and retrieval. Since on-line data bases are routinely accessed from abroad—especially within Western Europe and between Western European countries and the United States—the already considerable volume of trade may be expanding rapidly with the increasing number of on-line data bases available.

Latin American countries are overwhelmingly importers of information storage and retrieval services. In Mexico, for instance, the Servicio de Consulta a Bancos de Informacíon (SECOBI) is providing users in Mexico with access to on-line data bases in the United States through the TYMNET data-transmission network.[58] SECOBI provides services to two types of users: (1) The over-the-counter user, utilizes the services sporadically and its consultations are handled by SECOBI's own terminals in over ten locations in Mexico; (2) the terminal users, because of the scope and frequency of their activities, and their minimum service need of over twenty hours per month, require terminal installation in their offices. Over-the-counter enquiries increased from 230 users in 1976 to 2,078 in 1981, for an average annual growth rate of 55 percent (see Table 2.8). The principal users are people from universities and the private sector who seek information about medicine, psychology, agriculture, and chemistry. For in-office service, 118 terminals had been installed by 1981; the total number of hours used (and those of SECOBI itself) increased from about 600 in 1976 to about 7,000 in 1981 (see Table 2.9). The DIALOG and ORBIT systems accounted for three-fourths of hours of on-line use in 1986.

In Brazil, several information-retrieval services provide access to data bases abroad, mostly for commodity and currency quotations.[59] Furthermore, EMBRATEL, the Brazilian public telecommunications company, has established INTERDATA, a public international on-line database service that operates through an international data-communication gateway. This service permits users in Brazil to access data bases in the United States and Western Europe and vice versa. Since INTERDATA began operation in January 1983, the traffic through the public international data-communication gateway increased to 10,503 minutes by the end of January 1984 and 13,172 minutes by the end of February 1984 (see Fig. 2.2). INTERDATA provides access to 150 data bases of the DIALOG Information Service, over 70 data bases of the SDC-System Development Corporation, over 30 data bases of Telesystemes-Questel, and the data bases of Dow Jones Company.

Telecommunication Services. Growing world trade and especially the greater use of transborder data flows by an increasing number of transnational corporations are increasing the demand for international

communication services. Global telecommunication networks are carrying a growing variety of information, far beyond the scope of the simple voice and record messages that still make up the bulk of the traffic. The capabilities of and regulations concerning telecommunication networks are important factors affecting the diffusion of data services and many other activities that depend on data services.

In 1979, 60 percent of world traffic over telephone-grade circuits was routed over the transatlantic axis, and about 20 percent over the transpacific axis.[60] The volume of international data traffic on the telephone network seems to be increasing by 20 to 30 percent annually; within Western Europe data traffic exceeds traffic on the telex network by a considerable margin.[61] An important role in the growth of international data traffic is played by international value-added networks, the most important of which are EURONET, TELENET, TYMNET, and UNINET (see Table 2.10).

The growth of data traffic is also reflected in the rapid increase in the number of network-termination points, that is, points at which user equipment (normally a computer terminal) is connected to a transmission network. In Western Europe, 5 percent of all computers were connected with telecommunication lines in 1970; in 1985, this proportion is projected to be 40 percent.[62] In absolute figures, the number of network-termination points in Western Europe has increased from about 100,000 in 1972 to approximately 400,000 in 1979, and the number is expected to quadruple again by 1987 (see Tables 2.11 and 2.12). The United Kingdom, the Federal Republic of Germany, and France together currently account for three-fifths of these network-termination points, a share expected to decrease to one-half by 1987. Compared to that in the United States, however, the extent of computer communication in Western Europe is still small: In the United States, the number of network-termination points rose from 500,000 in 1972 to 2 million in 1979. This difference remains when the absolute number of network-termination points is standardized by the number for persons in the working population. For the United States, this figure was (in 1979) 24.3, for Western Europe, 3.5. These figures suggest that, on the basis of network-termination points alone, data transmission in Western Europe is only one-fifth of that in the United States—a ratio that has not changed since 1972.

Forecasts suggest that the number of transactions between data-communication users per average working day in Western Europe will increase from approximately 136 million transactions in 1979 to almost 800 million in 1987; the share of international transactions of these is expected to rise from 10 to 15 percent (see Table 2.11). The countries with the highest volume of transborder data flows are the United

Kingdom, Sweden, Belgium, the Federal Republic of Germany, and Italy, which together account for three fourths of Western Europe's total transborder data flows (see Table 2.12). The United Kingdom's very high share of nearly one quarter in this total appears to be founded on that country's function as the principal gateway of data flows from Western Europe to the United States (more than 3 million daily transactions, or 25 percent of all Western European international data transactions, are destined for the United States). Sweden's high share reflects the fact that a number of time-sharing bureaus and transnational corporations with international networks are located in that country, whereas Belgium—or, more precisely, Brussels—has traditionally been the site for headquarters or regional headquarters of transnational corporations and also for some data networks such as the Society for Worldwide Interbank Financial Telecommunication.

In the United States, revenues earned from international communication services increased from $1.2 billion in 1976 to $2.7 billion in 1981 and were estimated to rise further to $3.2 billion in 1982; domestic revenues amounted to $84 billion in 1981.[63] AT&T alone earned $1.8 billion from international services in 1982, which represented about 5 percent of AT&T's total long-distance revenues.[64]

The development of international leased lines can also be used to measure the extent of data-related telecommunication services (and trade in data services in general) as most data traffic utilizes these lines. A study undertaken for the OECD area examined the growth of the international leased-line network (which can carry both voice and data communication) among sixteen member countries of the OECD, which include all major members of that organization.[65]

According to the study, the number of international leased lines for data traffic increased substantially between 1976 and 1981 and at a considerably faster rate than leased international lines in general (see Table 2.13). The total number of leased international lines rose from nearly 9,000 in 1976 to almost 15,000 in 1981; of these, more than 3,000 carried data in 1976, compared to nearly 6,000 in 1981. If the United States and Canada are excluded (because a substantial number of their international lines had already been installed before 1976 and because quasi-public data networks had been fully operational for several years), the respective numbers are approximately 4,000 and 8,000 for international lines in general and 1,000 and 3,000 for data-carrying lines. Annual growth rates for individual countries typically ranged from 5 to 20 percent for international lines in general but 10 to 30 percent for data-carrying circuits.

Possibly reflecting the degree of economic interdependence, most international data traffic in 1981 took place between neighboring coun-

tries. For instance, 97 percent of the leased data lines originating in Canada terminate in the United States, and 77 percent of those originating in the United States terminate in Canada; 61 percent of Switzerland's data links are with neighbors, as are 53 percent of those of the Federal Republic of Germany. As a result, two principal regional clusters of data traffic can be distinguished: North America and Western Europe. The two clusters are linked with each other mainly by the United Kingdom, which seems to occupy the position of an intercontinental and intra–Western European data-traffic hub. The principal international data-traffic hub, however, is the United States: In 1981 nearly one-third of the United Kingdom's data lines, 97 percent of the Canadian, 86 percent of the Australian, and 71 percent of the Japanese terminated in that country.

International Transactions in Data Goods

Data goods are increasingly acquiring a data-service content that for large computer systems has reached a level of approximately three-fourths of their costs to users. Information on international transactions in data goods—in light of the lacunae of systematic information on international transactions in data services—can, therefore, be used as a proxy variable for international transactions in data services. As in the area of data services, such information is not systematically available for foreign direct investment, but the situation is considerably better for information on trade in data goods.

Foreign Direct Investment. The largest computer and data-processing equipment corporations derive a substantial share of their revenues from operations abroad (see Table 2.14). For most of the largest corporations, their foreign revenues are almost as important as their domestic revenues, and for a few foreign revenues grew faster than domestic revenues between 1981 and 1982. The part of these revenues accruing from data goods and that from data services cannot be ascertained, although the bulk is probably derived from data goods.

A large part of foreign revenues are generated by foreign affiliates. A survey of twenty transnational corporations in the computer-equipment industry revealed that, at the beginning of the 1980s, more than one-half of 533 foreign affiliates identified were located in Western Europe and 30 percent in developing countries (see Table 2.15). Seventy-eight of the 164 developing country foreign affiliates were located in Latin America. Of these, 56 were linked to U.S.-based transnational corporations (with IBM, with 15 units, being the most important), 16 to Western European firms (with Olivetti alone accounting for 11 of them), and 6 to Japanese transnational corporations; the main location of

Japanese foreign affiliates in this industry is the developing world, accounting for 13 of the 21 affiliates identified. A number of these affiliates (such as Olivetti and IBM) are producing typewriters, consumer electronics (some Japanese transnational corporations), and, increasingly, peripherals; however, a number also provide data services.

In the semiconductor industry, whose boundaries are blurring with the computer industry, practically all principal corporations have established foreign affiliates in developing countries, mostly for the assembly of standard integrated circuits (see Table B.13); a number of these affiliates are in Latin America (see Table 2.16). However, the growth of foreign direct investment in that industry appears to have slowed down, partly as a result of a drop in demand between 1979 and 1982 and partly because corporations in this industry are expanding their capacities (especially for newer components) in their home markets, using automated equipment to produce at competitive prices.

Foreign direct investment in data industries is likely to increase substantially in the future. In addition, joint ventures and cooperation agreements among transnational corporations in this industry are quite frequent and may become more so in the future (see Table B.14 and Fig. 2.3). The most important factor responsible for this trend is perhaps the already-mentioned blurring of the boundaries between data goods and other goods and services. As a result, computer equipment manufacturers that desire to expand in related areas may employ cooperation agreements, joint ventures, or acquisitions, rather than the costly development of their own technology; the joint ventures between IBM and Rolm Corporation and between Olivetti and AT&T are examples of this strategy. Another factor is that technological developments in the computer equipment industry are very research-and-development intensive, and companies may find it necessary (especially for reasons of economies of scale) to share the costs of research and development (see Table 2.17); examples of this include the cooperative effort in Japan on the fifth-generation computer and the establishment of the Microelectronics and Computer Corporation in the United States, a joint venture of computer and semiconductor corporations in research and development. Third, many corporations, especially in the United States, Western Europe, and Japan, seem to be cooperating to maintain and expand their market share vis-à-vis the industry's leader, IBM. Fourth, closely related to the third approach is the desire to gain access to other markets or to improve marketing arrangements. Most large corporations (with the notable exception of IBM) have a number of these cooperation agreements and joint ventures; U.S. corporations lead the field. A long-term effect of this development could be that the number of arm's-

length transactions in data goods and services may decrease relative to transactions that are subject to various interfirm arrangements.

Trade. In trade, the overwhelming share of exchanges takes place among the market economies in developed countries. In 1980, these countries accounted for 98 percent of exports and 92 percent of imports of automatic data-processing equipment; the share of developing countries was 2 and 8 percent, respectively (see Table B.15). Data for the early 1970s show no improvement in the relative position of the developing countries as exporters of computing equipment. In 1980, exports from the United States, the European Community, and Japan accounted for 37 percent, 45 percent and 4 percent of world exports, respectively, amounting together to 86 percent of total data-processing equipment exports. For the same year, the three regions absorbed 4 percent, 55 percent, and 5 percent of imports, respectively, for a total of 64 percent of world computer imports. Obviously, the United States, the European Community, and Japan are still the main manufacturing base of computers.

The pattern of trade flows (see Table 2.18) shows distinct trading zones: Exports from European Community countries are mainly directed toward Western Europe, which receives 82 percent of their total exports; for developing countries, African and Middle Eastern countries receive the bulk of their imports from the European Community. Japan has the most regionally balanced structure of trade; it ships more than 29 percent of its exports to the United States, 28 percent to Western Europe, and 26 percent to developing countries, especially in Asia and Oceania. The United States exports mostly to Western Europe and receives a large part of its imports from that area, as well as from Canada. Overall, therefore, Western Europe receives a fair proportion of its computer equipment from the United States; Western Europe, in turn, sells its production mainly to other Western European countries. Japan relies heavily on U.S. goods but has begun to penetrate foreign markets worldwide. Developing countries are linked to the three main manufacturing areas according to geographic proximity: Africa and the Middle East to Western Europe, Latin America to the United States, and Asia to Japan. Japan is also an important supplier for Latin America, principally Brazil, whereas the United States is doing the same for East Asia and Southeast Asia.

Latin American countries have increased their imports almost continuously between 1975 and 1980 (see Table 2.19); the principal importers are Brazil, Mexico, Venezuela, and Argentina. In 1978, Brazil had actually the sixteenth largest country market for computers and office equipment, followed closely by Mexico (twentieth), Argentina (twenty-fourth) and Venezuela (twenty-sixth) (see Table B.16). Also included in the top fifty

country markets were Chile (forty-third) and Colombia (forty-seventh). The highest growth markets in Latin America between 1977 and 1978 were in Mexico and Brazil, which had increases in market value 51 percent and 43 percent respectively. Compared with the other major import markets, Mexico had the sixth highest growth rate and Brazil the tenth highest.

The four principal importing countries in Latin America are also the most important exporters of computer equipment (see Table 2.20). In 1978, the four countries together exported almost $100 million of computer equipment, compared to imports of $236 million. Brazil's increase in computer exports is impressive, quintupling between 1975 and 1981 from $39 to $199 million. Venezuela's exports have also increased significantly, but the actual values remain small with $4 million in 1978.

In direction of trade flows, Japan is by far the most important export market for both Brazil and Argentina (see Table B.17). A very large proportion of Latin American exports are products of IBM, which has several manufacturing facilities throughout the area (see Table B.18). The presence of foreign affiliates also explains part of the imports since much of the equipment imported is assembled for local consumption or for re-export to other countries. In a number of countries, re-export reflects performance requirements to which computer producers are subject. For example, the Brazilian Special Secretariat of Informatics (SEI) authorized IBM to assemble the 4331-MG2 processor on the condition that 363 machines are exported and 242 are sold locally between 1979 and 1983 to users of the 360 and 370 models.[66] SEI also authorized IBM to manufacture 12,384 disk drives model 3370; 4,714 of these could be sold locally between 1982 and 1984, and the remainder had to be exported. In Mexico, IBM is exporting seven systems for each sold in the country;[67] the main markets for these are located in the Far East. In 1984, without being required by the government, IBM exported 90 percent of its printers produced in Argentina to Japan. IBM is not the only company with this kind of international hardware flows: Burroughs also exports from its largest overseas subsidiary, located in Brazil.

Derived Data-Service Trade and Foreign Direct Investment

In the section on the impact of data technologies on existing industries in Chapter 1, many of the effects of the increased use of data technology were identified. They included the tendency for traditional products, processes, and services to become data-based products, processes and

services and the integration of many of them into larger systems that function through data flows. Through the emergence of data-based activities in other countries and through their export by trade and foreign direct investment, these processes are internationalized. To the extent that they are accompanied by, or lead to, data-service transactions, derived data-service transactions take place.

Such transactions can have two principal sources. One involves required continued linkages between products, processes, or services in two different countries in the form of trade in data services. Such links may be established, for instance, when a complicated production facility, a sophisticated manufacturing process, the use of CAD/CAM, or research-and-development activities require on-line connections, for instance, to access data bases. Such a situation may also develop when an exported product is serviced via transnational computer-commmunication systems. Although most of these linkages are infrafirm within transnational corporations, they can certainly be established between independent parties as well. In many instances, they may represent an umbilical cord without which certain activities cannot be carried out or only at a considerably less-efficient level.

The other source manifests itself through foreign direct investment. To remain viable or efficient, a trade or foreign-direct-investment transaction may invite a data-service investment, principally for maintenance or general servicing. For instance, electronic telephone switching equipment, numerically controlled machine tools, and complicated software packages require continuing servicing. To the extent that this cannot be done via transnational computer-communication systems or through the use of indigenous capabilities, foreign direct investment in certain data-service activities may be needed.

No systematic data exist on the extent to which such derived data-service transactions take place; the extant data are lumped together with information on trade and foreign direct investment in general data services. It is, however, safe to assume that the importance of such transactions will increase as the data technology spreads, the associated activities are organized in systems, the complexity of products, processes, and services grows (and with it the likelihood for needed maintenance), and the telecommunication infrastructure improves and becomes cheaper (thus permitting remote diagnosis and maintenance).

The spread of data technology can be illustrated by the growing trade in numerically controlled machine tools. Trade in these machine tools has increased faster than trade in other machine tools (see Table 2.21). For instance, in Japan, where this trend was most pronounced, the share of numerically controlled machine tools in total machine tools increased from 24 percent in 1970 to 71 percent in 1981; in the United Kingdom,

the share went up from 9 percent in 1977 to 16 percent in 1981 and 23 percent in 1982. Since software is an important part of this equipment, certain numerically controlled machine tools can be expected to eventually become integral parts of transnational computer-communication systems.

Thus, as industrial production based on microelectronics is becoming more common and automation processes and other services acquire a higher data-technology content, data-service transactions derived from them will increase as well.

Infrastructure: Trade in Goods and Services

Data flows via transnational computer-communication systems are increasingly being used to facilitate, monitor, and direct trade in goods and services. By allowing real-time large-scale processing, storage, retrieval, and manipulation of information, transborder data flows are becoming the informational infrastructure of international trade.[68] This trend is most apparent in certain information-intensive industries.

International air transport, the credit-card industry, banking, and insurance all require extensive information flows, which are increasingly carried out in computerized form. Not only do data flows allow these industries to offer traditional services more efficiently, they also allow the development of new data-based services. Though the precise characteristics of this impact differ among the various service industries, four cases illustrate the nature of the forces at work. In each case, the availability of a high-quality infrastructure for international data communication and the use of transborder data flows have permitted a new generation of transnational service corporations to provide new products that respond to the growing internationalization of economic activity.[69]

In the air transport industry, extensive information flows are necessary to coordinate the airplanes, crews, passengers, and cargo that make up an international transportation network. Airlines have been able to improve the efficiency of their international operations greatly by using data flows. The principal mechanism is the Société international de télécommunications aéronautique (SITA) formed in 1947. Based originally on telex, SITA is now made up of a worldwide network of leased lines that carried nearly 6 billion messages among 243 airlines in 115 countries in 1982.[70] The most important service offered by SITA is flight and reservation information. More advanced services such as meteorological information and credit-card authorization are also available. SITA plans to add further services such as cargo and baggage handling, air-to-ground communications, and flight planning.

For small airlines and for the airlines of many developing countries, SITA is extremely useful, because it provides access to a wide range

of information and services that would be very expensive to generate otherwise. By making the operations of small airlines more efficient, the data services embodied in SITA enhance trade in air transportation services. Although large airlines derive efficiency benefits from the use of SITA, many also maintain private data networks that provide capabilities beyond those of SITA. For instance, private networks allow airlines to improve the efficiency of many internal operations such as crew scheduling and maintenance. Because a private network provides guaranteed access and a faster response time than SITA, reservations and other services are often obtained more efficiently from a private network. Such a network can also allow airlines to offer their passengers a broader range of services than are available from SITA. By providing access to more extensive data bases, for example, private networks allow airlines to provide hotel and rental reservation services and tourist information. The cost of a private network is normally justified by increased efficiency and by the enhanced competitiveness derived from offering travel services beyond basic transportation. Here, data services allow a new range of international services.

In the credit- and charge-card industry, new and complex challenges have arisen because of the greater national mobility of card holders who increasingly wish to use a card domiciled in one country to make transactions in another. This challenge is compounded by the growing number of persons who utilize credit and charge cards and the widening range of establishments that accept them. Companies providing credit and charge services compete by widening the customer and receptive-establishment base, encouraging (through higher credit or charge ceilings) the greatest use of cards, and reducing the delay between the use of a card and payment. These strategies could not be implemented at an international level without centralized card verification and authorization procedures, which minimize the risk of fraud, and efficient and high-speed procedures for transmitting transactions information. These functions consequently depend heavily on transborder data flows.

In banking, these flows have enabled banks to handle more efficiently the rapidly increasing volume of financial transactions from world trade and tourism and from international capital markets. At the same time, international banks are providing new transborder-data-flow–based services that respond to the changing needs of transnational corporate clients. In particular, banks are making available to corporate customers the international cash management services they originally developed for their internal foreign-exchange management needs. These services, which facilitate the handling of exchange rate risk in transnational corporations, also allow international banks to make further use of their large and increasingly sophisticated internal communication networks;

over the long term, they seem likely to induce international banks to provide electronic information services at the worldwide level.

Similar to airlines, banks have established an interbank data network for international transactions, the Society for Worldwide Interbank Financial Telecommunication (SWIFT). SWIFT began operations in 1977 with 518 member banks in fifteen active member countries. By mid-1983, SWIFT encompassed 1,073 banks in thirty-seven active countries (see Table 2.22), including 81 member banks in five Latin American countries (see Table 2.23). Between 1978 and 1982, the number of messages carried annually increased from 24,596,000 to 248,429,000.[71] Just as SITA is important for smaller airlines, SWIFT provides small banks with the basic services necessary to operate internationally.

Finally, transborder data flows are also affecting the range of services provided internationally by insurance firms, particularly in the property insurance area. The continued internationalization of firms has led to a strong demand in transnational corporations for international insurance coverage—for insurance on a range of facilities worldwide. International insurance firms increasingly use transborder data flows to monitor their exposure to risks held by a single transnational corporate client in several countries and to inform their clients of the evolution of their insurance positions.

Infrastructure: Foreign Direct Investment

Transborder data flows (TDF) are increasingly becoming the infrastructure for the operations of transnational corporations. In fact, the largest part of international data flows takes place within transnational corporations—that is, as infrafirm data flows—to provide data services to the various parts of a transnational corporate system, to speed up communication, to improve management, or to change the manner in which research and development and production are undertaken.[72] Although no estimates exist on the volume of infrafirm flows, foreign direct investment clearly relies increasingly on transborder data flows. As a recent study prepared by the National Telecommunications and Information Administration of the U.S. Government for the U.S. Senate observed: "International data communications have become crucial to the operation of U.S. multinational companies."[73] This statement is echoed in a recent report by Business International, which concluded that transnational corporations "are dependent on computerized flows of information to conduct their business today—and will be more so tomorrow."[74] As a result, the nature of the activities of transnational corporations is changing: They are becoming more integrated, and, perhaps, their affiliates are becoming more specialized. This development,

in turn, has implications for the manner in which international business is organized and affects the countries in which it operates.

Since transnational corporations have also internalized a substantial share of international transactions in finance, trade, and technology, a qualitative appreciation of the importance of transborder data flows for the operations of transnational corporations can help in understanding the overall significance of international data-service transactions.

As a rough estimate, more than 1,000 corporate transnational computer-communication systems are currently in operation, the overwhelming majority of them established by transnational corporations from developed market economies to service their worldwide affiliate networks. Systematic data exist for Japan, where the number of such systems increased from 34 in 1974, to 59 in 1978 and then nearly doubled to 116 by 1980 (see Table 2.24), and for Brazil, where the number of links increased from 3 in 1979 to 29 at the beginning of 1982 and 57 at the end of 1983 (see Table 2.25).[75] As the data for Japan and Brazil indicate, most corporate transnational computer-communication links can be found in service industries, although a substantial number also exists in the manufacturing sector.

Few publicly available studies survey the use of transborder data flows by transnational corporations. The principal ones have been undertaken by the OECD, the Intergovernmental Bureau for Informatics (IBI), and Business International.[76] The primary objective of all three studies was to ascertain the uses and corporate effects of transborder data flows. The studies are indicative of corporate experience with transborder data flows in a large number of firms, and they are consistent in terms of their findings regarding the importance of transborder data flows, the principal uses of these flows, and the benefits that they provide for user firms.

The results of the three projects confirm the growing overall importance of TDF for transnational corporations, and virtually all firms expect this importance to increase in the near future. Thus, for instance, 88 percent of the companies participating in the Business International survey stated that TDF were important or very important for at least one corporate function, a percentage that increased to over 90 when managers were asked to predict importance for 1988. The principal obstacle to the growing use of TDF appeared to arise from inadequacies of the telecommunication network, in particular in developing countries. The IBI survey found, for instance, that about 40 percent of the responding corporations planned to establish computer-communication systems as soon as local conditions permitted; this percentage was equal to that indicating that such systems had already been established. Laws and regulations, on the other hand, appeared to have little influence on the

growth of TDF up to the mid-1980s; forty-four of sixty-two companies that evaluated this matter in the Business International study did not believe that such actions affected locational decisions. This finding is corroborated by data in the OECD study—according to which, on a scale of 0 (no obstacles) to 2 (severe obstacles), laws and regulations scored 0.6 on the average—and by the expansion of transnational computer-communication systems in Brazil (see Table 2.25).

The three surveys also agreed on the relative importance that TDF have for various functions of corporations, allowing, of course, for variations by sectors. Financial management was by far the corporate function in which TDF were most intensively used (Table 2.26). In the OECD study, financial management accounted for 43 percent of total TDF use and reached 64 percent in service industries. In the Business International study, 60 percent of all transnational corporations surveyed rated these flows as important or very important in 1983, and 73 percent gave them these ratings for 1988. This evaluation did not differ substantially between U.S. and Western European firms, although the latter reached a rating of over 80 percent for the future importance of TDF in this area. Financial management was followed relatively closely by marketing and distribution (including ordering, inventory control, invoicing) in its perceived importance to users, although the volume of flows was smaller. TDF were also considered important for production (especially in extractive industries), management (including strategic planning), and research and development (especially in some manufacturing and extractive industries), but less so for personnel and payroll management. Noteworthy are the relatively high ratings for manufacturing, strategic planning, and CAD/CAM/CAE. The last function, in fact, had the highest growth rate in the Business International study: Almost twice as many companies as in 1983 expected TDF to be important in this corporate activity within five years. TDF were also expected to grow in importance in virtually all other activities in most industries.

The benefits that transnational corporations derive from the use of transborder data flows lie, first, in the area of increased corporate efficiency. In the Business International study, forty of sixty-five firms that addressed this issue stated that corporate efficiency had increased as a result of the use of TDF; twenty-five did not address the effect on efficiency directly but felt that their companies had to use transborder data flows because these flows had become a necessary international business tool; only one firm indicated no increase in efficiency. For one-third of the responding firms, transborder data flows opened new business opportunities—in such areas as foreign-exchange management and the

creation and sale of data bases—and eighteen used these flows to introduce new technologies in production.

In a broader context, TDF are a major element in the process by which transnational corporations take advantage of new technological possibilities and adjust to the changing economic environment. More specifically, the OECD study suggests that the use of TDF has had three major efficiency implications: (1) It has encouraged greater integration within transnational corporations, increasing the specialization gains ensuing from closer international interdependence; (2) it has expanded the international supply of new services, such as access to computerized data bases and on-line software maintenance, accelerating the diffusion of technological advances; and (3) it has improved financial management in transnational corporations.

On the sectoral level, the major factor driving the increasing use of transborder data flows by manufacturing companies has been the growing turbulence of the economic environment in which transnational corporations must operate.[77] Slower, more erratic growth subsequent to the 1974 oil price developments, together with profound structural changes in the world economy, has led to intensified international competition, paralleled by greater instability in the international monetary and financial systems. This changed environment has had three major implications for the strategies of transnational corporations. First, given slower growth in demand and output and greater competition on product markets, it has become increasingly important to achieve economics of scale in manufacturing and distribution through the international rationalization and integration of facilities. Second, the reduction of fixed costs has become more important, reflected in attempts to curtail duplication in research and development, to contain the growth of clerical costs and of administration overhead, and to reduce working capital requirements through better inventory management. Third, in face of much more unstable foreign exchange and financial markets, the management of international financial risk has become an increasingly important function in transnational corporations.

Transborder data flows play an increasingly important role in the implementation of these changes in strategic orientation. Transnational computer-communication systems have emerged as the crucial infrastructure for the international integration of production facilities. In effect, integrating production facilities in several countries—each of which produces a specialized part of an overall final product—requires major coordination of data flow to avoid large materials scheduling and inventory control costs. TDF networks provide the speed and accuracy needed to undertake these functions, in particular to coordinate the scheduling of manufacturing and distribution. Transborder data flows

are increasingly used within transnational corporations to contain the growth of fixed costs, thus reducing the firm's break-even point. One aspect of use is the growing automation of clerical tasks and in particular of the order control and billing process. Besides reducing administrative overheads, tighter management of accounts receivable allows firms to improve their cost flow. Equally important in terms of reducing fixed costs is the control of inventory requirements, which increasingly involves the use of computerized international inventory management systems. These systems interface with the computerized systems used for production management, on the one hand, and for billing, on the other; in addition to reducing costs, this interface improves the information available to management for financial control and corporate planning. Finally, given greater turbulence in world financial markets, the control of foreign-exchange exposure and of day-to-day financial strategy has increasingly been transferred in transnational corporations from foreign affiliates to regional or world headquarters. This transfer can only be successful if large volumes of financial information can be transmitted, frequently on a daily basis, from subsidiaries to headquarters and from headquarters to the foreign-exchange markets. TDF links between subsidiaries and headquarters and from headquarters to financial institutions provide a basis for these information flows.

Nonetheless, a number of even large transnational corporations do not utilize transborder data flows or use them only to an insignificant extent. By and large, the distinguishing features of these corporations is that they did not pursue integration strategies, so that the company headquarters has a loose relation to affiliates, similar to that of a holding company. Large information flows between the different parts of the firm were therefore not necessary, and the firm's information requirements could be accommodated by traditional communications media. In some cases, this nonintegrated structure reflects the characteristics of the activities in which the relevant transnational corporations operate; in others, it results principally from the history and management philosophy of the firm.

Moreover, the extent of TDF use differs between transnational corporations from different home countries. By and large, the U.S. firms in the OECD sample seemed to rely more heavily on transborder data flows than did the Japanese ones, with the European firms falling in between, but the extent to which these differences reflected a technological lag, differences in corporate strategy, or the mix of industries in which the firms operated is not clear. Moreover, given the uniform perception by the sample firms of the growing importance of TDF, these differences were likely to diminish over time.

In the service industries, the increasingly widespread use of TDF partly reflects the same economic forces at work in manufacturing. Growing instability in the international economy imposes the same constraints on service firms as on those in manufacturing—in particular, the need to tighten the control of financial risks.

Still, manufacturing transborder data flows appear primarily as an instrument used in implementing corporate strategies for reasons having little connection with transborder data flows themselves. However, transborder data flows play a more direct role in shaping the changing strategies of transnational corporations in the service industries. In particular, transborder data flows have enabled transnational corporations in these industries to expand the range of services they provide internationally. This result is clearly the case in the industries most closely related to information processing, such as computer and information services. Without TDF it would not be possible for data bases located in one country to be accessed in another; similarly, the growing use of on-line provision, diagnostics, and maintenance in computer software can only be extended internationally through TDF.

The picture that emerges from all three studies is that transnational corporations rely considerably—and increasingly—on transnational computer-communication systems. They depend on these systems not only to send messages faster (for ordering, marketing, distribution, invoicing, sourcing) but also to improve management information (which cuts across all areas but is particularly important in such corporate functions as financial control, strategic planning, inventory control) and to change the manner in which corporations actually engage in production activities (in manufacturing, research and development, design and engineering, CAD/CAM/CAE). The importance of transborder data flows for transnational corporations was summarized in the Business International study:

> The ability to transmit, exchange and access machine-readable information around the world has clearly become an important tool for the multinational corporation [MNC]. It is a tool that MNCs are coming to rely on to bring greater cohesion to the management of their geographically far-flung and functionally disparate operations. It is a tool they are counting on in ever greater numbers to gain a competitive edge, or merely to maintain their ability to compete. For many, . . . it is opening up new business opportunities. And, as important as TBDF is today, the survey confirms that it will be even more so in the near future.[78]

New Forms of International Trade

The application of data technologies is leading to the growth of new forms of international trade in that certain traditionally nontradable

services become tradable. This development is entirely new and it is made possible only by the development of data technologies.

As discussed in a previous section in this chapter, corporate transnational computer-communication systems are being used increasingly for a wide range of corporate functions, including financial management, accounting, invoicing, portfolio management, ordering, marketing, foreign-exchange management, inventory control, sourcing, and engineering. Considerable efforts have been made to create appropriate software, adopt efficient procedures, and routinize the work as much as possible.

No reason prohibits making services currently provided via transnational computer-communication systems within transnational corporations available outside these systems. It may be only a question of time until the processes of differentiation, specialization, and standardization of knowledge lead to the emergence of economies of scale that make it economically feasible to move these services out of their corporate framework and into the international market place. In airline reservation, hotel booking, and certain banking transactions, this evolution has already occurred with the establishment of the (commerical) closed user group networks SITA and SWIFT. Similar networks are emerging in other service industries. Thus, data technologies may conceivably make a whole range of disembodied and traditionally nontradable services tradable and, in this manner, create trade options in industries that have had to serve foreign markets through foreign affiliates. Candidates include banking, cash management, accounting, engineering, legal services, insurance, and architectural designs.

In fact, the application of data technology to banking is beginning to permit a measure of trade in a disembodied service without requiring a direct presence in the local market for the generation of international transactions. For instance, electronic banking is becoming widespread and already includes banking from automated teller machines abroad. The number of automated teller machines in the United States alone increased from 4,000 in 1975 to 43,800 in 1983, and these handled about 3 billion transactions in the amount of approximately $260 billion in 1983. The number of automated tellers worldwide is estimated at 103,000.[79] In principle, various local and national automated teller machine systems—7 national and over 200 regional systems existed in the United States alone in 1984[80]—can be linked up relatively easily through cooperative agreements of various banks, thus permitting international electronic funds transfer on a routine basis. SWIFT is an example of these developments.

Another area in which aspects of this process can be observed is cash management. In an age of high interest rates, fluctuating exchange rates, and narrow profit margins, cash management has become a crucial

corporate function, and many corporations have strengthened their capacities in this respect. Corporations can establish an internal cash-management network. For example, a transnational oil corporation has several hundred gasoline stations in several countries. All gasoline stations are requested to report the balance of their daily transactions by a certain time via the corporate computer-communication system to corporate headquarters. Headquarters aggregates all flows, and, by the next morning, the treasurer of the corporation has the exact cash-flow position of the enterprise available. This finding, in turn, permits a precise assessment of what funds should be held in what currency, what funds have to be borrowed and what funds can be placed into money markets to earn interest. Instead of establishing its own data network, the oil corporation could entrust the task of cash management to a transnational bank for a fee. Then all gasoline stations could be asked to deposit their daily balances by a certain time into the bank's local branches (or corresponding banks). The bank then aggregates the cash position and reports the results to the headquarters of the oil corporation.

Both approaches to cash management are being used. In the first, in which industrial corporations bypass banks, corporations begin to perform certain functions traditionally left to banks. In the second, an internal corporate function has been externalized and has become subject to demand-and-supply competition—it has entered the market place.

Banks in this example have a certain advantage because the management of financial resources is one of their principal functions and because many of them began early to create their own computer-communication networks and to produce the software needed for cash management. They can, therefore, offer their networks at a marginal cost to service other corporations. This approach may be particularly attractive to smaller corporations that do not wish to invest the necessary resources to build their own data networks. The costs involved are considerable: The completion of Citibank's worldwide network cost approximately $500 million.[81] Although this figure is clearly not representative, it does show that the establishment of a corporate data network is capital intensive and that savings may be realized by using an established network for different purposes.

This situation is precisely what appears to be occurring and what, in any case, would be economically sound. Once a transnational computer-communication system is in place, it can be used, at least in principle, for a variety of purposes. Banks may have originally established their data networks to improve their internal cash management. From there it is only a small step to open the system to customers for automated teller transactions or to put it into the service of corporate clients for functions like cash management. In fact, since high-speed sophisticated

networks are rarely fully utilized, the scope of the activities can be expanded.[82] The logic of this argument suggests that banks—and any corporation that has its own transnational computer-communication system—can expand the range of data services they offer via these networks, perhaps to the extent of making a large part of the network available to third-party users.[83] Third-party use, however, clashes directly with the interests of many PTTs, which do not wish to see that rapidly growing profitable data traffic is being siphoned off by private networks paying a flat fee for leased lines. Frictions between the owners of transnational data networks and PTTs may, therefore, increase in the future, especially if the latter do not provide state-of-the-art data services.

The underlying reality is that the owners of private and public transnational computer-communication systems are learning that "the global communication network becomes a pipeline of enormous capacity. Once a world information grid is built, the incremental cost of processing or transmitting additional information in that grid is very small. Thus, the incremental cost of adding services which are information-based is very low."[84] This low cost facilitates—perhaps even invites—the externalization of certain corporate functions (that is, the transformation of certain intrafirm transactions into commercially provided services) for those corporations that do not have their own computer-communication networks or do not wish to build certain specialized capacities. For corporations that have such networks, product segmentation may break down as they seek to optimize the use of their networks by offering a variety of services whose only common denominator is that they are data based. Independently of that, the availability of a transnational computer-communication grid provides the infrastructure—and opportunity—for other corporations to offer certain services (such as architectural designs) via telecommunication lines. The result is not only a blurring of the boundaries between service and nonservice corporations but also the growth of trade in traditionally nontradable services.[85]

The likelihood of this occurring raises a host of issues. Basic to all of them is the state of the telecommunication system because, as the price of informatics equipment decreases (while its power increases), the crucial variable for the use and expansion of data services is the quality of the telecommunication system. To put it differently, those who do not have access to a sophisticated telecommunication system will not be able to participate in the new forms of trade in data services. Also important are the regulations that govern the use of telecommunication systems. One of the principal concerns here is the question of third-party use. Regulatory questions may be further complicated by the blurring of the boundaries between the providers of services.

Another set of issues relates to the extent and the impact of replacing foreign direct investment with newly tradable services. Where substitution takes place, it may be necessary to adapt national laws and regulations to the new possibilities. Since many countries limit, for instance, inward foreign direct investment in banking, the question arises whether certain newly tradable banking services may constitute a circumvention of the intention of such regulatory regimes. Similarly, teleservices may substitute, to a certain extent, for the mobility of highly skilled labor. Instead of software specialists or architects moving from one country to another, they can stay where they are and provide their services via transnational computer-communication systems. This result, in turn, has implications for immigration policies and possibly trade policies.[86]

Finally, and perhaps most important to this study, any international discussion of services has to recognize that the rapidly changing data technology is giving birth to a multitude of new opportunities whose applications are difficult to predict and whose utilization blurs established demarcation lines between corporations, industries and services. This ambiguity makes it very difficult to predict the course of the evolution of international trade in services—but it seems certain that a whole range of new forms of service trade will be added to traditional transactions in this area.

Table 2.1 Foreign direct investment in services, selected home countries and years

Country and year	Total foreign direct investment	Foreign direct investment in services		
		World	Developing countries	Latin America
United States				
Stock (billion dollars)				
1973	101	26	7	5
1976	137	40	13	10
1982	221	68	15	9
Annual average growth rates (%)				
1973-1982	9	11	9	6
1976-1982	8	9	3	-3
United Kingdom				
Average flow (million dollars)a/				
1970-1971	1,406	571	114	12
1975-1977	3,255	1,197	369	136
1978-1980	6,857	3,382	840	388
Annual average growth rates (%)				
1970-1971 to 1978-1980	19	22	25	51
1975-1977 to 1978-1980	28	41	31	42
Germany, Fed. Rep. of				
Stock (million dollars)				
1971	7,277	973	329	...
1975	16,013	3,330	1,426	...
1980	37,857	8,910	2,651	...
Annual average growth rates (%)				
1971-1980	20	28	26	...
1975-1980	19	21	13	...
Japan				
Flows (million dollars)				
1973	3,494	1,173	456	218
1975	3,280	1,442	288	88
1982	7,703	4,733	2,070	901
Annual average growth rates (%)				
1973-1982	9	17	18	17
1975-1982	13	19	33	39

Sources: UN Centre on Transnational Corporations, based on United States, Department of Commerce, Survey of Current Business, various issues; United Kingdom, Business Statistics Office, Business Monitor: Overseas Transactions, various issues; Federal Republic of Germany, Ministry of Economics, "Runderlass Aussenwirtschaft," mimeo, various issues; and Japan, Export-Import Bank, Bulletin of the Research Institute for Overseas Investment, various issues.

a/ Excluding oil.

Figure 2.1 Types of international transactions in data services

		What	
		Disembodied services	Embodied services
How	Trade	Data processing Data bases Timesharing	Tapes with software Goods with data-technology content
	Market-presence transactions	Design of complex software packages	Complex software packages
	Foreign direct investment	Software consultancy Value-added networks Maintenance and servicing operations for goods with high data-technology content	Any data service industry

Table 2.2 Foreign sales in the computer-service industry, 1982 a/

Country	Revenue (million dollars)	Percentage of foreign sales 1981
United States	13,800	15-20
Japan	3,350	3-5
Western Europe	8,140	8-12
France	1,690	15-20
United Kingdom	1,490	5-10
Germany, Federal Republic of	1,220	5-10
Italy	820	10-15
Netherlands	580	10-15
Switzerland	410	5-10
Sweden	390	5-10
Denmark	310	3-5
Belgium	290	3-5
Norway	260	3-5
Finland	240	1-3
Spain	230	1-3
Austria	130	1-3
Ireland	60	1-3
Portugal	20	1-3

Sources: Quantum Science, MAPTEK Europe, and MAPTEK USA.

a/ Sales include those of remote computing services, batch processing, software products, and software services. Not included are software products sold by hardware manufacturers.

Table 2.3 Foreign revenues of U.S. computer-service corporations, a/ by service mode, 1980 and 1981

Service mode	Foreign revenue (million dollars) 1980	1981	Percentage of total revenue 1980	1981	Revenue growth 1980-1981 (%)
Processing services	1,005	1,127	10	10	12
Software products	933	1,141	24	22	22
Professional services	353	428	8	8	21
Integrated systems	158	267	7	8	69
TOTAL	2,449	2,963	12	12	21

Source: ADAPSO reports (based on unpublished INPUT sources).

a/ Two hundred and forty-three corporations with over $10 million in U.S. revenue.

Table 2.4 Foreign revenues of the principal software and data-processing corporations, 1981

Corporation	Country	Software a/ (million dollars)	Data processing b/ (million dollars)	Foreign percentage of total
IBM	U.S.	5,800	5,300	57
Control Data	U.S.	717	1,178	33
Digital Equipment	U.S.	658	814	42
Fujitsu	Japan	626	200 c/	5 c/
NCR Corporation	U.S.	614	687	55
Hitachi	Japan	600	150 c/	57 c/
Burroughs Corporation	U.S.	587	613	63
Computer Sciences Corporation	U.S.	...	601	17
Automatic Data Processing	U.S.	...	558	7 c/
TRW	U.S.	267	535	7
Electronic Data Systems	U.S.	...	455	3 c/
Nippon Electric	Japan	452	...	...
Hewlett Packard	U.S.	563	352	51
CII-Honeywell-Bull	France	541	...	...
ICL	UK	481	...	...
WANG	U.S.	403	...	...
XEROX	U.S.	367	...	...
Olivetti	Italy	325	...	...
Nixdorf	FRG	300	...	...
General Electric Information Services Co.	U.S.	225	350	30
Storage	U.S.	277	...	...
Data General	U.S.	229	118	35
Texas Instruments	U.S.	200	...	...
ITT	U.S.	162	...	...
Tandy	U.S.	160	...	...
Apple Computer	U.S.	160	...	...
McDonnell Douglas Corporation (Automation Co.)	U.S.	113	226	...
Harris Corporation	U.S.	...	209	20

Source: Transnational Corporations in the Data-Processing Industry, UN publication, forthcoming.

a/ Estimates of the software component of hardware sales.
b/ Software packages and products and services sold separately.
c/ Estimated.

Table 2.5 Foreign transactions of French computer-service firms, 1978-1980

Item	1978	1979	1980	Growth rate 1979-1980 (%)	Estimates for 1981 Value (million francs)	Estimates for 1981 Growth rate 1980-1981 (%)
Total revenues	5,400	6,900	8,500	23	10,500	24
Revenues by foreign affiliates	657	900	1,070	19	1,350	26
Exports	440	510	610	20	730	20

Source: France, Ministère du Redéploiement Industriel et du Commerce Extérieur, "Les sociétes de service et de conseil en informatique" (Paris, DIELI, various years).

Table 2.6 Geographical distribution of computer-service sales abroad by French firms, 1980

Region	Exports (million francs)	Percentage of total revenues	Sales by foreign affiliates (million francs)	Percentage of total revenues	Value (million francs)	Value Percentage
Western Europe	138	23	824	77	962	57
Eastern Europe	79	13	-	-	79	5
Middle East	45	7	16	2	61	4
Africa	182	30	88	8	270	16
North America	77	13	130	12	207	12
Latin America	64	10	5	-	69	4
Others	25	4	7	1	32	2
TOTAL	610	100	1,070	100	1,680	100

Source: France, Ministère du Redéploiement Industriel et du Commerce Extérieur, "Les sociétes de service et de conseil en informatique" (Paris, DIELI, various years).

Table 2.7 Software exports from India, 1975-1983

Year	Total value (million dollars)	Type of enterprise: Indian ventures	Indian enterprises with contractual relations with foreign transnational corporations	Joint ventures
1975-1976	0.7	...	...	...
1976-1977	1.6	...	...	...
1977-1978	2.0	...	...	...
1978-1979	...	...	...	...
1979-1980	4.4	...	...	...
1980-1981	8.0	1	4	3
1981-1982	14	3	7	4
1982-1983	24	6	11	7

Sources: O. Vikas, "Indigenous development of computer systems, peripherals and computer communication facilities," Electronics, Information and Planning 5 (August 1978): 773-842: India, Engineering Export Promotion Council, "Report of EEPC computer software delegation to USA" (New Delhi, 1983), mimeo, and Indian Department of Electronics.

Table 2.8 Over-the-counter users, by user group, 1975-1981

User	1975	1976	1977	1978	1979	1980	1981	Cumulative 1976-1981
Private sector								
Number	-	81	159	110	147	279	166	942
Percentage		35.2	32.7	15.8	12.8	16.9	7.9	14.9
Public sector								
Number	-	74	107	101	143	79	125	629
Percentage	-	32.1	22.0	14.5	12.4	4.7	6.0	10.0
Students								
Number	-	-	40	301	601	914	1,226	3,082
Percentage	-	-	8.2	43.2	52.3	55.4	58.9	49.0
Researchers								
Number	-	55	82	134	190	178	166	805
Percentage	-	23.9	16.9	19.2	16.1	10.8	7.9	12.8
Others								
Number	-	20	97	50	67	197	395	826
Percentage	-	8.6	20.0	7.1	5.8	11.9	19.0	13.1
TOTAL								
Number	-	230	485	696	1,148	1,647	2,078	6,289
Percentage	-	100	100	100	100	100	100	55.3

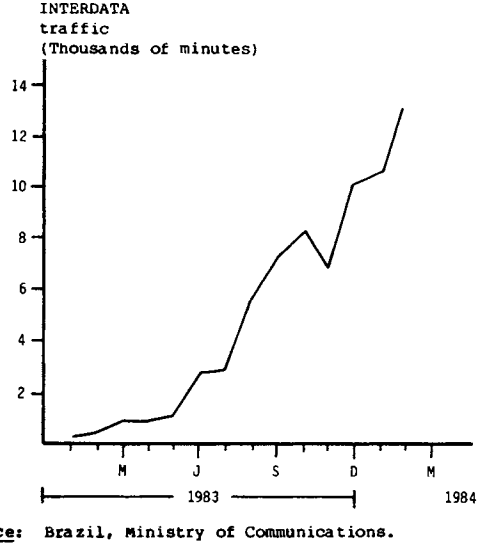
Source: Transborder Data Flows: Access to the International On-line Data-base Market, UN publication, Sales no. E.83.II.A.1, p. 135.

Table 2.9 Use of on-line data-base services, by service, 1975-1981

Service	1975	1976	1977	1978	1979	1980	1981
DIALOG							
Hours of use	-	488	843	1,061	1,614	2,913	4,145
Growth rate (%)	-	-	72.7	52.1	25.8	80.4	42.2
ORBIT							
Hours of use	-	110	338	654	1,035	782	1,065
Growth rate (%)	-	-	207.2	93.4	58.2	-24.4	36.1
New York Times							
Hours of use	-	-	-	103	152	187	220
Growth rate (%)	-	-	-	-	47.5	23.0	17.6
Data Resources, Inc.							
Hours of use	-	-	-	-	-	353	552
Growth rate (%)	-	-	-	-	-	-	56.3
BRS							
Hours of use	-	-	-	-	-	-	22
Growth rate (%)	-	-	-	-	-	-	-
Questel							
Hours of use	-	-	-	-	-	-	10
Growth rate (%)	-	-	-	-	-	-	-
Others							
Hours of use	-	-	-	-	-	-	700
Growth rate (%)	-	-	-	-	-	-	-

Source: Transborder Data Flows: Access to the International On-line Data-base Market, UN publication, Sales no. E.83.II.A.1, p. 135.

Figure 2.2 Traffic on Brazil's public international data-communication gateway, January 1983–February 1984



Source: Brazil, Ministry of Communications.

Table 2.10 Countries linked by regional and international public data-transmission networks, 1982

TELENET (United States)	TYMNET (United States)	UNINET (United States)	EURONET (European Community)	Nordic Data Network (Scandinavia)
Argentina	Argentina	Argentina	Austria a/	Denmark
Australia	Australia	Australia	Belgium	Finland
Austria	Austria	Austria	Denmark	Norway
Bahrain	Bahrain	Bahrain	Finland	Sweden
Belgium	Belgium	Belgium	France	
Bermuda	Bermuda	Bermuda	Germany, Fed. Republic of	
Canada	Canada	Canada	Greece a/	
Chile	Chile	Denmark	Ireland	
Denmark	Denmark	Finland	Italy	
Dominican Republic	Finland	France	Luxembourg	
Finland	France	Germany, Fed. Republic of	Netherlands	
France	Germany, Fed. Republic of	Hong Kong	Portugal	
Germany, Fed. Republic of	Hong Kong	Israel	Sweden	
Hong Kong	Israel	Italy	Switzerland	
Ireland	Italy	Japan	United Kingdom	
Israel	Japan	Kuwait	Yugoslavia b/	
Italy	Luxembourg	Netherlands		
Japan	Mexico	New Zealand		
Kuwait	Netherlands	Norway		
Luxembourg	New Zealand	Philippines		
Mexico	Philippines	Qatar		
Netherlands	Portugal	Saudi Arabia		
New Zealand	Singapore	Singapore		
Norway	Spain	Spain		
Philippines	Sweden	Sweden		
Portugal	Switzerland	Switzerland		
Qatar	United Arab Emirates	United Arab Emirates		
Saudi Arabia	United Kingdom	United Kingdom		
Singapore	United States	United States		
Spain				
Sweden				
Switzerland				
United Arab Emirates				
United Kingdom				
United States				

Source: Compiled from annual reports.

a/ Under negotiation.
b/ Under consideration.

Table 2.11 Main features of data communication flows in Western Europe, 1979 and 1987

Feature	1979 (thousands)	1987 a/ (thousands)
Network-termination points	393	1,620
PTT-connected terminals	625	3,960
Transactions per average working day	136,000	790,000
International transactions per average working day	13,000	116,000

Sources: Eurodata Foundation, "Eurodata '79: study synopsis" (London, n.d.), and T. Johnson and D. Lewin, "International data communications: volumes and applications" (London, Logica Ltd., n.d.).

a/ Estimated.

Table 2.12 Number of network-termination points (NTPs), NTPs per 1,000 working population, volume of transborder data flows, and flows to the United States, by country, 1972, 1979, and 1987 (thousands and percentage)

			1979					
						Transactions to United States per day		
Country	1978 GNP per capita (dollars)	1972 number of NTPs	Number of NTPs	NTPs per 1,000 working popula- tion	Inter- national trans- actions per day	Number	As percentage of international transactions	1987 number of NTPs a/
United States	8,612	500	2,000	24.3	...	...	...	...
Western Europe								
United Kingdom	4,955	32	117	5.2	3,100	2,100	68	377
Germany, Federal Republic of	9,278	17	62	2.8	1,500	140	9	230
France	7,908	13	54	3.0	690	60	9	241
Italy	3,076 b/	10	46	3.2	1,400	140	10	198
Spain	3,625	4	25	2.8	300	30	10	121
Sweden	9,274	5	20	5.7	2,300	220	10	92
Netherlands	8,509	4	17	4.1	480	40	8	74
Denmark	9,869	3	12	4.6	180	15	8	47
Switzerland	12,408	3	11	4.8	630	260	41	48
Belgium	9,025	3	9	3.0	1,600	150	9	64
Finland	6,090	1	7	3.2	360	30	8	33
Norway	7,949	1	7	3.6	100	8	8	28
Austria	6,739	...	4	1.6	120	10	8	36
Ireland	2,711 b/	0.2	1	1.3	50	4	8	8
Portugal	1,816 c/	0.5	0.8	0.3	60	6	10	8
Luxembourg	10,040	0.1	0.7	5.2	150	15	10	3
Greece	3,209	0.1	0.6	0.4	80	7	9	7
TOTAL								
Western Europe		97	393	3.5	13,000	3,200	25	1,620

Sources: Eurodata Foundation, "Eurodata '79: study synopsis" (London, n.d.); T. Johnson and D. Lewin, "International data communications: volumes and applications" (London, Logica Ltd., n.d.); Michael E. Beesley, Liberalisation of the Use of British Telecommunications Network (London, Her Majesty's Stationery Office, 1981); and Monthly Bulletin of Statistics, 34 (June 1980).

a/ Estimated.
b/ 1977.
c/ GDP per capita on purchasers' values.

Table 2.13 International leased lines among OECD countries, 1976 and 1981

Region/country	All lines		Data lines		Data lines as percentage of all lines		Annual average growth rate(%) 1976-1981	
	1976	1981	1976	1981	1976	1981	All lines	Data lines
North America								
United States	444	567	397	503	89	89	5	5
Canada	4,224	5,981	1,522	1,755	36	29	7	3
Subtotal	4,668	6,548	1,919	2,258	41	34	7	3
Western Europe								
United Kingdom	1,290	2,155	387	1,035	30	48	11	22
Germany, Fed. Rep.	1,289	1,969	324	663	25	34	9	15
Netherlands	403	712	103	338	26	47	12	27
France	...	1,052	...	297	...	28	...	...
Sweden	156	371	...	245	35	66	19	35
Denmark	263	384	105	172	40	45	8	10
Switzerland	152	289	90	171	59	59	14	14
Italy	60	295	32	155	53	53	37	37
Norway	116	210	33	96	28	46	13	24
Spain	76	101	54	76	71	75	6	7
Austria	...	156	...	66	...	42	...	...
Finland	36	82	18	41	50	50	18	18
Subtotal	3,841	7,778	1,200	3,355	31	43	17	30
Asia								
Australia	98	125	22	36	22	29	5	10
Japan	169	241	7	31	4	13	7	35
Subtotal	267	366	29	67	11	18	6	18
TOTAL	8,776	14,690	3,148	5,680	36	39	11	12

Source: OECD, "International data communications in the OECD area: 1976 and 1981," DSTI/ICCP/82.27 of 5 July 1982.

Table 2.14 Foreign revenues of U.S. computer and data-processing corporations, 1981 and 1982 (million dollars and percentages)

Corporation	Total revenues			Foreign revenues			Foreign revenues as percentage of total	
	1982	1981	Percentage growth 1981-1982	1982	1981	Percentage growth 1981-1982	1982	1981
IBM	34,364	29,070	18	15,464	13,954	11	45	48
Burroughs	4,186	4,100	2	1,759	1,690	7	42	40
DEC	3,880	3,198	21	1,397	1,248	12	36	39
NCR	3,526	3,432	3	1,728	1,785	3	49	52
CDC	3,301	3,120	6	1,057	949	6	32	32
Sperry	2,818	2,719	1	1,325	1,312	1	47	47
HP	2,212	1,816	22	1,018	872	17	46	48
STC	1,079	921	17	285	185	5	26	20
DG	805	736	9	234	221	6	29	30
Datapoint	508	449	13	178	104	7	35	23
Amdahl	462	442	5	177	182	3	38	41
Prime	435	364	20	161	142	13	37	39
Tandem	335	208	61	120	67	79	36	32
TOTAL	57,911	50,647	14	24,903	22,691	10	43	45

Source: IDC, EDP Industry Report, 30 April 1983.

Table 2.15 Distribution of foreign affiliates by region, early 1980s

Transnational corporations from	Developed countries			Developing countries						
	United States	Western Europe	Japan	Latin America and Caribbean	Africa a/	Middle East	Asia/ Oceania	Total	Other	TOTAL
United States										
IBM	-	27	2	15	1b/	2b/	7	25	9	63
DEC	-	25	1	3	-	1	6	10	3	39
Burroughs	-	21	1	7	-c/	-	2	9	3	34
CDC	-	31	1	2	1	1	2	6	6	44
NCR	-	7	1	2	1	-	-	3	3	14
Sperry Corp.	-	+2(10)	2	4	(1)	-	3	+7(1)	+1(2)	+12(13)
Hewlett Packard	-	19	1	4	1	-	7	12	2	34
Honeywell	-	7	1	2	-	-	1	3	1	12
Wang	-	11	1	4	-	-	6	10	2	24
STC	-	12	1	1	-	-	-	1	4	18
Xerox	-	(26)	(1)	(8)	-	-	(1)	(9)	(3)	(39)
Data General	-	14	1	4	-	1	7	12	2	29
Subtotal	-	212	14	56	5	5	42	108	41	375

Table 2.15, continued

Transnational corporations from	Developed countries			Developing countries						
	United States	Western Europe	Japan	Latin America and Caribbean	Africa a/	Middle East	Asia/ Oceania	Total	Other	TOTAL
Western Europe										
ICL	1	13	-	1	6	1	5	12	3	29
CII-HB	2	13	-	3	9	2	-	14	2	31
Olivetti	1d/	14	1	11	-	-	4	15	3	34
Nixdorf	2	24	-	1	1	-	-	2	4	32
Siemens	-	10	1	-	-	-	-	-	-	11
Subtotal	6	74	2	16	16	3	9	43	12	137
Japan										
Fujitsu	1	1	-	1	-	-	1	2	1	5
Hitachi	1	-	-	-	-	-	-	-	-	1
NEC	2	1	-	(5)	(1)	(2)	3	3(8)	1	15
Subtotal	4	2	-	6	(1)	(2)	4	13	2	21
TOTAL	10	288	16	78	22	10	55	164	55	533

Source: Transnational Corporations in the Computer and Data-Processing Industry, UN publication, forthcoming.

Note: Figures in parentheses refer to the foreign affiliates of diversified corporations. Although it is uncertain whether they produce computers or data-processing equipment, they have been included in the totals.

a/ South Africa excluded.
b/ IBM Africa and Middle East are located in France.
c/ Burroughs affiliate responsible for the African market is located in the United Kingdom.
d/ Olivetti holds, however, minority equity shares in more than twenty U. S. computer-equipment firms.

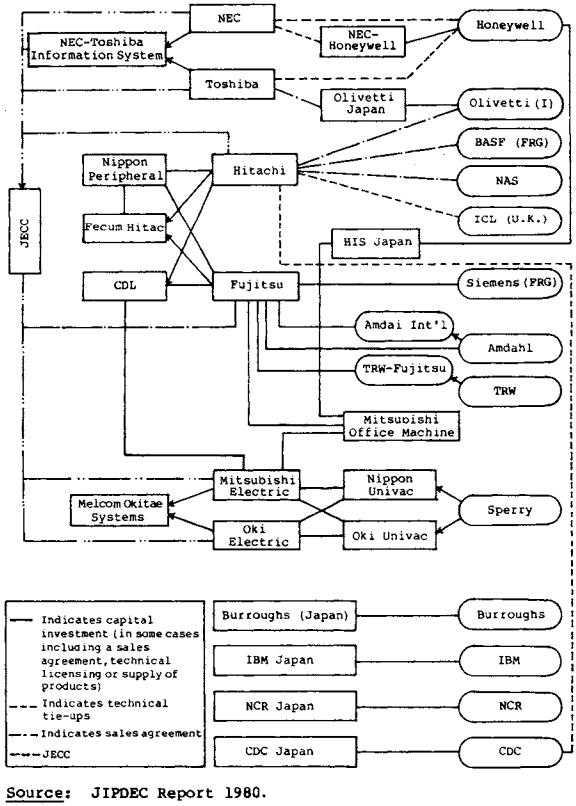
Table 2.16 Foreign assembly and manufacturing operations in Latin America, by transnational semiconductor corporations, 1982

Host country	Parent corporation	Home country	Year of establish-ment	Produc-tion	Type of produc-tion
Barbados	Intel	U.S.	1977	IC	A
	Thomson-CSF	France	...	IC, D	A
Brazil	Fairchild	U.S.	...	...	A
	RCA	U.S.	...	IC, D	A
	Nippon Electric Co.	Japan	1968	D	M
	Sanyo	Japan	1970	D	M
	Philips	Netherlands	...	S	...
	Siemens	FRG	...	IC, D	A
El Salvador	Texas Instruments	U.S.	...	IC	A
Mexico	Motorola	U.S.	...	D	A
	Intel	U.S.	1982	IC	A
	Fairchild	U.S.	...	IC, D	A
	Toshiba	Japan	1966	D	M

Source: Transnational Corporations in the International Semiconductor Industry, UN publication, forthcoming.

Key: A = assembly; M = manufacturing; D = discrete semiconductors; IC = integrated circuits; S = semiconductors, type not known.

Figure 2.3 Major joint ventures and tie-ups between Japanese and foreign computer manufacturers



Source: JIPDEC Report 1980.

Table 2.17 The comparative research-and-development intensity of the U.S. computer industry, 1982

Industry and corporation	Research-and development expenditure (million dollars)	Research-and-development expenditures as percentage of sales
Computer industry	5,173	7.0
IBM	2,053	6.0
Hewlett-Packard	493	10.5
Digital Equipment	472	11.1
Sperry	397	7.8
NCR	249	7.1
Burroughs	221	5.4
Control Data	221	5.1
Pharmaceuticals	2,991	6.1
Aerospace	2,510	5.1
Automotive	4,527	4.0
Chemicals	3,055	2.9
Telecommunications	1,102	1.3

Source: Business Week, Scoreboard Special, 21 March 1984.

Table 2.18 Structure of world trade in computer equipment, 1980 (percentages)

Region/country	Exports (f.o.b.)			Imports (c.i.f.)		
	United States	European Community	Japan	United States	European Community	Japan
Developed countries						
United States	-	4	29	-	45	71
Western Europe	61	82	28	37	51	12
Of which European Community	51	64	23	33	45	11
Japan	8	1	-	17	2	-
Other	17	3	15	39	1	3
Subtotal	86	90	71	93	99	86
COMECON countries	0.3	1	3	0.1	0.1	Neg.
Developing regions						
Latin America	8	2	6	2	1	13
Africa	0.4	3	0.1	-	Neg.	-
Asia/Oceania	4	1	19	5	0.2	0.1
Middle East	1	4	1	0.4	0.2	0.3
Subtotal	14	9	26	7	1	14
TOTAL world	100	100	100	100	100	100

Source: OECD, Trade by Commodities: Market Summaries. Exports, Imports, January-December 1980 (Paris, n.d.).

Table 2.19 Computer imports in Latin American countries, 1975-1981

Country	1975	1976	1977	1978	1979	1980	1981
Argentina	16	14	37	44	48	172	...
Bolivia	0.7	1	...	...	...	...	...
Brazil	...	...	46	81	86	99	120
Chile	...	...	11	15	25	40	...
Colombia	...	8	11	10	13	...	...
Mexico	...	...	38	60	...	...	...
Paraguay	...	...	1	0.6	...	1	...
Peru	6	7	4	...	...	...	...
Uruguay	...	2	3	3	4	8	...
Venezuela	...	31	28	51	49	60	...

Source: United Nations, 1981 Yearbook of International Trade Statistics (New York, 1982).

Table 2.20 Computer exports from Latin American countries, 1975-1981 (million dollars)

Country	1975	1976	1977	1978	1979	1980	1981
Argentina	21	17	24	21	25	39	...
Brazil	...	39	63	67	79	158	199
Mexico	...	...	8	5	...	...	...
Venezuela	...	0.9	1	4	...	...	...
Total	...	...	96	97	...	...	...

Sources: United Nations, 1981 Yearbook of International Trade Statistics (New York, 1982), and United States, Department of Commerce, "Country market survey: computers and peripheral equipment in Venezuela" (Washington, D.C., 1981), mimeo, p. 7.

Table 2.21 Share of numerically controlled machine tools in total machine-tool exports, selected countries, 1976-1982 (percentages)

Country	1976	1980	1981	1982
Germany, Fed. Rep. of	14.2	18.1	19.9	25.2
France	11.8	19.4	20.2	19.4
Italy	18.1	22.5	23.7	22.5
Japan a/	23.8	64.1	70.5	
United Kingdom	9.3 b/	10.9	15.6	22.7
United States a/		23.5	20.1	25.5

Source: OECD, "Trade in high technology products: an examination of trade related issues in the machine-tool industry," DSTI/SPR/83.102 of 22 March 1984, p. 18.

a/ Metal cutting machines only.
b/ 1977.

Table 2.22 Membership and traffic of SWIFT, 1977-1983

Year	Member banks	Member countries	Active countries	Traffic (1,000 messages) Actual volume	Cumulative volume	Peak day
1977 a/	518	21	15	3,187.0	3,187.0	...
1978	586	24	16	21,409.4	24,596.4	...
1979	683	29	16	34,351.3	58,947.7	...
1980	768	35	21	46,918.3	105,866.6	...
1981	900	39	26	62,575.6	168,441.6	318.6
1982	1,017	44	32	79,988.0	248,429.6	384.8
1983 b/	1,073	53	37	66,731.7	315,161.3	455.1

Source: SWIFT, Annual Reports, various years.

a/ August-December only.
b/ January-August only.

Table 2.23 Active Latin American members of SWIFT, August 1983

Country	Member banks	Registered users	Active members	Actual users	1982 processed financial transaction (1,000 messages)
Argentina	31	11	28	8	17
Chile	14	3	13	2	137
Ecuador	11	2	11	2	93
Mexico	14	1	12	1	251
Uruguay	11	10	11	9	95
TOTAL	81	27	75	22	593
Memorandum					
Austria	40	5	39	5	3,622
France	68	21	60	14	6,051
United Kingdom	33	86	27	60	8,052
United States	142	120	131	92	14,196

Source: SWIFT, Annual Reports, various years.

Table 2.24 Number of transnational computer-communication systems in Japan, 1974, 1978, and 1980 a/

Industry	1974	1978	1980
Manufacturing	11	17	33
Trade	10	14	25
Finance and insurance	1	7	22
Transport	5	10	18
Computer services	2	5	9
Stockbrokerages	1	1	3
News agencies, tourism	1	2	3
Government	3	3	3
TOTAL	34	59	116

Source: "Preliminary investigation of transborder data flows in Japan," E/C.10/1982/CRP.2 of 7 September, contained in Transnational Corporations and Transborder Data Flows: Background and Overview (Amsterdam, North Holland, 1984).

a/ All figures are for March of year given.

Table 2.25 Number of transnational computer-communication links of Brazil, 1982 and 1983

Industry	March 1982	December 1983
Petroleum distribution	2	4
Manufacturing		
Data-processing equipment	4	6
Other	8	18
Services		
Banking	1	10
Trading	1	1
Data services	2	5
Airlines a/	9	9
Other		2
Government	2	2
TOTAL	29	57

Source: Transborder Data Flows and Brazil: Brazilian Case Study, UN publication, Sales no. E.83.II.A.3, p. 165, and Brazil, Special Secretariat of Informatics.

a/ Including closed user group.

Table 2.26 Corporate assessment of the importance of transborder data flows, by activity and region, 1983 and 1988[a/]
(percentages)

Corporate activity	1983 United States	1983 Western Europe	1983 Other	1983 Total	1988 United States	1988 Western Europe	1988 Other	1988 Total
Financial functions								
Financial management	63.5	57.7	45.4	59.6	71.2	80.7	63.6	73.0
Invoicing	30.8	34.6	27.3	31.5	34.6	46.2	36.4	38.2
Paying	28.8	30.8	18.2	28.1	30.8	38.5	27.3	32.6
Portfolio management[b/]	15.4	23.1	-	15.7	23.1	26.9	-	21.4
Foreign exchange management[b/]	13.5	7.7	5.1	11.2	17.3	15.4	9.1	15.7
Marketing and distribution								
Ordering	36.5	30.8	45.4	36.0	42.3	34.6	45.4	40.4
Marketing and distribution	34.6	30.8	45.4	34.8	40.4	53.8	54.6	46.1
After-sales service	21.2	19.2	36.4	22.5	26.9	19.2	36.4	25.8
Customer service[c/]	11.5	23.1	18.2	15.7	11.5	23.1	18.2	15.7
Pricing information	3.8	3.8	-	3.4	3.8	11.5	-	5.6
Production								
Inventory control	38.5	26.9	27.3	33.7	44.2	46.2	36.4	43.8
Manufacturing	34.6	23.1	18.2	29.2	44.2	34.6	18.2	38.2
Sourcing	19.2	7.7	27.3	16.8	34.6	11.5	27.3	27.0
CAD/CAM/CAE	17.3	7.7	-	12.4	30.8	11.5	9.1	22.5
Product quality testing	13.5	7.7	-	10.1	15.4	11.5	18.2	14.6
Management								
Strategic planning	30.8	15.4	18.2	24.7	44.2	26.9	27.3	37.1
Management information	15.4	26.9	18.2	19.1	25.0	30.8	18.2	25.8
Electronic mail	9.6	-	9.1	6.7	13.5	-	18.2	10.1
Research and development								
Research and development	23.1	26.9	9.1	22.5	32.7	38.5	18.2	32.6
Design engineering	21.2	7.7	-	14.6	25.0	11.5	-	15.0
Personnel								
Payroll, personnel	23.1	11.5	9.1	18.0	28.8	15.4	9.1	22.5
Total number of firms interviewed	52	26	11	89	52	26	11	89

Source: Business International, Transborder Data Flow: Issues, Barriers and Corporate Responses (New York, 1983), pp. 11 and 14.

a/ Percentage of companies that consider transborder data flows to be important or very important for specified corporate activities.
b/ Several companies appear to have listed foreign-exchange management under portfolio management.
c/ Applies to banking/finance, transportation, and information service companies.

3

Growth of International Transactions in Data Services

The empirical material surveyed in the preceding chapters confirms that international trade and foreign direct investment in data services are apparently increasing rapidly, both in absolute terms and relative to trade and foreign-direct-investment flows (though comparisons between such very different sets of indicators must be made with caution). This chapter examines the determinants of this growth and the obstacles facing it.

Four sets of factors can be used as determinants of the growth of international trade and foreign direct investment in data services: (1) technological change, which has expanded the range of data-processing applications and reduced the costs of transmitting data internationally; (2) changes in the economic environment, which have increased the importance of timely access to information in the international management of a broad set of activities, thus inducing an increase in international trade and foreign direct investment in data services; (3) the emergence of a pattern of international specialization in the provision of data services associated with direct flows of trade and international investment in these services; and (4) various obstacles that impede the growth of international trade and foreign direct investment in data services.

Technological Change

The growth of international trade and foreign direct investment in data services partly reflects continued progress in the development of new information and telecommunication technologies (see Chapter 1). Decreases in the cost of computers and increases in this processing

capacity have encouraged the rapid diffusion of data-processing equipment. At the same time, the application of information technology to conventional functions has led to the development of office-automation equipment, in particular, word processors. The production of both types of equipment is expected to continue to grow extremely rapidly. The increase in the number of terminals of all sorts in use has been accompanied by a parallel demand for communication facilities capable of transmitting data among these terminals.

Advances in communication technology have, in turn, made it possible to meet this demand. The development of packet-switching technology for data transmission, standardized data-communication interfaces, high-speed modems, multiplexers, and other types of data-communication equipment, as well as continued advances in the speed and reliability of the basic telecommunication network, has substantially enhanced data-communication capability. At the same time, important improvements to the network for international telecommunications have made the high-speed international transfer of data increasingly feasible: These improvements include the rising capacity and diminishing cost of satellite communications facilities and broad-band undersea cables and the growing use of electronic switching equipment at international gateways.

Changes in the Economic Environment

These technological developments—though essential to the growth of international trade and foreign direct investment in data services—must be seen in the context of the economic forces that affect services transactions. For example, changes in the economic environment during the 1970s made the rapid transmission of information across national borders crucial to the competitive performance and strategies of transnational corporations. The overall environment of slow growth, intensified competition, and great volatility and instability in financial markets had increased the risks associated with managing international business. Adjustment to changes in the environment had to occur rapidly, if losses were to be avoided. Rapid adjustment, in turn, necessitated rapid access to information, so that changes could be seen as they occurred, and information on which to base decisions could be obtained.

Surveys of the utilization of transborder data flows by transnational corporations, carried out by the OECD and Business International, provide striking illustrations of this trend.[87] As described in Chapter 2, both surveys found that a major, and in many cases *the* major, application of transborder data flows in transnational corporations was financial management, including for foreign exchange purposes. Given the great volatility and instability of international financial markets in

the 1970s, this result is not surprising: Improved financial management within large, geographically diverse transnational corporations clearly became an area in which access to timely information flows—the essential advantage of transborder data flows—was indispensible.

The combined progress of economic integration and the rise in the ratio of world trade to world output has also increased the number of economic decisions requiring an input of international information. For example, nominal flows of trade payments have grown even faster than real flows, given continued rapid inflation. Managing these flows—tracing and controlling them, organizing the logistics of the movement of both goods and money—has consequently become an ever more complex and information-intensive task.

Moreover, these international flows of investment, trade, and payment involve an increasingly broad range of economic activities. Of particular importance is the rapid internationalization of the service industries—banking, insurance, transport-producer services—whose products typically involve a substantial information component. This internationalization reflects the growing importance of coordination functions in the world economy, that is, the need for large institutions specialized in managing the flows of payment and goods associated with international economic involvement. At the same time, the internationalization of the service industries increases the demand for international information transfer, since these industries are highly information intensive in their own internal management.

The growth of international trade and foreign direct investment in data services, therefore, reflects economic forces that make the international transmission of data increasingly important: the need for rapid access to data on which to base decisions in a more uncertain environment; the growing share of international trade and investment in overall economic activitity; and the internationalization of the service industries, which are themselves highly information intensive. In each of these cases, the growth of international trade and foreign direct investment in data services appears to be induced by changes in the sectors that primarily utilize data services, such as in downstream activities (manufacturing, banking, or air transport) that rely on international trade and foreign direct investment in data services to meet specific information management needs.

However, the growth of international trade and foreign direct investment in data services also reflects the emergence of this activity as an economic activity in its own right, with a particular pattern of international specialization giving rise to trade and foreign direct investment.

International Specialization in Data Services

As a growing range of data services become separate economic activities, provided on an arm's-length basis by independent firms, a pattern of international specialization is arising that corresponds more closely to the classic ideas of "trade" and "investment" than is the case with the largely intracorporate flows discussed previously. Examples of such internationalization include access by users in one country to data bases in other countries; the international sale of software; and international access to value-added networks.

A first problem in examining patterns of international involvement in data services is delimiting provision and purchase of such services from those for other goods and services, particularly (but not only) in the informatics field. (This issue was discussed in the section on "Impact on Existing Industries" in Chapter 1.) As previously stated, the boundaries between data services and other goods and services are blurring, and the designation of an increasing number of products as "goods" or "data services" becomes a matter of choice.

A second apparent difficulty in analyzing patterns of international involvement in data services is the heterogeneity of the products covered, even when the definition of this category is fairly limited. Thus, certain software products—notably software packages—are very similar to goods (as contrasted to services) in their economic attributes; other data services, such as data-communication services or data-entry services, have such classic service-sector characteristics as nonstockability and identity of consumption and production. To the extent that these differences correspond to differences in the structure of production and distribution costs they can be helpful in identifying the factors underlying international specialization and the forms this specialization takes.

A useful analytical approach in this regard is provided by the eclectic theory of international production.[88] According to this theory, three sets of factors determine the extent and structure of an industry's international involvement: (1) Ownership advantages provide firms in one country with firm-specific advantages relative to firms in other countries; they include, inter alia, access to technology, finance, and marketing or distribution channels. (2) Localization advantages determine whether it is more profitable to produce a product in one country or another and, in particular, whether local production will have some cost advantage over imports; these factors include the cost of labor, capital, and other inputs, transport costs versus scale economies and access barriers such as tariff or nontariff barriers. (3) Internalization advantages determine whether production at a site in country A using an ownership advantage (for instance, a patent) of a firm in country B should be organized on

Table 3.1 Data processing in Barbados, 1984

Corporation	Workforce	Investment (thousand dollars)
American Airlines	288	1,000
National Demographics	86	400
Kline & Co.	33	300
New American Library	26	124
The William Byrd Press	10	50

Source: Business Week, 12 April 1984.

a foreign-direct-investment basis by a firm from country B or by a firm from country A that, for instance, buys a licence to use the patent. These factors include the cost and risk of transferring technology and other ownership advantages, the ease of access by foreign firms to local suppliers and distributors, and restrictions on foreign direct investment. Though a detailed discussion of this model and its applicability to international trade and foreign direct investment in data services would go beyond the scope of this book, this approach can be used to analyze some salient features of international involvement in data services. In effect, the weight of ownership, location, and internalization advantages varies significantly among the different data service products.

Data Entry

In data entry (the activity of actually putting data into machine-readable form), the main factor affecting competitiveness is labor costs. Though basic literacy skills are required, as well as adequate supervisory labor, lower-wage countries can participate successfully in this activity, as long as they provide an adequate infrastructure for transporting the physical support of the data (tapes, disks, or punched cards). Moreover, the technology required is fairly straightforward and can be acquired on an arm's-length basis. Consequently, the advantages of location for this activity are substantial, whereas ownership and internalization advantages are not. As a result, trade flows in this activity have increased, with bulk data entry work being done for developed market economy firms, both by subcontractors and independent firms in developing countries (see Table 3.1).

Time-Sharing

Time-sharing is an activity in which localization and other cost factors are important. Successful involvement in this activity mainly requires

access to large-scale computing facilities and to data-communication links between users and the data-processing center (though batch work done on an off-line basis still accounts for a substantial share of total revenues). For any good data-processing and telecommunication infrastructure, the technology involved in time-sharing is fairly standardized. However, as advances in microelectronics reduce the economies of scale in computing (large computers no longer cost less, on a per-computation basis, than small computers), the market for pure time-sharing services has tended to contract, at least relatively to the overall growth of data-processing revenues. Such pure time-sharing—that is, the sale of straightforward computing power—is now mainly used to even out short-term fluctuations in data-processing requirements; for example, a user may access a time-sharing bureau to meet a sudden and/or short-term increase in processing needs, instead of expanding internal data-processing capacity to meet these needs. Given the relatively high transport costs involved in time-sharing (the cost of data communications is declining less rapidly than the cost of data processing), the scope for international trade in pure time-sharing services is fairly limited; some trade does occur, however, on a transatlantic basis, since peak time for data-processing requirements in Western Europe coincides with off-peak time in the United States and vice versa. Nor have high transport costs led to foreign direct investment in this activity, since—the technology being fairly standardized and widely available from data-processing equipment suppliers—foreign time-sharing firms have few ownership advantages to exploit through international investments.

Enhanced Time-Sharing

Enhanced time-sharing services are intermediate between the provision of simple processing power and the sale of software and data-base access. These services basically provide access to highly specialized or in some way unique software available only on a remote-access basis. Examples include access to the very complex models needed for geological or aeronautical-engineering calculations or the analysis of digital remote-sensing data. Most users do not need these models frequently enough to make it economical to lease or purchase the software they involve, particularly since this software may need to be operated on a particular equipment configuration or may have high maintenance and updating costs. The fixed costs involved in providing such services tend to be relatively high.

As a result of these fixed costs, there are significant scale economies in this activity, so that the service tends to be concentrated in the area with the highest density of potential users and users in peripheral areas

accessing the service remotely. This pattern of concentration not only reflects transport cost minimization but also the fact that such highly specialized applications are typically developed by, or in close cooperation with, major users. In some cases, in fact, they are marketed by subsidiaries of major user firms—as seems to be the case in certain geological applications. International trade flows in this activity, therefore, reflect both cost minimization and a product-cycle effect in which services are pioneered in areas with a high geographical concentration of users. As usage increases in other areas, these services may shift toward provision in overseas markets, either on a foreign-direct-investment basis or through the transfer of the technology required directly to foreign firms. To date, the latter approach has dominated, at least as far as the developed market economies are concerned, presumably as a result of the weakness of internalization advantages in this activity, since the technology can be transferred at relatively low cost and risk.

Information Storage and Retrieval

Data-base supply shares many of the characteristics of enhanced time-sharing. However, the very great economies of scale arising from the fixed costs involved in setting up data bases create more substantial entry barriers than occur in time-sharing.[89] As a result of these scale economies, market preemption effects are important: The first firm to establish a secure base in a market segment (for instance, economic information services) obtains real advantages relative to potential entrants. Moreover, the costs involved in updating and maintaining data bases appear to increase with the number of sites at which copies of the base are kept; this effect outweighs the potential impact of communication costs in favoring transfer of the bases to foreign sites as foreign demand increases. The interaction of high entry barriers with large costs to transferring data bases encourages geographical and producer concentration to persist, despite product-cycle effects on the demand side. This leads to substantial trade flows as users abroad step up their access to existing data bases.

Software

Product-cycle effects are also important in software-products activity. This activity is fairly heterogeneous, ranging from highly standardized software packages to "once-off" consultancy services provided for a specific software project or product. The major trend in this activity is for packages to become increasingly important, largely at the expense of in-house development and once-off or customized products.[90] As this happens, the supply of software is becoming an increasingly market-

oriented activity in which independent and specialized firms play a growing role.

As a result of this evolution, software is being increasingly traded on an international level. Successful involvement in this activity requires primarily an adequate supply of highly trained personnel and closeness to user markets, which is indispensible for rapidly identifying new product opportunities. New software packages therefore tend to be developed and launched in the largest national markets for an application; the United States, given its extremely high penetration rate for computers, has acquired a substantial lead in this respect.

Diffusion of software follows a product-cycle pattern: New software products are distributed into markets with lower levels of computer penetration—or less sophisticated users in a particular application—than the market for which they were originally developed. This transfer of technology to foreign markets does not generally require a transfer of actual production facilities, notably in the case of software packages; in effect, reproduction and transport costs for packages are very low, so that it is economical to duplicate the package itself at a central site. However, though local production facilities are not required, market presence is: A network of local staff is needed to provide user support and system maintenance. This market presence can be obtained either directly—the foreign producer establishing a branch office in the market in question—or by licensing the software product to a local software distribution firm. The choice between these alternatives seems to depend on the size of the firm that undertook the original product development. Larger firms, which have a continuing flow of new software packages into world markets, accept the fixed costs entailed by a network of branch offices more readily than do smaller, specialized software firms.

A higher level of local involvement is needed for international presence in the software consultancy activity than in software packages. Consultancy services in any field draw heavily on the international movement of skilled personnel as well as on an ongoing link between the contracting firm and the consultants. This movement requires a form of foreign direct investment in the foreign market; although the actual transfer of capital may be fairly limited, much of the investment involves personnel transfers and technology. For such transfers to take place, foreign firms need establishment rights, as well as the right to employ nonlocal staff in the country concerned.

Because high-level skills are required to develop and commercialize software systems, and such industries need to be close to major user markets, this market segment involves developing countries to a limited extent. Nevertheless, a range of software activities involves tasks that are fairly routine and formalized, though highly labor intensive. A notable

Table 3.2 Annual cost structure for a programmer analyst in India, 1982[a/]

Item	Cost (dollars)
Salary	3,600
Benefits (85 percent)	3,060
Overhead, training, education, and vacation	4,890
Subtotal	15,360
Profit	4,610
TOTAL	19,970

Source: India, Engineering Export Promotion Council, "Report of EEPC computer software delegation to USA" (New Delhi, 1983), mimeo, p. 74.

a/ With a degree equivalent to a MS in computer science and three-years experience.

instance is the microcoding of operating systems, which necessitates moderate skill levels in performing a highly repetitive task. A trend exists for this type of activity to be transferred on a subcontract basis to developing countries, particularly those with a relatively abundant supply of mathematically trained personnel. India provides a clear example of this trend. However, the recent development of automated systems for software engineering—which are capable of carrying out the more routine tasks at low cost—may undermine this transfer of activities.

This discussion suggests that the comparative advantages of some developing countries regarding the production of software is based on two factors: cost advantages and availability of skills. Most developing countries, including Latin America, possess a considerable cost advantage in the production of software. Compared to the cost of a U.S. computer professional—which ranges between $60,000 and $140,000 per person per year—software professionals in a developing country may cost between $18,000 and $25,000 per year.[91] This figure includes salary, benefits, and direct and indirect costs such as space, communications, utilization, and management overheads. In India, the cost of a programmer analyst with comparable experience to a computer professional is roughly $20,000 per year (see Table 3.2). In the Dominican Republic, an experienced programmer analyst costs approximately $24,000 per year.

A number of developing countries possess an educational infrastructure capable of training first-rate data-processing engineers and computer scientists. This infrastructure provides large pools of skilled personnel, especially in circumstances with relatively high levels of unemployment

in some engineering professions. Within Latin America, Argentina, Brazil, Mexico, and Venezuela have the largest training capability; as a result, these four countries are particularly favored for developing an internationally competitive software industry.

Beyond these two factors, which are generally valid for many developing countries, several Latin American nations have specific advantages and disadvantages. As documented in Chapter 1, the countries have particularly well-developed data-communication infrastructures. This situation is advantageous compared to that in many other developing countries, especially as regards the possible need for on-line servicing. Most types of software development require frequent and detailed interaction with end-users. An export-oriented software industry requires data-transmission facilities that allow access to modern hardware and operating software and interaction with users during the development process. Compared to the data-communication infrastructure of the Latin American area, some of the potential developing-country competitors in the international software market have relatively limited communication systems. India, for example, is now giving greater attention to building up of its data network. Some Latin American countries, especially Argentina, Mexico, and Venezuela, have a particular advantage because their access to the latest hardware and systems software enables them to develop application software and to tap the markets in the developed world.

Countries not having such access face great difficulties in the production of such software. India, for example, has limited access to state-of-the-art hardware. The development of certain software products requires the use of modern equipment and advanced operating systems. As a result of the current import policy, software companies' plans to import equipment are often delayed. This restriction limits their capability to develop new products because the industry cannot respond sufficiently fast to hardware changes to compete in state-of-the-art software markets in developed market economies. Among the products sold in these markets are standard packages that must be tailored to new system configurations, as well as new software developments that must cater to the rapidly changing technological environments (for example, new versions of compilers, data-base systems, data-communications protocols, and terminals). Finally, the language barrier limits Latin American countries' ability to penetrate foreign software markets. This barrier complicates user interface and documentation development.

Telecommunication Services

In data-communication services and other value-added telecommunication services, leased telecommunication lines provide a capability

in addition to that available on public networks (for instance, data and facsimile transmission, satellite business services, or value-added information services). The scope for the international provision of these services is limited because of regulatory obstacles. However, where conditions permit, such services would have to be provided largely on an investment basis; that is, a firm in country A would have to lease (or otherwise secure) the telecommunication facilities needed in country B to provide service in country B or between country B and country A. The United States is one of the few countries to have developed advanced value-added services on a competitive supply basis; in most other countries, such services—where they are provided—fall within the mandate of the telecommunication monopoly.

The Impact of Obstacles

The preceding sections have suggested that the growth of international trade and foreign direct investment in data services reflects three sets of forces: technological changes; shifts in the economic environment; and the emergence of international specialization in the market provision of data services. However, actual patterns of international trade and foreign direct investment in data services have also been shaped by the regulatory obstacles these forces have encountered. Two broad sets of regulatory policies have frequently been cited as obstacles to trade in data services: privacy regulations and telecommunication policies. Other potential obstancles like tariff barriers do not seem to have played a significant role.

Privacy Regulation

In the early and mid 1970s, concern was frequently expressed about the impact of privacy protection legislation on the flow of computer data between countries, and notably between countries with differing levels of privacy protection.[92] However, although a number of national privacy restrictions refer to, and/or contain explicit licensing procedures for, the transfer to foreign sites of computerized data files on residents, these do not seem to have led to cases in which the transfer of such files was hindered or prevented. Perhaps this resulted from a high level of compliance rather than a lack of actual impact; but user surveys—such as those carried out by the OECD and by Business International—found that major users of international data communications did not consider that national privacy laws posed substantial problems.[93]

Telecommunication Policies

Telecommunication regulations, on the other hand, have been a continuing source of friction and appear to have affected both intracorporate and market flows of data services. In effect, both these flows rely largely on leased telecommunication lines, not only for direct trade (when a user in country A accesses a data base in country B) but also for managing international corporate operations. For instance, remote maintenance plays an increasingly important role in the international distribution and sale of software systems; international leased lines are critical for remote access to data bases; and, finally, most large networks for intracorporate information systems in transnational corporations rely on leased lines. Regulations affecting the availability and cost of leased lines therefore have a fairly direct impact on international trade and foreign direct investment in data services. Three major problems have arisen in this respect.

First, in a number of countries, low levels of telecommunication development have resulted in a scarcity of leased lines and long waiting times. Although this problem is particularly acute in developing countries, PTTs in some developed market economies have recently adopted a general policy of encouraging users to shift from leased lines onto public networks, notably for data transmission. Some users have expressed concern that these public networks do not offer the same levels of quality, speed, and reliability available on leased lines.

Second, frictions have arisen regarding the pricing of leased lines. Generally, the leasing has been charged at a flat rate, a certain amount being charged for the lease of a line for a specified period. Though there have also been speed loadings—higher charges set for lines capable of transmitting at faster speeds—actual charges have not been sensitive to utilization rates on particular lines. As part of a general shift toward a pricing strategy based on usage rather than time or distance, a number of telecommunication authorities, particularly in Western Europe, are considering "volume-sensitive prices" for data communications. This strategy would involve setting charges on the basis of the volume of data actually transmitted over a line, thus reducing (or even completely eliminating) the current bulk discount granted to leased-line users. Though the impacts of such a shift lie largely in the future, a number of major users view this development with concern.

Third, restrictive conditions imposed on leased-line use may have affected the growth of international trade and foreign direct investment in data services. Telecommunication authorities typically do not permit the utilization of leased lines for third-party traffic (United States authorities are an exception in this regard): Traffic is only permitted

on a leased line between the two entities directly connected by the leased line. Although restriction can be interpreted more or less strictly, some leased-lines and users have claimed that it has made it difficult for them to offer value-added services on an international basis. For instance, it can be argued that the use of a time-sharing bureau's leased lines to transfer data from a host computer in country A to a separately owned computer in country B involves third-party traffic. Problems have also arisen in distinguishing a computing service involving several independent entities from a communication service between third parties.

These problems of interpretation have had a direct impact on the internationalization of value-added telecommunication services. In effect, even though these services are generally allowed to be provided commercially in the United States, in most other countries they are provided on a public-service basis by telecommunication authorities. These authorities consider that the use of leased-lines to provide such services involves a possible violation of restrictions on third-party traffic. As a result, U.S. providers of value-added services have encountered difficulties in expanding the geographical scope of their services.

International differences in institutional arrangements in telecommunications have had two major impacts on international trade and foreign direct investment in data services. First, as a result of these differences, commercial services allowed in one country cannot be so provided in others; this difference has been claimed to constitute an obstacle to trade and international investment, although such a claim is questionable because restrictions apply equally to foreign and domestic firms. Second much international trade and foreign direct investment in data services (at least its on-line components) depend on an infrastructure provided and managed in many countries by publicly owned telecommunication monopolies. This arrangement creates a substantial potential for friction because choices made by these monopolies about foreign suppliers may be viewed as discriminatory.

4

Policies in International Transactions in Data Services

Policy issues regarding trade and direct investment in data goods and services are complex, partly because a variety of important developments are taking place simultaneously and within a very short time and partly because policymakers have differing concerns. Some are preoccupied with purely economic considerations; others focus on considerations of sovereignty, national and cultural identity, and vulnerability to external influences because of increased dependency on decisions taken elsewhere.[94]

Perhaps the most evident cause for the complexity of policy issues is the rapid pace of technological change in the two physical bases of the data-services industry, telecommunications and informatics. In these two linked bases, technology sets the economic parameters, which, in turn, interact with political parameters and social considerations, greatly influencing the scope and modalities of policy. A continuing problem in international trade and foreign direct investment in data services is that public policy is often formulated on the basis of out-dated technological information. Although corporate, as opposed to public, policymakers may be less likely to err in this way, one should not assume that the former group is always operating on up-to-date information regarding data technologies. Because communication and computer technologies are evolving so rapidly, it is critical that policy issues be perceived in the light of the technologies of next year, not of last year. Policymakers must take into account the impact of such developments as remote-controlled industrial processes, specialized international data-processing networks to serve specific user groups (such as SWIFT), computer-aided engineering, design, and manufacturing within the parent—foreign-affiliate relations of transnational corporations, and the

changes that all these developments may bring about in the manner of undertaking economic activities. Perhaps because technology is evolving so rapidly, decisionmakers are attracted by the possibility of applying policy approaches used in analogous situations, for example, by applying the GATT—which was developed to regulate trade in "visibles" in the light of the beggar-my-neighbor trade policies of the 1930s—to international trade and foreign direct investment in data services and to other traded services, or by formulating a sort of simple, sweeping rule, like the OECD data pledge, to foster free trade in goods and services.

The purpose of this chapter is to review the more important existing arrangements relating to international trade and foreign direct investment in data services and to examine the mix of policy issues affecting these transactions by noting how certain key issues have been addressed by various countries by looking at various and often conflicting policy approaches or policy analogues, and by discussing some of the main elements that must be considered when formulating international policies. The first section highlights some of the more important international instruments directly relevant to international trade and foreign direct investment in data services, although the review is not exhaustive.[95] It is supplemented by Appendix B, which includes a description of the activities regarding transborder data flows undertaken in various forums. The second section of this chapter addresses the broad concepts drawn from international commercial policy agreements (most important are the GATT and related national trade legislation) as well as those concepts with special importance to international trade and foreign direct investment in data services.

Existing Arrangements

The principal multilateral instruments related to international trade and foreign direct investment in data services have been devised by the developed market economies, in the framework of the OECD and the Council of Europe. Relevant matters are also touched upon in bilateral arrangements and in the special sectoral policies of various national governments. But more relevant are the general policies bearing on data services and the agreements dealing with such issues under some broader heading. In fact, the discussion of national, bilateral, and multilateral devices and policies with relevance to international trade and foreign direct investment in data services illustrates the manner in which the sector issues are inevitably linked to other conventional policy areas.

Multilateral Arrangements

No one international institution deals authoritatively with all aspects of international trade and foreign direct investment in data services; rather, various aspects of the international dimension of data services are dealt with in different institutions.[96] Moreover, because of their origin and mandate, some institutions have developed general instruments or accords that bear—often very substantially—on international trade and foreign direct investment in data services; other institutions, or even the same ones, address such issues specifically. Perhaps most important, the OECD has at least four instruments or accords that, when applied to member countries, relate to international trade and foreign direct investment in data services.

The Code of Liberalisation of Capital Movements prescribes that member countries should remove restrictions on the movement of capital including that for direct foreign investment.[97] By a liberal interpretation, this code would preclude the application of restrictions on investment by nationals in enterprises abroad, either by loan or equity purchase or by the setting up of foreign affiliates. The code would appear to preclude governments from interfering in the outflow of funds for investment purposes, including investment in data services. However, the code allows for reservation and derogations, and even OECD countries do not have to adhere to it. Thus Canada is not a signatory to the code, and only very recently has the United Kingdom lifted all restrictions on the outflow of investment funds.

An even more relevant OECD code for trade in data services, as distinct from foreign direct investment, is the Code of Liberalisation of Current Invisible Operations.[98] It requires signatories to remove restrictions on the buying and selling of "invisibles" between themselves and on the transfer of funds for such purposes. This code relates directly to international trade and foreign direct investment in data services because computer services are invisible; it relates to such services indirectly because it covers such invisible trades as tourism and insurance, which are major users of data services. On the surface, this code appears to go far in providing an international regime for traded services. The U.S. GATT study on services makes clear, however, that in the U.S. view this code is inadequate in providing a functionally effective set of international rules because the liberalization of invisible transactions has been impeded by the reservations, derogations, and limitations on the code's measures. The U.S. position is that the OECD invisibles code is insufficient because (1) it does not apply to developing countries; (2) countries can easily maintain extensive reservations and commit extensive derogations; (3) it does not provide an established apparatus

for dispute settlement and particularly no sanctions for noncompliance; and (4) the questions of rights to conduct business and national treatment for foreign-controlled affiliates are treated insufficiently.[99]

The third important OECD instrument is the 1976 Declaration and Decisions on International Investment and Multinational Enterprises, which includes a Decision on National Treatment.[100] The decision stipulates that the treatment of foreign affiliates should be no less favorable than that of domestic enterprises in comparable situations. Thus, if a computer-service firm establishes a foreign affiliate in another OECD member country, that host country is obliged to treat the affiliate (in regard to taxation, procurement, and such) precisely the same as a domestically controlled firm. For instance, a contract to supply computer hardware or computer services could not be awarded to a domestically controlled firm solely because it was domestically controlled. This declaration has obvious implications for the position of large transnational corporations in data services, many of which are controlled in the United States but have affiliates in other OECD countries.

The fourth OECD arrangement that bears on international trade and foreign direct investment in data services is the Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data.[101] This instrument aims at protecting the privacy of persons on whom data have been collected in transborder-data-flow transactions, without restricting the free flow of information. The guidelines are voluntary, and no provision has been made for dispute settlement or for sanctions for noncompliance. For these reasons, the members of the Council of Europe have devised a binding Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data, which came into force on 1 January 1986.[102]

Finally, a Declaration on Transborder Data Flows was adopted in 1985 in the OECD framework, in which the member governments commit themselves to foster free trade in information services. The desire of, especially, the United States, to adopt a data pledge seems to indicate that the OECD invisibles code alone is not regarded as a sufficient instrument to deal with international trade and foreign direct investment in data services.

None of these OECD instruments contains a provision conveying an unequivocal right of establishment to foreign investors. The Decision on National Treatment deals with the correct treatment of a foreign-controlled firm, but it is silent on right of establishment. Although a number of countries have only a few limitations in their domestic legislation on the right of foreigners to establish business operations, all countries have held back from granting (in international agreements) an unlimited right to foreign transnational corporations to establish

themselves in their territories. A decision of the OECD council in April 1984 amending the liberalisation code made, however, considerable progress toward such a right.[103] The U.N. Code of Conduct on Transnational Corporations, on the other hand, grants no right of this kind.[104]

The right to prohibit establishment by foreign entities, like the right to deny entry into national territory to foreign persons, is an aspect of sovereignty. However, within Western Europe (that is, within the European Free Trade Area established by the Stockholm Agreement) and within the European Community (as established by the Treaty of Rome), the rights of establishment for enterprises of the signatories is granted. Thus, for example, the Federal Republic of Germany can preclude a U.S. or Brazilian firm from establishing a foreign affiliate on its territory, but it may not prohibit a Dutch or a French firm from so doing, assuming that the latter complies with domestic legislation on incorporation. Right of establishment can be important for international trade and foreign direct investment in data services; for instance, it may be necessary to set up foreign operating facilities to provide adequately the range of services offered by computer service bureaus (see the discussion in Chapter 2).

Although Latin American countries have done little to regulate regional data-service industries, the Conferencia de Autoridades Latinoamericanas de Informatica (CALAI)—an organization formed to coordinate computer policies in the region and to share experiences—is working toward defining some common regulations. For instance, during its 1983 meeting, CALAI decided to set up a working group to study the possibility of adopting standardized protocols for the data communication networks in the region. This standardization would facilitate access to telematics services for users throughout the area.[105] CALAI is also surveying the entities that develop software, with the objective of establishing joint software development projects.[106] In addition, CALAI agreed to stimulate joint software development by two or more countries in the region.[107] Finally, CALAI is studying regional trade in data goods and services in order to consider the creation of a common regional market.

Bilateral Arrangements

The crucial issue of right of establishment is addressed in the agreements establishing the free-trade and common-market regimes among developed market economies of Western Europe. Certain existing or proposed bilateral arrangements also address this issue. For example, the United States and Panama have drafted a bilateral treaty concerning the treatment and protection of investment that seems to convey a right of establishment to each other's corporations, subject to explicit res-

ervations, most of which are in the services area.[108] Moreover, the treaty explicitly prohibits (art. 2) "performance requirements" as a condition for the establishment of a foreign affiliate; any requirement that goods or services must be purchased locally is specifically prohibited. If this treaty is ratified by Panama and the United States, subsequent treaties entered into by either signatory conveying most-favored-nation treatment in regard to establishment would convey the same rights.

A free-trade agreement between the United States and Israel, on the other hand, deals primarily with trade barriers. Its purpose appears to be to provide access to the United States for Israeli goods on better and more stable terms than would be provided under the U.S. general system of tariff preferences for developing countries (which is regarded by the United States as a unilateral arrangement). A non-binding annex to the agreement deals with trade in services, including data services.

Canadian and U.S. authorities are examining another approach to dealing explicitly with data services as a separate and distinctive sector. Private business interests in Canada, which are important intracorporate users of data services within North America, have proposed that Canada and the United States establish a sort of common market in computer services.[109] They want to deal with trade in computer services separately from issues in the telecommunication sector. When examining policy issues, the private business that originated the proposal expressed concern at the possible extension to the sector of antidumping regulations and countervailing duties (which now apply only to goods) and to U.S. assertions of extraterritorial jurisdiction, which have implications in data processing and data storing. During the ensuing intergovernmental discussions, however, the scope of an agreement could be broadened to include, for instance, tariffs and telecommunication equipment.

Neither the Canadian nor U.S. authorities apparently aim at a specifically preferential arrangement. Although the agreement might involve a reciprocal exchange of rights, other countries would have the option of adhering to it. (From the U.S. viewpoint, data-service relations with the United Kingdom are more important than those with Canada because of the extensive use of transborder data flows between financial markets in London and New York.) The U.S. and Canadian authorities would be discussing a conditional most-favored-nation agreement—an arrangement in which any other country may acquire the same rights but only on condition that it makes substantially the same concessions (and assumes the same obligations) as the original parties.

The discussions between Canada and the United States will serve to identify and define some of the relevant issues. In fact, they may lead to the first international (albeit bilateral) framework specifically designed for computer services, a framework that may become a model. But just

as bilateral trade agreements are no substitute for the multilateral GATT, such agreements in data services are not likely to be accepted as a substitute for a multilateral approach. This limitation is recognized in this Canadian initiative, because it is meant to attract other countries. One possible approach is that third parties would be invited to sign a model treaty; however, other potential participants would probably not merely accede to the rules negotiated by the United States and Canada but would want to participate in the rule formulation themselves to make sure that their interests are taken fully into account. Another possible approach is that third parties would be invited to join in the negotiations once they get beyond the preliminary discussion stage. However, a Canada-U.S. arrangement may prove to be neither a model nor the beginning of a wider arrangement, given the great dependence of the Canadian economy on that of United States and the strong interest of Canadian users in access to U.S. data resources. Still, these discussions between Canada and the United States can be expected to lead to a clarification of a number of the issues surrounding international transactions in data services and they may prove to be pathbreaking.

National Arrangements

Developed Countries. The various policy elements that bear on international trade and foreign direct investment in data services can perhaps best be illustrated in a national context. For example, for Canada, policies have to be examined that deal with such broad issues as telecommunications, direct investment by foreigners and by Canadian firms abroad, export promotion, and regional economic development programs, as well as with such specific data-service issues as privacy protection, the development of computer-service firms, the export of their services, their role in the local market, the possibilities for Canadian software firms, and the relationship of data services to regulated industries, such as banking. The interplay of these policy components is further complicated by the federal political structure of Canada. The identification of these policy elements makes it clear that describing the data-service policy in any one country is a substantial effort: The country case studies published by the UN Centre on Transnational Corporations on Brazil and Poland bear this out, especially since the role of general instruments and agreements is not addressed in those studies.[110] Even the briefest consideration of the Canadian policy environment shows the difficulty in developing consistent policies for a sector that cuts across traditional lines and in which the technology is evolving rapidly.

The Canadian telecommunication sector is characterized by a mixture of public and private ownership subject to an equally complex regime

of regulation of services, standards, and rates. A number of provincial governments developed publicly owned telephone systems; in other regions, private companies provided a regulated monopoly service. The largest of these, Bell Canada, is undergoing reorganization designed to enable the carrier to participate in growing domestic and international data-service markets. The telegraph systems were originally developed by the two principal railroad companies, which now have joined with Telecom Canada to offer a combined service, and which, like the telecommunication systems in many countries, are extending their range of services beyond what in the United States would be considered that of a common carrier. Meanwhile, a few computer-service companies, through leased lines and private networks, are active exporters of data services, which are based primarily on proprietary software.

As the data-service sector developed, Canada focused on the role of equipment producers. As a byproduct of regional economic development programs, foreign affiliates in Canada (as well as Canadian-controlled firms) were encouraged to create manufacturing facilities in those Canadian regions with less than average employment; rationalization and specialization of production were urged as the only practicable way in which a small country could participate in hardware development. Certain indigenous firms were encouraged with government loan guarantees and even equity participation. In retrospect, it appears that these firms suffered from a lack of in-house research and product-development capacity. To meet this problem and to provide external markets, Canadian companies formed working alliances with companies from other countries (Japan and the United Kingdom). Several small Canadian specialist companies in the computer/communication hardware sector emerged, usually basing their operations around the research skills or commercial acumen of a few individuals. One policy dilemma was whether research-and-development funds (and procurement contracts) should be directed to Canadian-controlled firms only or whether Canadian affiliates of foreign firms should be accorded the same treatment. Employment and regional-development considerations were, however, powerful arguments for not withholding funds from foreign affiliates. Whether a substantial domestic capacity could be developed by funding research and development in Canadian-controlled firms became a subject of discussion in regard to the administration of individual subsidy programs.[111]

These same issues are now surfacing in regard to software production. Relatively small firms may be innovative and commercially successful in the software sector. On one hand, Canadian authorities had discouraged (under the Canadian Foreign Investment Review Agency [FIRA]) a number of applications by transnational corporations to establish software affiliates in Canada. (Proposals to establish foreign affiliates in Canada

had to be approved by federal authorities; these authorities could use the power over right of establishment to refuse to allow particular foreign affiliates to be established in Canada if their activities were deemed not to provide "significant benefit" to the country.) Canadian software firms, on the other hand, are free to establish affiliates in the United States, and Canadian computer service bureaus (such as I. P. Sharp) are selling data services in the United States and elsewhere. Thus, any attempts by Canadian authorities to restrict access by U.S.-controlled computer-service affiliates would concern the United States, especially since Northern Telecom, a major Canadian producer of telecommunication hardware, has made inroads into the U.S. market.[112]

The purpose of this review is to emphasize that in any given country international trade and foreign direct investment in data services are inextricably bound to such issues as telecommunications, industrial and regional policy, policy for research and development, tariffs, regulation of national monopolies, and the role of transnational corporations. Only in a few countries—of which Brazil is perhaps the most prominent—have international trade and foreign direct investment in data services been given such priority that specific sector policies have been adopted that cut across traditional administrative and policy demarcations.

An interesting attempt to pull together a variety of policy devices into a coherent sector policy in international trade and foreign direct investment in data services is under way in the United Kingdom. At present, this attempt involves the separation of the national telephone system from the Post Office, the potential privatization of the resulting telephone company, the entry within a regulatory framework of other telephone companies (ending a natural monopoly), the active stimulation of domestic computer-service facilities, and the financing of hardware component development. The last policy involves providing government development funding apparently primarily to U.K.-controlled corporations; the United Kingdom authorities may be concerned that if funds for research and product development are made available to foreign affiliates in the country, the results of any successful research may "leak" abroad. This strategy obviously conflicts with the policies of regional economic development since in the United Kingdom (as in Canada) foreign affiliates have been established with government subsidies to build manufacturing facilities in areas of low employment.

United Kingdom authorities take the view that the country's interest lies in an unrestricted international market for trade in data and that the United Kingdom can become an important exporter of data services. This view is borne out already in the configuration of leased lines and data traffic documented in Chapter 2 and the role of data services in the financial sectors (for example, Reuters). However, some governments

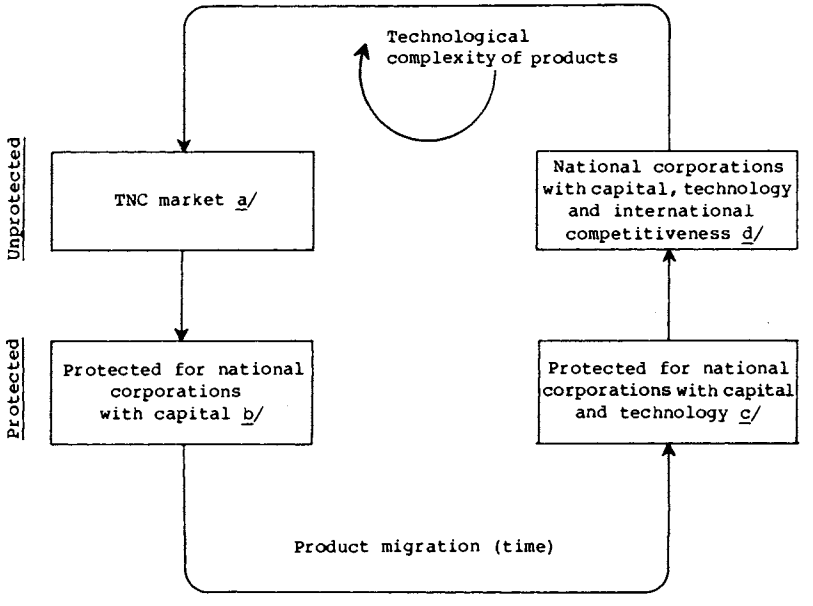
and especially corporations are concerned that software should be more carefully protected by copyright; a revision of the copyright legislation (which may involve proposals to modify the international copyright convention) is, therefore, being considered.[113]

The status of software under intellectual property legislation is being discussed in a number of countries. The view commonly held in the United States is that software should be given the long period of protection provided by copyright, in line with comparable information in books and other media. In Japan, however, a plan had been proposed to provide protection for software by the patent system; thus the owners of software would be protected during a much shorter period (normally fifteen years, as opposed to fifty years under copyright). This difference over software protection is important in that both views assume that the increasing use and development of microelectronics will lead to a shift in emphasis from research and development of hardware to those of software, as well as to the commercialization of the resulting products.

Latin American Countries. Among Latin American countries, Brazil has the most detailed and comprehensive policy framework relating to international trade and foreign direct investment in data services.[114] Brazil has formulated four principal objectives that determine the country's policies regarding data resources: (1) to maximize data resources located in Brazil, whether imported or locally produced; (2) to acquire and maintain national control over the decisions and technologies relating to Brazilian industries; (3) to broaden public access to information; and (4) to administer information resources in a manner that will enhance the country's cultural and political environment. To fulfill these four objectives, Brazil has attempted to build the necessary infrastructure—an appropriate telecommunication network and a viable informatics sector—and to develop clearly defined policies regarding telematics and transborder data flows. The country's ultimate aim is to create data industries and linkages that contribute positively to Brazil's overall industrial development.

The strategy of the Special Secretariat of Informatics (SEI) of Brazil is to enhance the capabilities of national industry to manufacture increasingly complex data technologies (see Figure 4.1). As part of this policy, foreign affiliates are encouraged to exercise their comparative advantage and to produce advanced state-of-the-art computer goods and services, both for local consumption and export; they are also encouraged to improve local research-and-development facilities. Once a product can be manufactured with national capital, the respective market segments are protected to give the infant industry an opportunity to develop, whereas foreign affiliates are encouraged to develop more sophisticated products (instead of upgrading products in the same segment). The

Figure 4.1 Brazil's industrial informatics strategy



Source: Transborder Data Flows and Brazil: Brazilian Case Study, UN publication, Sales no. E.83.II.A.3.

a/ Not protected (transnational corporations are welcome if they export and use state-of-the-art technology) because national corporations are not yet able to enter production.
b/ Protected for national corporations (which can use foreign technologies) because they are able to invest but do not yet have their own technology.
c/ Protected for those national corporations that have their own capital and technology but are not yet fully competitive in the international market.
d/ Protected barriers are lowered because national corporations are competitive in the international market. Local technology is still required, and preventive measures are being taken to maintain control of the national industry.

degree and type of protection are a function of the technological stage of the products involved. The Secretariat envisages that as soon as international competitiveness is achieved, protective barriers can be lowered, although measures may be necessary to ensure the continued improvement of local technologies and the permanence of national ownership of the country's informatics industries.

To protect this informatics policy against international leakages, SEI has adopted specific measures dealing with transborder data flows. Most important, SEI decided that the establishment of international data-communication links required the Secretariat's prior approval to ensure that they were set up in accordance with the guidelines of the national

informatics policy. (The content of messages, however, is not supervised.) Such links are approved for specific purposes only and for fixed periods of time, which may be extended for up to three years.

This regulation is based on the principle that data and the means to treat them are economic resources, subject to trade and crucial to socioeconomic development. Furthermore, data structuring is considered to be closely bound to national security. That any country has the right to regulate the nature of transborder data flows is, therefore, a Brazilian policy position. The government of Brazil holds the view that the establishment of any link should not jeopardize the operations of the local units in case of an interruption of the link; it should not lead to an outflow but to an inflow of data resources; and it should not affect negatively the country's balance of payments.

Brazil's transborder-data-flows policy, therefore, consists primarily of the application of criteria used to evaluate the conditions and the extent to which individual applications for links fit with these overall, specific objectives and, hence, merit approval. The criteria are based on two dimensions of transborder data flows: the categories of transborder data flows (commercial and corporate) and the types of use for information resources in their transnational computer-communication systems (person-to-person data communication, data-base access, and data processing). Approval of transnational computer-communication systems depends on which intersection of these dimensions is involved (see Figure 4.2).

The government of Brazil holds that its policy on transborder data flows has generally neutralized a number of impacts of transnational data links that would otherwise have been negative. This change has been achieved by rearranging some corporate data networks to enhance the data resources of foreign affiliates in Brazil, including affiliates in data and other industries. Brazil's government sees the country's transborder-data-flow policies as having led to the increased location of computers, software, data bases, and skilled human resources in the country and improved national control over them. As a result of the Brazilian government's policy, transborder-data-flow links are not being used to export data resources and thus do not increase the country's vulnerability. In the few cases in which Brazil's objectives were at stake, negotiations between the applicants and SEI seem to have led to mutually satisfactory results. The country's transborder-data-flow policies are also seen as having contributed positively to the emergence of a national data industry and especially its data-base segment. Since the same policies have strenthened data resources in other economic sectors, the government considers that they have contributed to the country's overall socioeconomic development.

Figure 4.2 Brazilian transborder-data-flow policies

On-line use of transborder data flows	Category of on-line transborder data flows		
		Corporate	Commercial
	Data communications	Person-to-person communications are not restricted.	Brazilian PTT only; co-operation agreements possible.
	Data-base access	Copy of data base in Brazil, whenever reasonable.	Encouraged, but in co-operation with Brazilian institutions, preferably with copy of data base in Brazil. If no local copy, services are provided by the PTT, although co-operation agreements are possible.
	Data processing (including use of software)	Not favoured abroad if reasonable local alternative exists.	Not allowed abroad, except in exceptional circumstances.

Source: Transborder Data Flows and Brazil: Brazilian Case Study, UN publication, Sales no. E.83.II.A.3.

The government of Brazil thus concluded that transborder-data-flow policies can serve as important support for national development objectives. These policies can be used to promote the growth of infant industries and to strengthen local industrialization. They may be particularly relevant because of the importance of information for economic development or, from an even broader perspective, of the informatization of society. Transborder-data-flow policies are considered a soft instrument for the support of development: They can be designed to increase

gradually local capabilities and to facilitate national industrial competitiveness without unduly harming the essential interests of foreign investors.

In Latin America, three broad policy groups have a direct impact on the development of individual data-service industries. First, because data communications is, with very few exceptions, a state monopoly, policies must be developed regarding the use of data-transmission facilities by private users. Second, data processing and information storage and retrieval are provided under competitive conditions, and regulatory policies in these areas sometimes restrict foreign direct investment. Third, a group of policies is oriented toward the development of indigenous software industries; these are often conceived as an extension of industrial hardware policies.

In the Latin American region, Brazil and Mexico are particularly noteworthy for their software policies, although other countries of the region, such as Argentina and Uruguay, are considering enacting software production policies as well. To strengthen the competitive position of national hardware producers, encourage technological development, and benefit the balance of payments, Brazil's policies for fostering a software industry (contained in Normative Act 27, effective 1 December 1983) focus on establishing a national software registry. Three categories of software are distinguished. The first category involves those software programs developed in Brazil by persons physically resident or domiciled in the country or by corporations owned by Brazilian citizens residing in the country. The second category includes those software programs for which no national alternatives exist but which are of economic interest to Brazil; however, the technology and proprietary rights related to these programs must be transferred to a national corporation. The third category includes all other software programs. The government of Brazil gives highest priority to the use of software from the first category and requires all government agencies to use such programs whenever possible. Corporations using unregistered programs apparently cannot sell services to the government and cannot take advantage of income-tax reductions available to other corporations to offset the cost of buying software. Since the government is an important user of data goods and services, the registry enables it to exert some control over the marketing of software products in Brazil and to encourage local production of software while reducing redundant imports of products.

Brazil regards software imports as nonpatentable technology transfers. It does not consider patents as being applicable to software because it is technically impossible to divulge software technology and to protect simultaneously its proprietary rights. Thus, software import contracts are subject to approval of both SEI and the National Institute for

Industrial Property. In implementing the policy, SEI scrutinizes all requests for registry and approves only those conforming with its general guidelines and with its overall objective of encouraging local software generation. As growth in demand for a certain type of foreign software becomes apparent—evinced by repeated requests for registration—Brazilian software companies are alerted to market opportunities and encouraged to develop a local equivalent.

In Mexico, the main legal instrument used to promote the development of a software industry is the technology-transfer law. This law, originally promulgated in 1972 and restated in 1982, was designed to regulate contracts that involve transfer of technology, including software contracts (see Art. 2, para. m). According to the law, whenever users purchase software products, they have to register the contracts with the National Registry of Technology Transfer. The only software products exempt from this regulation are operating systems and software games. During the first year of application of the restated law, of 296 contracts submitted for registration, 204 were approved and 92 denied.[115]

Under this law, the government of Mexico can, in principle, reject a technology-transfer (including software) contract. It might follow this course when an equivalent to the product to be purchased has been produced in the country. Thus, the government can foster the emergence of a national software industry. On the other hand, the government allows imported software to be purchased if the product is not available in Mexico or if it would be very costly and time-consuming to develop it locally. If users do not register software contracts, the law requires the user to pay fines that can amount to 5,000 Mexican pesos; in addition, users are not able to treat payments for nonregistered software as a deductible expense when calculating taxable income.

Uruguay is considering enacting legislation to use the purchasing power of the government—which controls a substantial share of the computer stock—to develop a software industry. Because of the small size of the potential software market, a national industry has evolved very slowly, and most software is supplied by hardware manufacturers. According to proposed policy, the government would act as a purchaser of software, which would be distributed among public and private users.[116]

In data processing, a distinction must be made between issues pertaining to domestic industries and those related to transborder data flows. In the former category, the principal issue is the provision of teleprocessing services by service bureaus. In Mexico, for example, service bureaus are limited to providing batch services, since teleprocessing services can only be offered by the government, which also can accord licenses to private agents. In Venezuela, on the other hand,

teleprocessing by service bureaus is allowed and, in fact, constitutes one of the industry's most valued services.

Brazil has pioneered policies in situations in which offering data-processing services involves the flow of data across borders. The Brazilian government generally discourages transborder-data-flow links used to process data generated in Brazil, especially when the results are to be used domestically. This policy is directed toward promoting the location of data resources and data-structuring processes in the country. In line with this policy, a number of transnational corporations, as well as the Brazilian airline Varig, were advised to restructure their transnational computer-communication systems to utilize computing power in Brazil.

The transmission of data over telecommunication lines involves such issues as the control of the infrastructure and the control of terminal equipment purchasing. In the former area, policy can depend on domestic demand for services and the government's capability to satisfy that demand. In Venezuela, for example, data-communication facilities were inadequate to meet demand. Thus, the government determined that, in addition to the lines of the Compania Anonima Nacional Telefonos de Venezuela, the buildup of several private microwave-based networks would be permited. The private networks are used for transmitting both voice and data and for both in-house and outside data transmission; for example, General Electric de Venezuela, a foreign affiliate of General Electric Company, sells data-communication and teleprocessing services over its own network.

In Mexico, data transmission is legally differentiated from teleprocessing. The first service, a government monopoly, is provided through either leased lines coordinated over the national territory by the national telecommunication network under the General Directorate of Telecommunications or a dedicated data network completed in 1982. The private sector is allowed to participate in the teleprocessing segment. For example, besides the in-house teleprocessing networks, two time-sharing firms, Teleinformatica de Mexico, S.A., and Tiempo Compartido, S.A. (both foreign affiliates of U.S. transnational corporations) have been authorized by the government to offer teleprocessing services. In Brazil, data communication services are administered by the telecommunication utility EMBRATEL. To stimulate the use of public services, the establishment of private data communication networks is authorized only in cases in which the public data networks cannot provide the required services.

Control of terminal equipment purchasing varies across the region. Venezuela, for example, before completing the construction of its dedicated network, had a liberal policy regime regarding the purchase of modems and other couplers connected to telecommunication lines.

However, once the national public dedicated network was completed, the national telecommunication utility started monopolizing modem sales and rentals. In Guatemala, which does not have a dedicated network, data are transmitted through leased telephone lines, and users are free to purchase their own equipment to connect to the system, as long as such equipment meets the standards of the telecommunication utility.[117] In Mexico, modems have to be approved by the government. In most cases, the General Directorate of Telecommunications rents modems, which are manufactured locally. Thus, the government fosters the development of an indigenous telecommunication equipment industry. In Brazil, there seems to be a trend toward adopting a policy that gives users the right to own their data terminal equipment, subject only to technical approval by the Ministry of Communications. In Paraguay, finally, modems can be chosen by the user according to standards recommended by the International Telephone and Telephone Consultative Committee (CCITT) of the International Telecommunication Union (ITU).[118]

India. For purposes of illustrating the policy approach of a developing country in another geographical region, the software policy of India is briefly outlined in the following.

Software export promotion policies in India were initially defined in 1970. In September, the Department of Electronics introduced a decree that authorized the importation of computerized equipment intended to develop software. (Since the mid-1960s, imports of computers to India have been closely controlled.) The only requirement established by the program was that during the first five years of operation, the imported equipment had to generate software exports for an amount equivalent to 200 percent of c.i.f. value. In July 1976, this decree was liberalized: Indian citizens residing overseas were authorized to import equipment and required to generate software exports for an amount equivalent to 100 percent of the c.i.f. value. The underlying objective was to stimulate the repatriation of Indian capital.

For five years, both decrees of 1970 and 1976 were implemented simultaneously. According to this double framework, the export requirements of software varied according to the origin of the capital. In April 1980, however, the Department of Electronics initiated a study on the need to establish a more comprehensive policy framework for promoting software exports. The government appointed an advisory committee of experts charged with evaluating the existing policies and the formulating recommendations. The committee's recommendations were approved, and, in January 1981, a new and comprehensive policy was put in place.

According to this new policy, all imports of equipment used to develop software for export are subject to approval by the Department of Electronics. The requirements vary according to the purpose of the import and the characteristics of the applicant: (1) The equipment is imported by an Indian company to develop software for export; after a certain period, the computer will be used to produce software for local consumption. (2) The equipment is imported by an Indian company to develop software for export in agreement with a presigned contract; in this particular case, the company will reexport the equipment once the project is finished. And (3) the equipment is imported by an Indian citizen, residing overseas, who decides to invest capital by purchasing a computer to establish an export-oriented software company in India.

According to this classification, importers in each category must follow certain requirements. In case 1, the company has to export software in an amount equivalent to 300 percent of the c.i.f. value of the imported equipment. Furthermore, the applicant must attach to the import application export contracts signed with foreign customers, which have a value equivalent to at least 20 percent of the c.i.f. value of the computer to be imported. In case 2, no performance requirements are stipulated. However, the project is not expected to last longer than two years, and the imported computer cannot be used for developing software for local consumption. In case 3, the applicant must export 200 percent of the c.i.f. value of the imported equipment. A lower performance requirement was established in order to stimulate the repatriation of Indian capital. All applicants are required to use at least one-third of the operating time of imported equipment for the development of software for export. In addition, every six months the applicant must send status reports to the Department of Electronics, which also monitors the installations to check compliance with these requirements. If a firm does not comply, the Department of Electronics has the right to confiscate the equipment.

The Indian government also plays an active role in the promotion of software exports. In 1981, a department was created for that purpose within the Engineering Export Promotion Council. The thirteen overseas offices of the council gather and relay market intelligence on software development. In addition, two missions were sent to Western Europe and the United States with the following objectives: to identify opportunities for exporting software from India to industrialized countries; to study technical and financial requirements in supplying software to those markets; to study the size of the markets and the distribution pattern for export of software, through software houses, computer manufacturers, and so on, and to identify the different market segments; to study trade practices for software export in the markets of industrialized countries, such as terms of payments, delivery time, and import duties;

to study possibilities of establishing buy-back arrangements with selected software customers; and to boost India's exports of software overseas. Presumably largely as a result of this policy of combining performance requirements for importing equipment with the promotion of exports overseas, India has been very successful in the export of computer software (see Table 2.7).

Policy Considerations

Conceptual Conflicts

Gains from Trade Versus the Strengthening of National Data Resources. In transactions in data services, one major policy orientation is that transactions in such services are analogous to transactions in goods, they involve many of the same economic elements as an export of a good or a foreign direct investment to produce goods, and, as in the case of goods, they ought to be allowed to take place as freely as possible. (Because data flows include press-information flows, considerations relating to the free flow of information often also enter the argument.) This approach implies that providers of data services have a right to deliver their services to their affiliated companies and to arm's-length customers with a minimum of government restrictions on the movement of such services or of the capital required to produce them in the host country. And this implies nondiscrimination in access to common carriers, in the rate structure of carriers, and in the treatment of foreign affiliates; taken further, it implies a right to establish private telecommunication networks. One argument holds that all economies will benefit by such a regime because resources will be used in the most efficient way. This approach applies the notion of comparative advantage—which developed in the debate about trade in goods—to the movement of data services. It is a view that tends to elevate gains from trade (which accrue to private economic agents) and efficiency consideration over all other public-interest considerations. By the same token, providers would have a right to establish foreign affiliates and for such affiliates to receive the same treatment as domestically controlled firms. The approach is reflected in the OECD Code of Liberalisation of Current Invisible Operations and the Code on Capital Movements and carried further in the 1983 proposal on services by the U.S. Chamber of Commerce.

In contrast to this view are concerns such as those expressed in the Brazilian transborder-data-flow policies, that involve the creation of domestic data capacities that promote industrialization, maintain adequate national control over the development process, and protect cultural sovereignty and identity. To these can be added the desire to obtain

access to the international data market, to regulate adequately natural monopolies (such as electronic communication systems), and to control economic agents that occupy dominant supplier positions. This view is often held by countries whose data resources are not yet developed or not yet fully developed and that utilize infant-industry arguments and take recourse to protectionist measures, subsidies, performance requirements, and similar measures, including the favoring of national champions (chosen corporations to advance national objectives). For these countries, national treatment is only acceptable if it is qualified by a development clause.

An important question in this context is whether the nationality of corporate ownership is significant for a policy aimed at strengthening national data resources. One opinion has been that, given widely dispersed ownership of capital, the character of management, not ownership, is relevant, and, given a properly devised regulatory environment, foreign affiliates of transnational corporations need not be expected to operate very differently from domestically owned corporations. In addition, in rapidly moving fields like telecommunications and informatics, foreign affiliates are the best vehicles for the transfer of technology, and anyway only a few countries can succeed in establishing a broad range of internationally competitive data industries. However, many countries (such as Brazil, Canada, France, and Singapore) base their views on the assumption that nationality of ownership does matter. In France, for example, intervention techniques, including subsidies and state participation in equity, have been deployed to ensure that important French firms (particularly in data technologies) remain domestically controlled.[119]

In international discussions, the United States has been a principal proponent of the gains-from-trade approach. This approach reflects a U.S. commitment in principle to a liberal trading and foreign-direct-investment regime. It also reflects U.S.-controlled firms' very strong position in the provision of computer hardware, software, data-processing facilities, information storage and retrieval, and telecommunication services, and the U.S. status as principal home country of transnational corporations whose operations depend increasingly on transborder data flows. However, because gains from trade are gains does not invalidate or devalue other public-interest considerations, nor would it be correct to assume that countries that do not accept the gains-from-trade approach are motivated entirely by the desire to capture more gains for themselves through protectionist measures. Instead, other countries are, as a result of their own political processes, concerned about other public-policy considerations or have formulated their national interests to take into account gains other than gains from trade. It is, therefore, important

for all countries to consider exactly how their various public-policy goods or objectives should be related to each other.

Deregulation Versus Natural Monopoly. Another policy theme is the increased concern (in the United States and the United Kingdom, for example) that the scope of state regulation should be reduced in data services—in which it is particularly relevant to the provision of telecommunication services—as in other sectors. It is suggested that regulation imposes certain inherent costs, that regulators tend to develop their own bureaucratic values and interests, which may not even reflect the goals of regulation, and that they are often captured by their clients. This belief that a freer market would better serve the public interest has led to a number of proposals for deregulation and to policy decisions that certain large economic agents should be forced to divest themselves of parts of their organizations (for example, this direction was taken by U.S. courts in forcing AT&T to divest itself of local telephone systems). In certain countries (such as Japan and the United Kingdom), this approach has engendered proposals to turn state-owned monopolies into private-sector corporations and then to assign to them more homogenous responsibilities. For example, British Telecom was split from the United Kingdom Post Office, and a proposal has been made to sell the new entity to the private sector by a share issue.

The deregulation approach is not shared by all countries, nor is it equally relevant in all of them. Some countries did not create PTTs on the European model. Like the United States, a number of countries have had private entities operating their telecommunication facilities or (like Canada) have had private entities (even if under close governmental control) operating some parts of the telecommunication system and public entities others. Many countries hold to the view—which until very recently was also held by the United States—that telecommunication services are a natural monopoly and, therefore, should be closely regulated as to the availability of services and rates structures. In economies significantly smaller than that of the United States, it may not be possible to permit more than one international (or national) telecommunication carrier. The experiment, now being conducted in the United Kingdom, of allowing new carriers to enter the previously monopolized market will no doubt be watched closely by many countries. Furthermore, even if the ability to deregulate should be a function of market size, the perception of what market size yields a natural monopoly (on efficiency grounds) may well change with technological developments. The real or perceived existence of a natural monopoly has implications for industrial policy in international trade and foreign direct investment in data services and other areas.

A single carrier, particularly if it is state owned, can be used as a vehicle for implementing a policy of discriminatory control of access to data bases and processors. For instance, domestically controlled computer-service firms can be favored over foreign firms. This distinction can be made by a discriminatory rate schedule, by limitations on the use of leased lines and user-controlled systems, and by the maintenance of artificially high fees for international connections. Such policies may seem particularly threatening to outside data-service suppliers if the carriers that they are obliged to use are also suppliers of computer services (like British Telecom). In some (especially developing) countries, the use of such a technique—the device of the chosen instrument or national champion—may be favored in the framework of a broader industrial policy aimed at strengthening national data resources. Moreover, the operation of gateway controls on trade in data services may be assigned to the designated national carrier (that is, all international data flows are required to pass through a node or conduit under the control of the national carrier).

Some Evidence for Conceptual Conflicts. That the conceptual conflicts outlined in the preceding sections are not only of a hypothetical nature can be seen in the recent discussions about the proper role of IBM in Western Europe, the principal supplier of data goods and services in that area.

IBM Europe has proposed that, as an important computer and data-service company in Western Europe, it should take part in the European Community's European Strategic Programme for Research and Development in Information Technology (ESPRIT), a program launched to lay the foundations for a fully competitive Western European data industry by 1990. IBM's desire to join ESPRIT appears to be in contradiction to the program's aim of enabling Western Europe to build a data industry of its own.[120] A parallel issue has arisen with IBM's proposal to utilize its own computer network methodology—System Network Architecture (SNA)—in Western Europe. According to press reports, a consortium of twelve Western European computer companies has objected to this proposal before the Commission of the European Communities and has urged the Commission to adopt a more open system (the Open System Interconnection Standard), which would offer greater scope for computer facilities made by different manufacturers to be interconnected. Further, IBM is reported to be discussing with the authorities of various European Community member states proposals for an electronic funds-transfer network and a private telephone switching network (with the United Kingdom authorities).

The IBM proposals look particularly attractive because they offer the possibility of tried and tested networks being quickly established for

newly privatized entities. However, "the larger question is a political one in that it [the universal acceptance of IBM's network] would give IBM a high degree of control over European communications generally."[121] The IBM proposals by which the U.S. company would be treated as a Western European entity are being considered in the light of the continuing discussion within the Commission of the European Communities of the implications of IBM's strong position in the market. How much the fact that IBM is not controlled in Europe will be a factor in the Commission's thinking is not clear.[122]

Reactions to the IBM proposals illustrate a fundamental conflict between national and international approaches to data services. On one hand, countries attempt to strengthen national data resources using nationally based companies (which they regard as essential) in the framework of a natural (PTT) monopoly. On the other hand are the national treatment of the gains-from-trade approach toward international transactions in services and the view that market forces should play a greater role in all segments of the data industries. National treatment is centrally important to this conflict of perceptions.[123] In trade policy, it is a central concept of GATT: Imported goods, once the agreed fee has been assessed for them at the frontier (art. 3), are to receive such national treatment. In foreign direct investment, national treatment is a major component of the OECD Declaration and Decisions on International Investment and Multinational Enterprises and a key issue in the negotiations of a UN Code of Conduct on Transnational Corporations. At the same time there appears to be some reluctance to treat IBM Europe, which has been allowed established in Western Europe (indeed, which has received subsidies to locate plants in Western Europe), on the same basis as other Western European firms.

Key Policy Issues

The preceding section showed the complex issues that form the framework within which policies on international trade and foreign direct investment in data services have to be articulated. These policies raise several questions regarding (1) the assertion, particularly by the United States, of extraterritorial jurisdiction for securities regulation, antitrust regulation, and export controls on U.S. technology and defined U.S. products; (2) the possible extension to traded services of the concepts of the antidumping and countervailing duties systems; (3) the concept inherent in the devices to counter "unfair" trade practices of governments and the related question of using removal of tariff preferences of imported goods (under the GSP) from particular countries to try to secure better terms of access to other countries for services, including international

trade and foreign direct investment in data services; and (4) the problems that would arise if the concept of "safeguard" action for imports were extended to trade in data services.[124]

Extraterritoriality. The problems raised by assertions of extraterritoriality can best be illustrated by the Dresser case.[125] Dresser, a major U.S. supplier of oilfield and pipeline equipment and related technology, was required to comply with the orders of the U.S. export control authorities in the export of goods *produced in France* from U.S.-origin technology by its foreign affiliate. Under international law, the French firm was subject to the jurisdiction of the French Government alone; Dresser France was, therefore, ordered by the government of France to ignore the U.S. regulations and fulfill its contracts to supply certain equipment to the USSR for use in the construction of a gas pipeline from the Urals to Western Europe. In compliance with the orders of the U.S. export control authorities, the parent firm cut the data link with its French subsidiary. The French subsidiary was, however, dependent for its engineering and design work on the computer program operated by the parent firm, which it accessed from France. The orders given the U.S. parent had implications for affiliates and suppliers not only in France, but also in other countries such as Australia.

Apart from the obvious question raised by this assertion of extraterritorial jurisdiction, this action drew attention to a number of issues related to international trade and foreign direct investment in data services. First, it highlighted that the increase of integration within transnational corporations brought about by the growing use of transnational computer-communication systems had also increased considerably the vulnerability of corporate systems to interruption. Second, given the absence of international agreement on the extent of extraterritorial jurisdiction, such an action suggested to host countries that they should exercise caution in permitting the establishment of transnational computer-communication systems if these systems would make foreign affiliates located on their territory dependent on central data-processing capabilities, access to which could be interrupted or conditioned by the application of policies in another country. Further, the Dresser case cast doubt on the validity of the postulate of free trade in international trade and foreign direct investment in data services and the concept of national treatment for foreign affiliates.

The reverse of this assertion of extraterritorial jurisdiction could arise in international trade and foreign direct investment in data services in the context of securities regulation and antitrust. Here, the question is the extent to which the storage of data—the maintenance of on-line data—in one country (the United States) by firms in other countries brings them (because material is stored in the United States) within

the jurisdiction of U.S. courts. Material or information filed in computer memories appears to be treated by U.S. courts on the same basis as business records maintained in a conventional manual filing system. For transnational corporations conducting certain operations in the United States, information on such operations held in the United States (however filed) would be clearly subject to the jurisdiction of U.S. courts. Slightly less clear is the position in regard to data stored in the United States by foreign corporations operating outside the United States but possibly having an effect on U.S. commerce; a number of U.S. antitrust cases exist in which foreign firms operating outside the United States have been cited as codefendants (see the Canadian Radio Patents case).[126] The situation of foreign firms operating in part in the United States and involved in antitrust cases is clear enough: If data are stored in the United States, the U.S. courts may assert jurisdiction. Presumably, penalties would be invoked for the destruction of such data or its removal to another jurisdiction, just as they would be for such actions in regard to conventional files. Consideration of the Laker and Uranium antitrust actions should make clear the extent to which access to file data forms the basis for antitrust actions.

A related issue could arise when a U.S. firm stores data abroad. Presumably, the U.S. courts would—in cases involving, for instance, possible Sherman Act violations—assert jurisdiction over such data, regardless of their location and the legislation on privacy or security of data that might apply at that location. The assertion of jurisdiction would be enforced by levying a penalty (usually a daily fine) on the U.S. resident corporation. Clearly, important issues of legal practice arise here with implications as to how data-service firms should merchandize their services and what categories of data may prudently be stored in or outside the United States.[127]

The cases cited here are perhaps the best-known in the field, but the application of extraterritorial jurisdiction is not limited to the United States alone. All the implications of these cases have not yet been fully appreciated in terms of data-service policy nor of the proposals for negotiating international rules of general application to traded services.

Antidumping and Countervailing Duties. Most governments have legislated arrangements on the basis of which private parties may seek remedies against competitive practices they wish to discourage. Moreover, all governments have the capacity to raise with other governments the implications of objectionable private or governmental trade practices. The GATT articles, like the treaty system that preceded them (a system of bilateral treaties linked by unconditional most-favored-nation clauses), deal only with a few important devices that have required the elaboration of treaty-based rules. Thus, article 6 of the GATT sets out rules regarding

the imposition of antidumping duties and of countervailing duties. These two types of action are distinctive because in their administration a private party may activate a substantial state apparatus. In an antidumping system, a complaint by a private interest triggers an elaborate investigation into the pricing practices of exporters in other countries, but in the normal case, only the actions of private parties are at issue. In a countervailing duty system, the policies of another government or governments are at issue. Under domestic legislation implementing the Tokyo Round Code on subsidies and countervailing duties, private parties have procedural and substantive rights to bring about a tax levy on imports alleged to be subsidized; in effect, private parties have access to domestic procedures that may cause one government to offset the policies of another government. In most aspects of commercial policy, private parties do not have legal rights to bring about state-to-state negotiations, for that reason, the countervailing duty system has become such a difficult issue.

Antidumping duties apply to transactions involving dumped goods that are determined to cause or to threaten injury to domestic producers, and countervailing duties may be applied to imports of subsidized goods that cause or threaten injury. These measures are regulated by article 6 of the GATT and, more recently, by two detailed codes negotiated in the Multilateral Trade Negotiations of 1975–1979.[128] Neither of these measures has yet been extended to service transactions. It may be argued that, if the case for using such measures to offset or preclude injury in goods transactions is generally accepted, the same logic should apply to other trade transactions, such as international trade and foreign direct investment in data services. Two U.S. trade policy lawyers have in fact argued that, as a first step, the United States should extend its domestic legislation on antidumping and countervailing duties to services.[129] This view has been addressed carefully but equivocally in the U.S. GATT services study. The authors of the study commented on dumping: "While the principles in article VI relating to anti-dumping have a conceptual application to many service imports, it is doubtful that the mechanism for computing the level of distortion . . . could be applied to services"; on the GATT clause regarding subsidies and countervailing duties, the authors observed: "The principle of the distortive nature of subsidies contained in article XVI is as relevant to services as it is to goods. However, any eventual processes for dealing with subsidy calculation in the service sectors must be somewhat less precise than required by existing countervailing duty laws."[130]

Addressing this issue, the Royal Bank of Canada, in a study of trade in computer services, stated:

> The anti-dumping system and the countervailing duty system . . . has become highly protectionist, and we believe that there should be negotiations, which would be controversial, detailed and difficult, to bring these measures under a greater degree of control. *To extend these measures to any service sector would be a most retrograde step, and, if it were seriously urged by the U.S., that would be reason alone to abandon the proposal for a Canada/U.S. bilateral on traded computer services.* Aside altogether from the implications for this sector, the precedent would have been created for the whole of the services sector. Could we really contemplate the use of anti-dumping measures, as a price regulating device, in the banking, insurance, or air transport sectors?[131] (Emphasis in original.)

Since this study appeared, evidence has increased as to the central role that these measures play in the industrial and trade policy of the European Community (particularly the antidumping measures) and of the United States—that is, a number of cases have extended the scope of these measures and established detailed precedents.[132] They are also employed extensively by Australia and Canada. Measures such as these, which are administratively complex, difficult to administer, expensive for private parties and punitive and discriminatory in application, bear particularly on potential exports from smaller to larger countries. Like many trade policy measures, they are often inherently power biased.[133] They are particularly effective when applied against imports from developing countries, but they have little practical value as protective measures, if used by developing countries against imports from developed countries. No doubt this practical consideration is one reason these measures are used so little by developing countries.[134]

In any general discussion of possible rules for traded services, proposals to extend GATT article 6 measures to such services will probably be considered. From the viewpoint of developing countries that might want to enter the data-service market as exporters, there might be a real risk that the private interests affected in the importing industrialized country might propose that countermeasures be applied to competitive exports on the grounds that they are dumped (priced for export at less than the comparable price in the exporter's home market) or that they are subsidized for export. Only if the antidumping and countervailing duty systems were less punitive—if they required a demonstration of a significant level of injury, not merely that of some adverse competitive impact—would such a policy development be less threatening. From the viewpoint of data-service policies for developing countries, even discussion of these issues is probably not advisable since their results would probably be unfavorable to developing countries.

Unfair Trade Practices of Governments. Another device by which private parties have rights to activate the state investigative system and,

in due course, state-to-state action and reaction, is Section 301 of the U.S. Trade Act of 1974. This section provides for action by the administration against "unfair" acts of other governments that adversely affect U.S. commerce. The scope for retaliation and for countermeasure and, as the provision now reads, for a private party making a complaint has considerable procedural assurance that, if the complaint is held to be well-founded, the provision on intergovernmental discussion must be activated. The thrust of the provision, as amended, is to narrow the scope for the exercise of discretion by the executive. This provision includes within its purview "unfair" acts by governments in the service as well as goods sector.

In several cases, intergovernment discussion has been required when private parties in the United States have complained under Section 301 about the practices of other governments in services sectors. Most of these cases have involved activities that are not explicitly covered by existing treaties and have therefore been considered between governments on a more or less ad hoc basis.[135] Although data-service transactions are not excluded, no cases had arisen involving them as of 1984. The fact that these matters have to be discussed outside the framework of a specific treaty provision is important evidence that some sort of multilateral agreement is necessary, in regard to specific services or in regard to general traded services.

Experience with the GATT article 6 provisions on antidumping and countervailing duties suggests, however, that the process of negotiation tends to accelerate the elaboration of international and national procedures, which in turn make more automatic, formal, and legalistic the rights of private parties to seek redress by activating the state-to-state discussion and compensatory apparatus. It is not at all clear that, from the viewpoint of developing countries, Section 301 of the U.S. Trade Act should be translated into a trade-agreement provision.

The character of this provision and the extent to which private parties can trigger state action under it have been emphasized because Section 301 may well be expanded and made more detailed in regard to traded services; thus it could cover trade in data services. A number of proposals for legislation of this sort has been discussed in the U.S. Congress. The drafting of these various proposals seems to reflect a view that the United States can best advance its interests in the tradable services sector by increasing the procedural scope for the processes of complaint, hearing and then consultation and discussion with other governments. The accepted approach seems to be that such consultations will be more fruitful if the U.S. administration has been clearly delegated the power to retaliate against the exports of goods, or services, or other commercial interests of the other party if the policy complained about is not adjusted.

Data-service trade issues can quite possibly be raised in these developments.[136]

A related development in U.S. trade-policy legislation is the administration's proposal to revise the U.S. system of generalized tariff preferences for imports of goods from developing countries so that a tariff preference on imports may be withdrawn on a discriminatory basis (that is, from one country only) to retaliate against the trade practices—including practices regarding trade in services—of such other country. The policy that tariff preferences on goods may be withdrawn in retaliation against a practice determined under domestic procedures to be harmful to U.S. services exports or to affect adversely foreign affiliates of U.S. transnational corporations in service industries (by, for example, refusing to give them national treatment) is explicit in the administration's proposals.[137] This policy has obvious implications for the data-service policies of developing countries.

Safeguards. GATT not only provides for measures against unfair import competition but also allows restrictions on imports that are traded "fairly." The latter occurs, first, when a country determines that it must safeguard its balance of payments (Art. 12) and, second, when imports of a particular product cause or threaten serious injury to domestic producers of a like product (Art. 19, the safeguard or escape-clause provision).

Many developing countries restrict imports of goods and services and restrict remittances by local affiliates of foreign firms. They justify such actions (under the GATT, when goods are involved) by invoking either the balance-of-payments provision or the many special provisions in regard to "development," that over the years have been built into the GATT (Art. 18 and pt. 4). However, during the past two decades, developed countries have evolved stricter rules among themselves. With regard to restrictions on imports for balance-of-payments purposes, the GATT formally prescribes quantitative measures, although import charges (price measures) are preferred. However, in recent cases of countries' imposing restrictions or charges on imports for balance-of-payments purposes, neither was imposed on service transactions. For example, although a wide range of imported goods was made subject to an import surcharge in the Canadian foreign exchange crisis of 1962, no comparable tax or charge was imposed on imports of services; similarly, no charges on traded services were imposed by the United States in the 1971 balance-of-payments crisis.

As for imports of particular categories of products that cause or threaten serious injury, the extension to any service sector (such as data services) of provisions analagous to GATT article 19 would probably be undesirable because, given that there is as yet no meaningful agreement

on the character or level of injury at issue nor any effective system of international surveillance, national governments would be free to impose restrictions as they saw fit. They would be restricted only by the threat of retaliation, a device that small countries are not always willing to use. Still, if a comprehensive agreement on traded services were worked out, some sort of specific safeguard provision or escape clause would have to be included, since every government would want some scope for protective action.

If this should occur, the focus should be what in the continuing GATT discussions of the safeguards issue is called the "conditions" and the "criteria" that apply to taking such action. Any agreement should specify, for example, the circumstances under which action could be taken by one country to limit imports of traded services from another, how long such measures may last, whether compensation should be paid, and what procedures should be established for consultation. Because the GATT safeguards issue figures high on the agenda of multilateral trade discussion and some countries are pressing to put general rules in traded services on the agenda, the issue of extending article 19 to general traded services or to key data services may arise, or an analogue of GATT article 19 may be proposed.

Specific Data-Service Issues

Apart from these broader issues, several specific issues have particular implications for international trade and foreign direct investment in data services. The first such issue is raised by the proposal to extend the provisions of the Tokyo Round agreement on government procurement practices to service contracts, including contracts for data services. The second isssue is the role of standards or norms in the data-service area; data havens are the subject of the third. The fourth concern is the protection of data stored in data bases from access by unauthorized persons and the corollary of ensuring that personal data of the sort are accurate (by giving a right of access to the data subject). The fifth issue is of ensuring that other states do not have a right of access to data within their jurisdiction solely because of the convenience and competitiveness of some computer-service companies. A final issue is the nature of the right of establishment as it applies to data services: Should it be treated as a "right of presence" or a "right to deliver" a service?

Procurement. Many governments use the award of contracts for the supply of computers, telecommunication equipment, and data services as an instrument to support national companies ("a chosen instrument"). Such contracts for hardware—if they exceed the minimum value specified in the Tokyo Round Agreement on Government Procurement and involve

procurement by entities covered by the code[138]—are within the terms of the GATT procurement agreement. But the scope of the Tokyo Round Code is limited in terms of entities; furthermore, developing countries have not been eager to adhere to it. The code contains a provision (art. 9) that calls for review and for further negotiations for the extension of the code to new entities. The U.S. government has been asked by Congress to explore the scope for adding service contracts to the code. In situations in which governments do not have their own data-service capacity, efforts to extend the code to such services could seriously limit the ability of governments to favor their chosen instruments with contracts or to use such contracts to serve other national purposes, such as research or the development of domestic capacity.

The first step in any negotiation on this matter is for negotiating countries to exchange lists of requests. Little enthusiasm is evident even among the developed countries that have signed the existing code for the extension of its provision to service contracts, including data-service contracts. One reason is that many important entities purchasing goods are not yet listed in the code, and thus dealing with that issue seems to have greater priority. Moreover, devising an appropriate import tariff is difficult, as it is in other service areas. For traded goods, import tariffs may be levied as the goods clear customs; the purpose of the code is to prohibit an additional preference for domestic goods, superimposed on the import tariff. If it were feasible to devise techniques for levying tariffs on imported data services, it would be more feasible to consider narrowing the scope for awarding an additional preference for domestic products in procurement contracts.

Standards. A number of international arrangements in the service area operate not in terms of the conventional trade-agreement language of most-favored-nation treatment, national treatment, and so on, but in terms of setting norms or standards of conduct, most important, in terms of technical protocols. Such forms of international cooperation and techniques for formulating the rights and duties of states were developed in the nineteenth century, for example, in the framework of the Universal Postal Union. All countries had an interest in developing minimum common rules to ensure the operation of certain systems at the international level, and this interest could be best served by the adoption of standards of conduct. The work of the International Civil Aviation Organization (ICAO) in relation to the operation of airlines and of the International Telecommunication Union (ITU) is directed toward establishing such norms of conduct and such standards; for example, the allocation of radio frequencies, protocols for equipment interface, and so on. In the data-service area, this work has gone forward primarily under the auspices of the ITU. Governments' adoption in

their domestic legislation of these interface standards for interconnection by other users to government-controlled data-service facilities gives these standards authority.

A concern, however, is the scope for equipment suppliers, who are also data-service firms, to devise their own network systems with their own standards for interface. This concern was already noted in reference to the dispute about IBM's network and the alternatives in the European Community. Developing countries may have to decide whether they should commit themselves to the networking and interface standards of one or another major supplier or whether they should keep to internationally mandated standards.

In the ITU as in the ICAO, the drafting of obligations to adhere to certain norms in the provision or licensing of a service, or the setting of interface standards often confers a right to nondiscriminatory treatment. This approach may have much the same practical effect as that achieved by trade-agreement provisions setting out most-favored-nation rights, or, in some particular provisions, may amount to the equivalent of national treatment.

Data Havens. The concept of a legal haven is familiar in tax law and in legislation on banking, insurance, and financial services. The notion implies the existence of some special privilege (such as a lower rate or tax) or the provision of some special legal systems, which shelter the activity concerned from scrutiny and remove the legal situs to outside the national or territorial jurisdiction of a particular state where the rules are considered inimical to the particular activity. The concept of a haven from territorial jurisdiction is the obverse, of course, of the concept of extraterritorial jurisdiction.

The notion of a data haven is not yet well developed. To some it suggests the provision of data storage without the same degree of legal protection or scrutiny required by emerging privacy legislation; to others it implies that a location for data storage which is proposed outside the jurisdiction of another country. Small countries operating other types of havens may be tempted to create parallel data havens. However, these probably will be circumscribed by the willingness of courts to exert extraterritorial jurisdiction (as in the Florida–Bank of Nova Scotia case) and by the imposition of requirements to keep certain basic data within national boundaries and therefore in domestic data-storage facilities (as required of banks under the Canadian Bank Act).

Privacy. Privacy is an area in international discussions of data services that has been written about in some detail.[139] With the acceptance of international understandings on privacy (such as the Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data, adopted by the Council of Europe), national legislation

is likely to exclude increasingly from contracts computer-service firms whose national governments have not adopted such understandings or similar ones. This process is slow. In the United Kingdom, for example, the Data Protection Bill, which would implement United Kingdom obligations with respect to the Convention of the Council of Europe, has not yet been enacted, and, once enacted, the bill will require up to two years to become fully operational. By prohibiting data transfer to countries in which no comparable protection of privacy exists, the convention will also deal with one aspect of the data-haven issue.

Jurisdiction. International agreements on privacy, such as the Convention of the Council of Europe and the OECD Guidelines on Transborder Data Flows, have not solved the issue of jurisdiction over data. No rulings have determined what authority the courts of any one country have over data stored in that country as a result of the sale of data services by a company in that jurisdiction to a user in another country, or the corollary problem of what access should be given to the user country courts to data about persons in its jurisdiction that is stored elsewhere. One idea (developed in preliminary discussions of the Canadian-U.S. proposal) is that the data originating in one country but held abroad should be considered outside the jurisdiction of the receiving country and accessible by the courts of the user country in the same way as if the data were stored in the user country.

In practice, it would be difficult to deal with situations in which a parent firm in one jurisdiction stored data with its foreign affiliate in another country. If the data dealt solely with the affairs of the foreign affiliate, then they would fall within the authority of the receiving state where the affiliate is located. However, if they dealt with the affairs of the parent firm, they would be within the jurisdiction of the originating or user state. This distinction may be clear enough in theory, but it is difficult to apply in practice. In the Dresser case, it would seem that if the engineering data to which Dresser France required access had been stored in a third country, the U.S. export control authorities would nevertheless have denied those data to Dresser France; that is, they would have asserted jurisdiction over those data stored abroad.

Extensive international discussions will be required—not only dealing with data services but also regarding banking and insurance, which are major users of data services—if working understandings are to be reached. Meanwhile, it is necessary to consider the legal risks involved in storing data in various jurisdictions. These issues will be examined in the intergovernmental discussion of the proposed Canadian-U.S. common market for computer services.

Right of Establishment. Reference has repeatedly been made to the right of establishment for foreign-controlled data-service firms and

national treatment of such firms once they are established. It is not likely that, in the near future, many countries will be willing to grant a really comprehensive, multilaterally agreed right of establishment for foreign-controlled firms producing goods and services (including data services). The reservations and derogations to the OECD Code on Capital Movements make this quite clear. The United States, for example, has enacted extensive legislative restrictions on the operation of foreign corporations in a number of service industries (see the draft bilateral treaty between Panama and the United States cited earlier in this chapter). Neither the draft UN Code of Conduct on Transnational Corporations nor the GATT articles contain establishment provisions. Still, the issue is certain to be extensively discussed in any broad services negotiations.

In this context, the concepts of "right of presence" or "right to deliver a service" have been addressed.[140] These concepts are as yet relatively vague, although they are being discussed in some detail in such sectors as insurance. They need to be more fully articulated, and then perhaps they can contribute to the international discussion of trade and foreign direct investment in data services.

5

Summary, Conclusions, and Policy Implications

The Spread of Data Technology and the Rise of Trade and Foreign Direct Investment in Data Services

The growth of data services and international trade and foreign direct investment in these services forms part of a broader process of technological change based on developments in microelectronics. The decreasing cost and increasing performance of electronic components have altered the economics of information processing and made it possible to perform electronically and economically a widening range of functions related to the creation, storage, manipulation, and transmission of information.

These changes have been most evident in the development of entirely new goods and services for the treatment of information: The proliferation (documented in Chapter 1) of data goods and data services (data processing, software, information storage and retrieval, telecommunication services) is a highly visible instance of this trend. The industries producing these goods and services account for an increasing share of overall output and employment. At the same time, the accelerated development of microelectronics is altering both the products and the processes of established industries.

Electronic devices have been used to replace electromechanical and other nonelectronic control elements in a broad range of industrial applications like process monitoring, instrumentation, and control. They have also been used to enhance the sophistication and flexibility of the control functions built into products and to introduce automatic control capabilities previously lacking. An important advantage of electronic control devices is the ease with which they can be programmed and hence adapted to new tasks; but they are also more robust and cheaper

and require less space. Exploiting these advantages involves both the incorporating of microelectronic elements into traditional products (such as washing machines) and attaching computers to complexes of these products (such as machine tools).

Incorporation of electronic controls into capital equipment changes production processes in downstream user industries. For instance, developments in computer-aided design and manufacturing are modifying production technology in industries using machine tools, in this way altering their cost structures and international competitive positions. An instance of particular relevance to developing countries is the increasing sophistication—resulting from greater electronic control capabilities of garment-making machinery—that is eroding the competitive advantage of countries with low labor costs. The impacts of these changes in production technology on cost structures are manifold and complex; they involve changes in the composition of purchased inputs, the technical skills needed to operate equipment, capital costs, the amount of space required for factories, and the extent and nature of scale economies.

These changes in manufacturing processes are paralleled by even more far-reaching modifications to service functions. The significance of service functions related to data treatment is growing both in the traditional service sector and in other parts of the economy. Thus, producing automobiles requires a broad range of data information activities: Design and other aspects of research and development; actual management of flows of inputs and intermediate products; the monitoring of inventories, orders, and deliveries; financial management of the cash flows arising from the flows of goods; and so on. Secondary industry—even that part not oriented to producing goods primarily used for data processing—involves an increasing component of information inputs and processes. These are, of course, of even greater significance in the traditional service industries, which specialize in providing coordination functions to the economy as a whole.

By modifying the technology of information handling, developments in electronics have completely altered the way in which these information functions are carried out in established industries. Traditional functions—such as the preparation of payrolls or the control of inventories—previously performed manually, rely increasing on computers. At the same time, new information functions have become possible and are supplied by specialized departments as services, both internally and to customers. For instance, suppliers of certain manufactured goods use data networks to provide enhanced maintenance services to their customers, whereas banks use data networks to supply transnational cash management services to major transnational corporate clients.

By modifying the technology used for information functions in established industries, advances in electronics have changed cost structures and competitive positions in these industries. Access to advanced computer technology has become an important factor, for instance, in determining research-and-development capabilities in the automobile industry or in providing a competitive service in banking and finance.

The combination of these developments has given rise to the rapid internationalization of the data industries described in Chapter 2. Although several difficulties hamper the exact determination of the growth of these transactions, they appear to be among the most dynamic components of both international trade and investment. In fact, the boundaries between data goods and data services are blurring. Thus, for instance, more than three-fourths of the total cost to the user of large computer systems is accounted for by software, the balance by hardware; in a sense, therefore, such computer systems have become service products to which some hardware is attached. Similarly, the boundaries between data goods/services, on the one hand, and traditional goods, on the other, are also fading. Thus, for instance, mechanical telecommunication switching systems are rapidly being replaced by electronic switching systems whereas approximately 60 percent of the cost of developing the latter is accounted for by software development costs; again, the purchaser of such an electronic telecommunication switching system obtains a sophisticated set of operating systems, application programs, and programming aids, plus a special-purpose computer and associated peripheral equipment.

Apart from trade and foreign direct investment in data services per se, the impact of data technologies on existing industries is giving rise to international data-service transactions. These transactions are developing primarily through embodied services (such as telecommunication switching systems), continuous direct data links for operating and servicing purposes, and increased need for on-the-spot servicing. Such derived data-service transactions are particularly important to other service industries, especially air transport, the credit-card industry, banking, and insurance. In these and other industries like shipping, transborder data flows have become an indispensable tool for international transactions.

Transborder data flows are increasingly becoming the infrastructure for the operations of transnational corporations; in fact, most international transactions in data services take place via corporate transnational computer-communication systems. Perhaps 1,000 such systems were in existence at the beginning of the 1980s. These flows are used not only to speed up communications but also to improve management (for

example, financial management, inventory control) and to change the manner in which research and development as well as production are undertaken (for example, computer-aided design and computer-aided manufacturing). The benefits that transnational corporations derive from the use of transborder data flows are in the area of increased corporate efficiency, and they are a major element through which these corporations take advantage of new technological possibilities and adjust to the changing economic environment.

Finally, the application of data technologies is leading to the growth of new forms of international trade in that certain nontradable services become tradable. For example, in the banking industry, use of data technology is beginning to permit trade of a disembodied service without requiring a direct presence in a foreign market for the generation of international transactions. Thus, in 1981, 7 national and more than 200 regional automated teller machine systems existed in the United States; in principle, these systems can be linked relatively easily to such systems elsewhere and, in this manner, permit routine international electronic funds transfer. Similar developments may occur in the case of other disembodied services, such as insurance, accounting, engineering, and legal services. Some of these services are already provided routinely via corporate transnational computer-communication services within transnational corporations. It may be only a question of time until the processes of differentiation, specialization, and standardization of knowledge lead to the emergence of economies of scale that make it economically feasible to take these services out of their corporate framework and into the international market place. In the fields of airline reservations, hotel bookings, and certain banking transactions, this move has already occurred with the establishment of the commercial closed-user-group networks SITA and SWIFT.

Thus, the emergence of microelectronics-based data technologies has not only led to the creation and growth of data industries and to changes in the modus operandi of existing industries, it has also given rise to new international economic transactions and is changing the nature of existing transactions. As discussed in Chapter 3, the growth of international trade and foreign direct investment in data services is largely a function of four factors: technological changes, which have expanded the range of data-processing applications and reduced the costs of transmitting data between nations; changes in the economic environment, which have increased the importance of timely access to information in the international management of a broad set of activities, thus inducing an increase in international transactions in data services; various obstacles that impede the growth of these transactions; and the emergence of a

pattern of international specialization in the provision of data services associated with direct flows of trade and international investment in these services. In the light of these factors, the patterns of international involvement in data services can be summarized as follows.

1. Data entry and certain routine programming operations are highly labor intensive and require moderate skill levels. In some instances, these operations have been transferred to developing countries, generally on a subcontracting basis; however, in both areas, the comparative advantage of the developing countries may be eroded by the growing automation of these tasks.

2. Time-sharing is basically a declining activity, as processing costs fall more rapidly than communication costs; particularly over long distances, the scope for international involvement is limited. Enhanced time-sharing, however, remains a growth area, with localization patterns basically reflecting the need for proximity to advanced users; this activity involves a product-cycle effect, with supply being shifted to foreign sources as demand at these sources increases.

3. Data-base services, though also experiencing a product-cycle pattern on the demand side, do not display a shift in supply to foreign sites as overseas demand grows. In this activity, trade flows represent the primary form of foreign involvement, presumably because the cost of maintaining a data base increases with the number of sites at which it is stored. However, a local presence in foreign markets is important in securing sales, especially for products drawing on the data base, such as consultancy services, user seminars, and provision of documentation. These ancillary services may be even more profitable than the principal activity.

4. Software products are heterogeneous, with packages displaying classic product-cycle characteristics; initial supply occurs in the most advanced markets (generally the United States) and then shifts to markets with lower levels of computer penetration. However, this shift in supply primarily involves presence in foreign markets rather than the actual production of software in those markets. Presence may be obtained through the establishment of a branch office or through arrangements with local distributors. Local presence is even more important in the custom software and software consultancy areas.

5. Value-added telecommunication services have had only limited international involvement, mainly because of regulatory obstacles. On a commercial basis, these services have developed mainly in the United States; they are provided elsewhere by telecommunication administrations. If greater international involvement in this activity becomes feasible, it would be primarily on an investment basis.

Implications for Developing Countries

A crucial question is what role trade and foreign direct investment in data services will play in shaping the international dimensions of data technologies. In formulating policies in this area, developing countries face two challenges: First, to secure a position in the new industries arising from advances in electronics (notably in the industries supplying data services); and second, to do so while maximizing the complementarities between those industries and the ones in which these countries are already engaged, while minimizing the costs imposed on established industries by policies to promote new industries. In the following sections, the impact of trade and foreign direct investment in data services on the location of electronics-based industries in developing countries will be examined, before turning to the impact of these transactions on the competitive positions of these countries in established industries.

Impact on the Location of Data Industries

By and large, the factors affecting location patterns in data services are not favorable to developing countries in that proximity to markets and access to advanced technology play a key role. Virtually the only market segments in which there appears to be an emerging role for developing countries are data entry—which is only marginally important in data services as a whole and may well be adversely affected by trends in data-capture technology (optical scanning and other automated data-entry techniques)—and the production of certain kinds of software.

It is not clear whether international trade in data services hinders the development of an autonomous data-services industry in countries that lack appropriate supplies of skilled personnel (notably electronic engineers and software professionals) and the infrastructure (notably in the telecommunication field) required to provide data services. Rather, in these countries, the slow emergence of data-service suppliers may result not from the strength of the international competition but from the absence of an adequately supportive educational and technical environment.

This distinction has important policy implications in that infant-industry policies applied to data services may be counterproductive, if the resources required to develop a data-service industry are not taken into account. In particular, policies aimed at promoting the growth of data services in developing countries may have to be based on a strengthening of educational facilities in the computer-science area and of the telecommunication infrastructure for data transmission. They may also have to provide appropriate stimuli to the demand for data services,

since the development of data-service industries appears to be highly sensitive to the pressure of demand. Underscoring these considerations is the complementarity between data services and other electronics-based industries, notably those producing electronic hardware. This complementarity between services and hardware is particularly important for software and data-network services: These are both essential complements to the computer hardware industry and are a source of major design interdependencies.

This complementarity gives rise to both risks and opportunities. On one hand, policies that reduce the domestic availability of software—for instance, by hindering the import of software in areas in which domestic substitutes are not available—may adversely affect local hardware markets and may hinder the development of a local computer industry. On the other hand, policies that raise the technological capacity of local software suppliers—for instance, through the upgrading of educational facilities—may also provide an important boost to the local supply of electronic equipment.

It appears, therefore, that policies to promote data-service industries in developing countries should take into account three sets of interdependencies.

1. Between local technical resources and capabilities and the emergence of a data-services industry. It is unreasonable to expect such an industry to develop in the absence of appropriate infrastructures for education, for telecommunications, and for a data-services market.
2. Between the different components of data services. Access to specialized data-base and time-sharing services (such as for computer-aided design) may assist local development of software; if access to the one is curtailed, the growth of the other may be hindered.
3. Between data services and other electronics-based industries; policies to promote local supply and data services may enhance the growth potential of a local computer industry; but policies that prevent a local computer industry from accessing recent developments in software may adversely affect its prospects.

These interdependencies suggest that policies for data-service industries in developing countries should ensure that an appropriate infrastructure is established and that this infrastructure is used to promote development in those market segments in which a viable role can be defined and complementarities with equipment manufacture are maximized. Although such policies may need to provide an element of infant-industry protection

to firms operating in the market segments selected, this should not unduly compromise access by firms to foreign suppliers of other major data services. The segments to be protected should be carefully defined so that potential harmful effects in other areas are minimized.

Finally, it may be appropriate to place national policies regarding data services into the larger context of an industrial policy and the desired economic development path. Naturally, these policies should be based on an understanding of the impact of data technologies, and they should be informed by the experiences of other countries in this regard. The experiences of other developing countries, especially those in Latin America, deserve careful analysis, with a view toward establishing the extent of their applicability to other countries of the region.[141] This task, of course, belongs to individual governments: They may wish to pay particular attention to their role and that of the public sector in strengthening domestic data resources (especially regarding data-related research and development), hardware manufacturing, data base creation, production of software, provision of data-processing power and telecommunication services, and the role of transnational corporations.

Impact on Established Industries

Technological advances in electronics have far-reaching implications for competition in established industries. These advances are altering both products and processes in established industries and modifying cost structures and hence locational patterns. The most immediate impact for developing countries is the declining importance of labor costs as a competitive advantage and the growing importance of access to data technologies. Even in a labor-intensive industry, such as clothing manufacturing, the early 1990s are likely to see considerable progress in automating sewing operations (thanks to electronic programmable sewing and fabric-handling machines), undermining the strong position acquired by a number of developing countries in this labor-intensive industry. Moreover, though developing countries may well be able to acquire such equipment on the world market, installing, operating, and maintaining it will require skills presently in short supply in many of these countries.

Establishing an independent competitive presence in a broad range of engineering industries increasingly requires access to advanced data technology. This access is needed for product design (which uses computer-aided design technology) to incorporate electronic devices into products (such as refrigerators or sewing machines), to utilize computer-aided manufacturing technologies when these yield substantial benefits (for instance, for batch production of machine tools), to test product quality, and to control the distribution of products to customers.

Finally, the competitive importance of access to data technology is even clearer in the established service industries: The potential for raising productivity, reducing cost, and enhancing service through computerization in such areas as transport, banking and insurance, and public administration is obvious. If this potential is not realized, developing countries may impose a substantial excess cost on their economies; if they do realize it, they will be better placed to compete in the world market for services.

Developing countries may face a dual challenge at the end of the 1980s: The declining importance of wage costs in determining competitiveness may reduce their attractiveness as sources for currently labor-intensive products, and the growing importance of access to data technology may increase the attractiveness of sources of supply located in the industrialized countries, where this technology is concentrated.

Trade and foreign direct investment in data services may be viewed as diminishing the risks inherent in this challenge. In effect, these transactions make advanced data products available in developing countries; for instance, users in these countries can access data bases or enhanced time-sharing services located in the developed market economies. In this sense, trade and foreign direct investment in data services expand the range of services available to local users and compensate for gaps in local supply.

On the one hand, access to foreign data services requires an infrastructure that is not available in many developing countries. For example, access to data bases or specialized time-sharing applications necessitates a sophisticated infrastructure for data transmission, as well as access to the training facilities and equipment needed to make optimal use of these services. Frequently, neither the local telecommunication infrastructure nor the local arrangements for operator training and equipment supply are up to this task. On the other hand, countries may pursue a selective strategy that does not necessarily require an across-the-board upgrading of the needed infrastructure. For instance, to improve their foreign-exchange management, developing countries may establish online connections to a currency-quotation data base; this process may need only one data link, namely between a central bank and a vendor offering this service.

The extent to which foreign supply can compensate for the inadequacies of local data industries in developing countries may also be limited in another respect. Data products in developed countries obviously are designed to meet the requirements of users in these countries, but these requirements may differ from those of developing country users. In the economic data-base area, for example, the products commercially available focus on economic indicators and models of developed countries.

Much less information can be acquired from these data bases on developing country trends and prospects.

This discussion highlights the need for a policy response to the challenge arising from data technologies. If developing countries do not upgrade their infrastructure for managing data resources, they may find it difficult to benefit from trade and foreign direct investment in data services. At the same time, these transactions cannot by themselves meet the data-technology needs of developing countries; policy initiatives—possibly on a cooperative basis among developing countries—may be required to fill existing gaps.

These policy initiatives probably should have a dual thrust. First, the capacity of established industries in developing countries to draw on data technology to increase their competitiveness needs to be enhanced. This will require appropriate training and education policies, investments in the telecommunication and informatics infrastructure, and technology awareness programs. Facilitating access to trade and foreign direct investment in data services is important in this regard; an example might be policies to ease local industries' access to computer-aided design applications in the industrial countries. Second, the adequacy of the services available through trade and foreign direct investment in data services to meet local needs should be assessed, and options for improving the match between supply and developing country needs should be examined. Possible cooperative efforts among developing countries may deserve special attention in this respect.

The Role of Transnational Corporations

In devising policies to deal with the impact of trade and foreign direct investment in data services on the location of data resources and the competitive position of developing countries in established industries, considerable attention has to be paid to transnational corporations because of the role these corporations play in the world economy in general and in data industries in particular. Transnational corporations account for the largest share of world trade, a good part of international financial flows, and the largest share of transfer-of-technology transactions, and they play a substantial role in the industrialization of developing countries.[142] In addition, transnational corporations are leaders in the data industries, both as producers and as consumers of data services; in fact, most transactions in data services are undertaken within the framework of transnational corporations. The application of data technologies by transnational corporations and the growth of intrafirm transactions in data services have not only profound implications for the structure and operations of transnational corporations but also for

the relations between these corporations and the economies in which they operate. These implications can be considered under three major headings: impacts on the industrial composition and product ranges of transnational corporations; impacts on the international intrafirm division of labor in these corporations with particular reference to the competitiveness of developing country sources of supply; and impacts on the internal structure of transnational corporations and the effect of this structure on the relations of transnational corporation with host developing countries.

Industrial Composition and Product Ranges of Transnational Corporations. The emergence of new products and processes based on data technology has altered both the industrial composition and the product ranges of transnational corporations. As demand for electronics-based products has expanded rapidly, companies supplying these products have grown faster than those in traditional industries. Moreover, having secured markets in their home countries, firms in these industries have internationalized their production and distribution operations, with their foreign operations growing more rapidly than their home-market sales. As a result, they have become an increasingly important source of foreign direct investment, which—though principally oriented to the industrial countries—has also resulted in greater investment operations in developing countries.

This process, conforming to the classic product–life-cycle model, is relevant to data services (as already noted in Chapter 3). In particular, the internationalization of corporations has been increasing in the database, software products, and enhanced time-sharing market segments. This internationalization is primarily oriented to marketing and distribution rather than to international production; but it does require the establishment in foreign countries of branch offices and distribution arrangements by suppliers of these products. Although the resulting capital inflows to host countries are modest, this interaction nonetheless raises important questions about market access and technology-transfer policies.

Developing countries are faced with an increasing number of foreign investment proposals in data services, as well as in other electronics-based goods. The critical question is the extent to which these proposals will serve to reenforce the technological and industrial capabilities of host developing countries. In particular, investments mainly oriented to marketing and distribution—although helpful in easing access by developing countries to data services—should be complemented by investments in strengthening local skills and production capacities in data-resource industries. Perhaps market access should not be unconditional but rather based on the reciprocal interests of investors and host countries.

The growth of trade and foreign direct investment in data services has altered the internationalization strategies of other industries. The most notable impact has been on those services industries whose activities involve a substantial element of information handling, in particular, the finance, insurance, and transport industries. In the finance and insurance industries, the massive use of data technology has created entirely new products and changed traditional processes. In both instances, the international dimension has been important. Thus, the development of international cash-management services has provided a major impetus to the internationalization of the larger banks, as has the use of electronic data networks to monitor the operations of foreign branches and to facilitate the transfer of data and funds between branches and parent companies.

This internationalization has had two implications for developing countries. First, as with the electronics-based industries, they have had to deal with a growing number of foreign-direct-investment proposals from service industries. Second, policies regarding the management of data resources have had a major effect on the operation of transnational corporations in the service sector. Since international banks rely so heavily on data services for their international operations, they consider policies aimed at the data-service industries as having a significant impact on their operations. In particular, policies that seek to promote a domestic data-service industry in developing countries may be seen by international banks as restricting their capacity to operate in those countries and hence as at least indirect restrictions on foreign direct investment in banking.

From the viewpoint of developing countries, this situation involves both risks and opportunities. Developing countries can conceivably benefit from participating in the internationalization of service industries. To do so, they must provide an adequate infrastructure for international transactions in data services, which will increase their capacity to negotiate their participation in this internationalization process for mutual benefit.

Finally, in addition to expanding the range of products offered internationally—and hence of industries that the developing countries' foreign-direct-investment policies must take into account—advances in data technology may also reduce the relative importance of some established industries and of transnational corporations in those industries. The products of a range of industries are either being supplanted or greatly modified by data technologies. In framing policies for the transfer of technologies—be it through foreign direct investment or licensing—developing countries should seek to ensure that the tech-

nologies so obtained are not those being rendered obsolete. Although this task is difficult, the pace of technical advance increases its importance.

International Intrafirm Division of Labor. In dealing with the changes in the industrial base of transnational corporations and their product ranges, developing countries will need to take into account the shifts induced by new technologies in the international division of labor. In effect, these shifts alter the potential benefits of foreign direct investment for developing countries and the eventual outcomes of policies bearing on foreign-direct-investment flows. Advances in data technology may directly and indirectly undermine the competitiveness of sources of supply in developing countries: Directly, because they erode the cost advantage developing countries can derive from lower labor costs; indirectly, because firms in developing countries—both domestic and foreign owned—may not be able to access the data technologies needed to develop new sources of competitiveness.

Given these impacts, a scenario can be written in which the position of developing countries in the intrafirm division of labor within transnational corporations deteriorates. More specifically, it is imaginable that foreign affiliates in developing countries would be mostly confined to the narrowing range of products in which labor costs remain a determining factor in competitiveness, whereas the newer activities, drawing more heavily on advanced data technologies, would be located in the industrial countries. At the same time, the competitiveness of domestic firms in developing countries could decline because they could not match the affiliates of transnational corporations in their access to data technology. In the specific field of data services, this scenario primarily entails a strictly limited presence of developing countries, which would mainly be consumers of imported data-service products. Within data services, investment by transnational corporations in developing countries would be concentrated in marketing and distribution, with little local research and development or production. Moreover, the limited availability of data services in these countries and the possible mismatch between these services and local requirements would further undermine their international competitiveness.

To prevent this from happening will require close policy attention in developing countries. Clearly, the technological and education infrastructure for data technology has an important role to play, involving activating human resources, deploying research and telecommunication policies that encourage the development of a domestic data-service industry, and encouraging transnational corporations to locate data resources in developing countries. As a result of such a strengthening of domestic capacities, developing countries may be able to include data services in negotiations with transnational corporations about local-

content and export-performance requirements. Here again, awareness by policymakers in developing countries of the importance of data services will be an important factor in facilitating their adaptation to changing patterns of technology and comparative advantage.

Relations Between Transnational Corporations and Host Developing Countries. Transnational corporations, major users of data services, are using international data networks extensively to facilitate international production management, the coordination of research-and-development laboratories and computer-aided design facilities, the management of foreign exchange risks and international financial transactions, and the management of inventory and distribution, financial control, and accounting and reporting.

Concern has been expressed that closer and more continuous monitoring of the performance of foreign affiliates by parent companies may reduce the autonomy of affiliates within transnational corporations.[143] This result would further complicate relations between host countries and foreign affiliates since the latter might not be in a position to control the day-to-day management of parts of their activities.

The evidence is mixed.[144] A study by the OECD in cooperation with the Business and Industry Advisory Committee to OECD suggested that changes in the internal management structure of transnational corporations are not the result of data technologies but are facilitated by their use.[145] The authors of the OECD study argue that the observed changes in the internal structure of transnational corporations result primarily from the adaptation by corporations to a changed economic environment, characterized by slower, more unstable growth, intensified international competition, and greater turbulence in world financial markets. Another study commissioned by the OECD highlights some of the consequences for developing countries of the use by transnational corporations of data technologies to achieve greater internal control.[146] The study's author argues that these technologies may make it easier for transnational corporations to operate highly specialized manufacturing affiliates in developing countries, without transferring to them the broad range of management functions that play a key role in strengthening local technological capabilities. More specifically, transnational corporations could accede to developing country requirements for a local manufacturing presence while de facto minimizing the actual transfer of skills. This study—like an earlier one also commissioned by the OECD[147]—further suggested that transnational corporations could exercise through transborder data flows a high degree of remote control over local companies in which they own only a limited share.

Though little empirical evidence is available, these points tend to strengthen the observations on the risks of a deteriorating presence of

developing countries in the intrafirm division of labor of transnational corporations. Moreover, in seeking appropriate policy responses to this risk, a further danger arises: Developing countries may secure a continued presence by transnational corporations that is not made up of autonomous affiliates capable of contributing the most to the local economy. Questions of management autonomy in the age of transborder data flows expand the agenda with which policymakers in developing countries will have to deal in their relations with transnational corporations.

Evaluation. Developments in trade and foreign direct investment in data services appear to have three major impacts on transnational corporations and their relations with host developing countries.

The rapid international expansion of new firms and industries based on electronics (including data services) means that developing countries face an increasing number of foreign-direct-investment proposals from these sources. Moreover, the growth of trade and foreign direct investment in data services has facilitated the internationalization of service industries, which are also seeking investment opportunities in developing countries.

In considering these proposals, developing countries must ensure that they strengthen their position in the intrafirm and international division of labor. In effect, they run the risk that advances in data technology will undermine their competitiveness in established industries, leaving them as suppliers of a shrinking range of labor-intensive products and as marketing-and-distribution outlets for transnational corporations. Particularly as regards data services, averting this situation will require a determined effort to upgrade the local technical and educational infrastructure, together with a negotiating stance appropriate to ensuring that transnational corporations transfer to host developing countries the skill base needed for data services.

In seeking to ensure that such a skill transfer occurs, developing countries will need to take into account changes in the internal structure of transnational corporations associated with the growth of transborder data flows. Particular attention may have to be paid to ensuring the autonomy and independent viability of foreign affiliates and notably their capacity to carry out a full range of management functions. Here again, local content requirements—especially as regards data services—may have a role to play.

In spite of these risks, technologies and the role of transnational corporations in them offer a wide range of opportunities for developing countries to improve their economic situation. Developing countries must seize such opportunities by adopting policies that permit the application of these technologies in a manner that strengthens their domestic data resources, while drawing on the proven ability of trans-

national corporations to combine efficiently the various factors of production and, in particular, to pioneer and utilize new technologies.

Overall Impact on Industrialization and Development

The rapid growth of trade and foreign direct investment in data services both forms part of and accelerates underlying trends toward the integration of the world economy. The integrating effects of trade and foreign direct investment in data services extend well beyond the data-service market itself: The availability of sophisticated worldwide computer networks promotes the internationalization of service industries; facilitates trade in goods; permits the tighter integration of operations within transnational corporations, for instance, through an intensified division of labor within these firms; and gives rise to new forms of international transactions.

At the most immediate level, closer integration through data services poses important problems of industrial strategy for developing countries. Particularly important among them are the risks of an erosion of competitive advantage in established industries without a compensating gain in the most dynamic sectors of activity. These immediate concerns must be seen in the context of the more far-reaching changes associated with greater integration. As the world economy becomes increasingly integrated, changes in comparative advantage are more rapidly translated into changes in patterns of trade and localization, which also contain new opportunities. Although such changes enhance longer-term efficiency, they reduce the time available for adjustment. Furthermore, shocks to the world economy—technological, monetary, or other—are transmitted more rapidly, putting greater pressure on the weaker economies.

Trade and foreign direct investment in data services play a crucial role in each of these respects. For instance, the availability of data bases on the prices and quality of products offered on world markets increases the transparency of these markets and the speed with which they respond to changes in competitiveness. The use of high-speed data networks to implement financial transactions and monitor developments on world financial markets has reduced the lags between events (for instance, a fall in the forward price of foreign exchange) and responses (in this instance, capital outflows).

Developing countries may gain significantly from these increases in the efficiency of world markets. Greater transparency of markets, for instance, should improve the terms on which they purchase needed foreign products and offer their output for export. Nonetheless, these changes will increase the pressures under which developing countries operate, pressures both of responding to the wide range of shocks that

bear on their day-to-day economic management and of adjusting to the more medium-term shifts in competitive advantage.

The response to these pressures will substantially affect the role of the developing countries in the world economy. The crucial question of interest here is the extent to which they will be able to draw on data technologies to improve their competitive position. In responding, it is useful to distinguish three broad groups of developing countries: (1) those that have already developed a technological and educational infrastructure for dealing with data technologies; (2) those that have not yet done so, but which have a potentially large domestic market for data-technology products; and (3) those that have neither an appropriate infrastructure nor a potentially large domestic market.

Countries in the first group are best placed to respond to the challenge of changing technologies. More specifically, their policies can emphasize selective import replacement. In the smaller economies, policy could be aimed at the short-term development of new products for the world market, but it should also promote, through active technology-diffusion programs, the use of data technologies by domestic firms so as to increase competitiveness. Countries in the second group might fare best by initially emphasizing infrastructure development. As infrastructure yields its first results, there may be a potential for selective import replacement in the data-services field. However, attempts in this direction may be counterproductive if an adequate technical infrastructure is lacking. Further, such attempts should not compromise efforts to ensure that firms in established industries can draw on data resources to strengthen their competitive position. Countries in the third group might also have to put initial emphasis on infrastructure development. With a limited domestic market, the potential for import replacement is reduced. Such countries may well need to focus primarily on improving access to international data resources and make a more limited attempt to promote a domestic industry.

Although the differences between developing countries are important, they also share important common interests. For instance, considerable scope exists for cooperative action by developing countries to improve the match between the products offered through trade and foreign direct investment in data services and the developing countries' needs; in the data-base area, for example, countries could make an effort to increase the availability of data that are particularly relevant to developing countries. Likewise, developing countries should consider a number of opportunities for cooperative action to upgrade their infrastructure and hence their access to the international data market. Finally, such countries share common interests in ensuring that the international public-policy

framework for trade and foreign direct investment in data services takes their developmental needs into account.

International Policy Discussions

In view of the growing importance of trade and foreign direct investment in data services, an increasing number of countries are considering (or taking) measures designed to deal with these transactions. So far (as shown in Chapter 4) most of these measures have focused on issues relating to the transborder flow of personal data and have been taken by developed market economies, both at the national and multilateral (OECD, Council of Europe) levels. Discussions are intensifying in the area of economic data flows as well.

These discussions have to consider a number of basic policy options, which have implications both for domestic and international public-policy frameworks.[148] Basic to policy formulation in this sector is an examination of which policy mix best serves the national interest of a given country. The basic orientations in this policy approach are given by the gains-from-trade approach (described in Chapter 4), on the one hand, and approaches that serve other areas of national interest, on the other hand, particularly, the desire to strengthen domestic data resources (basic research, hardware, various data services, skills, and the required infrastructure). Other areas of national interest include considerations of national security, national identity, and sovereignty, as well as the desire to maintain whatever degree of control over the process of economic decisionmaking the national political process has promulgated.

Decisions on this policy mix depend (as suggested in the preceding section) on the nature and size of the domestic market and the strength of domestically controlled entities in the data-services sector. Thus, the United States, with a large domestic market and a number of important corporations in the data-service sector, may find it advantageous to adopt a position in favor of the removal of restrictions to trade and foreign direct investment in data services and of the adoption of internationally approved interface standards. However, even the United States has not adopted a complete hands-off approach to the sector: U.S. intervention has taken the form of restrictions on foreign direct investment and of extensive research financing for the defence industries (which may be a form of indirect data-services subsidization). The United Kingdom is another country with a substantial domestic market and with considerable research-and-development facilities. Although regional and sectoral development has been extensively subsidized, the British emphasis has been on the rapid growth of very substantial software firms and computer-services bureaus, often based on established

positions in specialist markets. Such firms and bureaus have become important in the financial services area as exporters. The United Kingdom has tended to support international policy proposals that favor removing restrictions by others to such exports. Consistent with this approach, the United Kingdom has supported—within the European Community, the OECD, and GATT—the U.S. proposal to deal with restrictions on trade in services.

At the other extreme, a small country (Switzerland, Singapore) may well conclude that it also has an interest in maintaining a relatively open environment for trade and foreign direct investment in data services. As a small country develops an important role in financial services, for instance, it may wish to ensure that its financial institutions have unrestricted access to the fullest range of data services offered internationally. There remains the question of the role of foreign-controlled firms in the local data-service industry, especially as regards the extent to which domestically controlled firms (perhaps with limited foreign participation) are likely to serve the national interest better than foreign-controlled ones. Policy on this point in the data-service sector will obviously be related to the general policy approach regarding foreign direct investment.

A similar range of policy options exists regarding the use of national champions or chosen instruments. Because of the pervasiveness of informatics, governments may conclude that at present they need to assign to a chosen instrument a range of responsibilities in the data-services area, just as in a previous period such an approach was important for telecommunications.

Governments must decide the extent to which they wish to regulate such aspects of the sector as rate structures. The detailed regulation by an independent authority—say of telecommunications and of leased lines and private networks for transborder data flows—may be considered as separate policy issues from such a question as the appropriate role of the national champion. By following the PTT model, a country could arrive at a system in which the sole provider of a service—the chosen instrument with total market dominance—is also the regulatory authority. A number of countries have preferred to establish powerful independent regulatory authorities rather than allow the service provider to exercise regulatory functions as well. At present, there is relatively broad agreement that communication carriers should be regulated but less agreement as to whether data services should be the subject of any specific regulatory regime. Brazil's policy appears to be the most important example of an approach based on the concept of positive control/regulation in the data-service sector. However, other countries have also used regulatory

approaches to decide whether or not common carriers can be allowed to provide data services.

A review of the range of policy positions adopted by different countries and of their approaches to policy choices would show that almost all countries are unaware of the issues related to data services, of policy fragmentation, or of a lack of a coherent policy. Various departments and agencies, each having its own responsibilities, may inadvertently act in contradictory ways. For example, in various countries, transnational corporations have been encouraged (often with extensive subsidization) to establish data resources, primarily for the generation of employment; the same governments have meanwhile been channeling funds to domestically controlled firms to encourage research and the development of domestically controlled data resources. A historical parallel might be the mix of unregulated or partially regulated development in the electricity-generating and transmission industries or in the telephone industries. This parallel has only limited relevance, however, because of the importance of the data industries and the impact they have on all economic activities and international economic transactions.

Nevertheless, a few countries—including Brazil, Canada, France, Japan, and the United States—have already developed a more coherent policy approach to data services. Moreover, some countries, especially the United States, are trying to project their approaches into the international arena. Some bilateral investment protection treaties, for instance, appear to pay more attention to foreign-direct-investment questions in services, including data services, than was typically the case in the past. Furthermore, negotiations are being considered between Canada and the United States on traded computer services.

At the multilateral level, discussions have been concluded in the OECD on a data pledge and are continuing on a strengthening of the liberalization codes; a range of activities is being initiated by the Intergovernmental Bureau for Informatics; research is being undertaken by the UN Commission and Centre on Transnational Corporations; and work is likely to be initiated in the framework of GATT, UNCTAD, and UNESCO.

Since the work in some of these forums may lead to negotiations on an international framework for trade and foreign direct investment in data services, developing countries may wish to review the issues of particular interest to themselves. These issues relate to extraterritorial applications of laws; the possible extension to the area of traded data services of the concepts of the antidumping and countervailing duties systems; measures related to unfair government trade practices; and problems raised by the concept of safeguard actions. They also include a number of specific issues with particular implications for trade and

foreign direct investment in data services, namely, the proposals to extend the provisions of the Tokyo Round agreements on government procurement practices to service contracts, including contracts for data services; the role of standards or norms in international trade in data services; problems raised by data havens; privacy concerns; questions relating to jurisdiction over data stored in a given country; and the issues of right of establishment and right of presence. Each of these issues has been discussed in Chapter 4 from the viewpoint of developing countries, and special attention was paid to conflicting policy approaches and policy analogues (especially with reference to GATT) and to the main elements that should be considered when formulating policies at the international level.

In developing policy approaches at the national, regional, and international levels, the crucial importance of the telecommunications and informatics infrastructure for international trade in data services must be borne in mind.[149] Without an adequate infrastructure, the participation of countries in these transactions must, by necessity, remain limited. Countries may, therefore, wish to consider intensified efforts at all levels to strengthen their infrastructure in this area. Such measures may include a stocktaking of national and regional informatics and telecommunication capabilities to have a factual basis on which to build policies.[150] Measures may be considered to improve the technical and administrative aspects of this infrastructure. They may include the definition of regional standards and protocols and increased transparency of rules and regulations, particularly concerning telecommunications, to encourage national and regional transactions in data services and the equipment needed for them.

In Latin America, it may be possible to make greater use of the Conference of Latin American Authorities in Informatics (CALAI) and the Latin American Technology Information Network (RITLA). Similarly, the establishment of a regional data network—analogous to EURONET—could be studied. LATINRED could be supported—analogous to the DIANE effort—by an organization that contracts individual producers to make their data bases available on the network and that could help develop software. An important contribution could be made in stimulating the development of national and regional data resources, strengthening regional integration in the framework of economic and technical cooperation, and providing the infrastructure for regional closed user group networks.

Serious consideration could be given to an active participation in international efforts aimed at strengthening the telematics infrastructure in developing countries. Two such efforts involve the Multi-Sectoral Information Network (MSIN), sponsored by the Group of 77,[151] and

the Technological Information Pilot System (TIPS), implemented by the UN Financing System for Science and Technology for Development (UNFSSTD) in consultation with the UN Development Programme and other UN organizations.[152] Both projects have a strong regional focus while, at the same time, allowing linkages with developing countries in other regions and possibly even providing access to the international data market.

Conclusions

Data technologies form the nexus around which domestic economic and social activities and international economic exchanges will be restructured in future. Although this process began in the developed market economies and is led by corporations (especially transnational ones) from these countries, it will some day engulf developing countries as well. The developments documented in this book in the data industries and especially in trade and foreign direct investment in data services are an expression of these changes. Driven by a highly dynamic technology, they proceed with a singular rapidity, regardless of whether or not individual countries take cognizance of them.

As with all new developments, data technologies entail both risks and opportunities. By incorporating skills into equipment and creating new efficiencies, data technologies are changing the relative importance of different factors of the production process, particularly that of the labor factor. The implications of such a development—which finds its clearest expression in automation—can be wide ranging, especially for developing countries. They include such opportunities as the creation of new industries; leapfrogging in other industries; easier access to needed information; and improved transparency of world markets. But they bring with them new uncertainties concerning such areas as the changing nature of comparative advantage; the location of established industries; patterns of foreign-direct-investment technology and trade flows; dependency; and the international division of labor. Not surprisingly, therefore, access to and the location of data resources—especially data-goods and data-services industries and the skills to use them—are increasingly regarded as being strategically important for economic development. In all these processes, transnational corporations play a crucial role: Since they occupy a central position in the world economy, the fact that they are the principal originators, suppliers, and users of data technology makes them the most important agents of change.

Although—and perhaps—the exact implications of the changes brought about by the data technologies can not yet be determined in detail, it is important to ensure that developing countries benefit from them and

that any negative effects are being kept to a minimum. Without policies designed for this purpose, the impact of the data technologies on developing countries may be determined more by the uneven distribution of economic (and increasingly data) resources between North and South and less by a rational utilization of all resources and possibilities available worldwide.

This inherent need to formulate policies regarding data technologies is given further urgency by the desire of a number of important countries to establish an international framework for trade and foreign direct investment in services, of which data services are a central component.[153] Negotiations on such a framework should take fully into account the special circumstances of developing countries. This approach requires considerable awareness, discussion, and coordination among developing countries. Only the developing countries themselves can ensure that such negotiations lead to a framework that reflects the interests of all countries and that can form a viable basis for the movement toward an international information economy.

Notes

1. In addition to the interest these questions have attracted in government circles, academic writing on services is increasing. See, for example, Ronald Kent Shelp, *Beyond Industrialization: Ascendancy of the Global Service Economy* (New York, Praeger, 1981); J. Singlemann, *From Agriculture to Services* (Beverly Hills, Calif., Sage, 1979); Jacques Nusbaumer, *Les services: Nouvelle donne de l'économie* (Paris, Ed. economica, 1984); and Karl P. Sauvant, *International Transactions in Services: The Politics of Transborder Data Flows* (Boulder, Westview, 1986).

2. The members of the Latin American Council are Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay, and Venezuela.

3. The U.S. Government (mainly the Department of Commerce and the Office of the U.S. Trade Representative) was also responding to the representation of important U.S. service transnational corporations that saw these restrictions as a potential threat to their service exports. See Jonathon D. Aranson and Peter F. Cowhey, "Trade in services and Latin America" (Caracas, SELA, 1984).

4. See UNCTC, *Transnational Corporations and Transborder Data Flows: Background and Overview* (Amsterdam, North Holland, 1984).

5. For a detailed discussion of the primary and secondary information sectors, see Marc Porat, *The Information Economy: Definition and Measurement* (Washington, D.C., Government Printing Office, 1977).

6. OECD, *Interfutures: Facing the Future. Mastering the Probable and Managing the Unpredictable* (Paris, 1979).

7. See, for example, *Transborder Data Flows and Brazil: Brazilian Case Study*, UN publication, Sales no. E.83.II.A.3; Alain Madec, *Les flux transfrontières de données: Vers une économie internationale de l'information* (Paris, La documentation française, 1982); and *A Vision of Telecommunications Policy in the '80s* (Tokyo, Research Institute of Telecommunications and Economics, 1982).

8. See *Transnational Corporations in the International Semiconductor Industry*, UN publication, forthcoming.

9. The distinctions between microsystems, minisystems, and small, medium, and large systems (the last two are generally referred to as general-purpose computers) are usually determined by performance considerations and cost rather than core-memory size. However, recent developments in microelectronics have made it increasingly difficult to draw these distinctions. As a result, the terms minicomputer, microcomputer, and small systems tend to be used rather loosely. Furthermore, the definitions and concepts that underlie them vary considerably from country to country and at times even within countries over time. For example, in its study the information commission of Costa Rica, considered small computers to be those with memory size smaller than 64 kilobytes (KB); medium computers to have between 64 KB and 254 KB; large computers to have between 256 KB and 1 megabyte (MB); and very large computers to have 1 MB or more. (See Costa Rica, Consejo Nacional de Investigaciones Cientificas y Tecnologicas, Comision de Informatica, "Investigacion sobre recursos computacionales" [San José, 1982], mimeo, p. 4.) The U.S. Department of Commerce, on the other hand, bases its classification on average monthly rental fees of the complete system (including peripherals): Minicomputers, up to $1,300; small computers, $1,300 to $6,500; medium computers, $6,501 to $20,000; and large computers, $20,001 or more. (See, for example, United States, Department of Commerce, International Trade Administration, Office of Export Planning and Evaluation, "Country market survey: computers and peripheral equipment, Venezuela" [Washington, 1981], mimeo, p. 4.)

It should also be borne in mind that classifications become rapidly obsolete as technological advances reduce circuity and computer size, while substantially increasing the performance and capacity every 12 to 18 months. Advancements in large-scale integration (LSI) will make the classification and comparisons of data on a year-to-year basis an increasingly difficult task.

10. This ambiguity, of course, creates many problems when it comes to the description of the industry. To take a few examples (see, United States, Congress, Office of Technology Assessment, *Computer-Based National Information Systems: Technology and Public Policy Issues* [Washington, D.C., 1981], p. 149), as soon as microcomputers or computers on chips are incorporated in small systems, they become personal or desktop computers. Similarly, a minicomputer becomes a small business system when it is supplied with management application programs. In both cases, according to the final destination of the constitutive element, microcomputer or minicomputer, it will be classified under different headings—desktop computers or small business systems. Therefore, a given microcomputer may be included in microcomputer production figures, in desktop sales, and in users' spending figures. However, the bias is not a systematic one, and, depending on the distribution channel, a desktop computer may be double counted as microcomputer and a desktop or registered only once as desktop. It is thus not possible to find reliable figures that allow one to go from manufacturing data to products installed on end-users' premises through sales accounts.

11. See, generally, *Transnational Corporations in the Data-Processing Industry*, UN publication, forthcoming. It should be kept in mind that the averages

reported mask substantial intercountry and intracountry variations. For instance, more than 75 percent of all computers in Brazil in 1979 were concentrated in two cities, São Paulo (75 percent) and Rio de Janeiro (25 percent). This meant, for São Paulo, a per unit computer average of 3,012 inhabitants (compared to 13,513 for Brazil as a whole). Interestingly, this figure is not far from the national ratios of advanced nations that in 1980 were 1,003 for the United Kingdom, 848 for Sweden, 488 for Canada, 353 for the United States, and 272 for the Federal Republic of Germany. Thus, the figure for São Paulo shows a level of computer usage that follows more the overall profile of an industrialized nation than that of a developing one. Concentration of computers in urban settings is a very common phenomenon throughout developing countries. For instance, 81 percent of the computer population in Mexico is concentrated in Mexico City, whereas 55 percent of the computers installed in Argentina are located in Buenos Aires. See Mexico, Secretaria de Programmacion y Presupesto, *Diagnóstico de la Informática en México, 1980* (Mexico City, 1980), and Argentina, Secretaria de Planiamento de Informatica, "Rejisto de recourses informaticos" (Buenos Aires, 1980), mimeo.

12. See Mexico, *Diagnóstico de la Informática en México, 1980*, p. 71.

13. See *Transnational Corporations in the Computer-Services Industry*, UN publication, forthcoming.

14. See *Transnational Corporations in the Computer-Services Industry*, op. cit.

15. See, United States, Department of Commerce, International Trade Administration, Office of Export Planning and Evaluation, "Country market survey: computers and peripheral equipment in Venezuela" (Washington, D.C., 1981), mimeo, p. 9.

16. See *Transnational Corporations in the Computer-Services Industry*, op. cit.

17. See *Transborder Data Flows and Brazil*, op. cit., p. 89, and the discussion on software policies that follows.

18. See Quick and Asociados, "Mexican market survey for computers and related equipment" (Mexico City, 1979), mimeo, as updated.

19. See "Informe nacional de Chile a la CALAI" (Montevideo, 1983), mimeo, p. 7.

20. Ibid.

21. See, "Informe nacional de Paraguay a la VI CALAI" (Montevideo, 1983), mimeo, p. 2.

22. See, United States, Department of Commerce, International Trade Administration, Office of Export Planning and Evaluation, "Computers and peripheral equipment in Venezuela," op. cit.

23. See *Transborder Data Flows: Access to the International On-line Database Market*, UN publication, Sale no. 83.II.A.1.

24. Ibid.

25. Ibid., and Cuadra Associates, *Directory of Online Databases* (Santa Monica, Calif., Cuadra Associates, 1983).

26. See *Transborder Data Flows and Brazil*, op. cit., p. 124, also for following information.

27. See *Transnational Corporations in the Telecommunication Industry*, UN publication, forthcoming.

28. See also Eduardo Galli, "Microelectronics and telecommunications in Latin America," ID/WG.372/4 of 5 May 1982, especially pp. 38ff.

29. In this context, see also Juan Rada, "Advanced technologies and development: Are conventional ideas about comparative advantage obsolete?" *Trade and Development: An UNCTAD Review* 5 (1984): 275–296.

30. If figures for the United States on the information sector are indicative, the largest share of the production of data goods and services is likely to be of an intermediate nature. C. Jonscher showed that, at the beginning of the 1970s, over two-thirds of the U.S. information sector's output was an input to the production of physical goods. See his "Information resources and economic productivity," *Information Economics and Policy* 1 (1983): 13–36.

31. See Badiul A. Majumdar, "Technology transfers and international competitiveness: the case of electronic calculators," *Journal of International Business Studies* 11 (fall 1980): 106.

32. See *Financial Times*, 3 July 1984, p. 25. This takeover ranks among the two or three largest nonoil takeovers in U.S. history.

33. OECD, *Software: A New Industry* (Paris, forthcoming), p. 115.

34. K. Hoffman and H. Rush, "Microelectronics and the garment industry: Not yet a perfect fit," *IDS Bulletin* 13 (March 1982): 40.

35. See International Monetary Fund, *Balance of Payments Manual*, 4th ed. (Washington, D.C., IMF, 1977), p. 11. It should be noted that foreign affiliates in a country are regarded as residents.

36. Factor and nonfactor services together are also referred to as "invisibles." It should be noted that returns from labor working abroad (worker remittances) are not considered a factor service for balance-of-payments reporting purposes, but rather are reported under private unrequired transfers.

37. The figures are from "EFTA countries' trade in services," *EFTA Bulletin* 4 (1983): 17.

38. IMF, *Balance of Payments Manual*, para. 408.

39. This is not meant to be a formal definition of a transnational corporation. Such a definition is being elaborated in the framework of the discussions of the UN Code of Conduct on Transnational Corporations; see "Outstanding issues," *The CTC Reporter*, 18 (autumn 1984).

40. "Telecommunication and computer services," Working Paper prepared for the Task Force on Trade in Services (Ottawa, n.d.), mimeo, p. 6.

41. See Peg Kay and Patricia Powell, eds., *Future Information Processing Technology: 1983* (Washington, D.C., U.S. Department of Commerce, 1983), p. 163.

42. This is reflected, for instance, in the draft UN Code of Conduct on Transnational Corporations, in which paragraph 42 states: "States should have the right to regulate the entry and establishment of transnational corporations including determining the role that such corporations may play in economic and social development and prohibiting or limiting the extent of their presence in specific sectors" ("Text of the draft United Nations Code of Conduct on

Transnational Corporations," *The CTC Reporter* 12 [summer 1982]: 25). The OECD countries have now recognized among each other the right of establishment; see OECD "Decision of the Council amending Annex A to the Code of Liberalisation of Capital Movements (adopted by the Council at its 600th meeting on 4th April 1984)," C (83) 106 (Final).

43. Access to a country's distribution system for the purpose of trade in goods is covered by the GATT system, and is, therefore, a trade issue.

44. For a general review of the difficulties of measuring trade in services, see UNCTAD, "Production and trade in services, policies and their underlying factors bearing upon international service transactions," TD/B/941 (and Corr. 1) of 1 March 1983, and UNCTAD, "Services and the development process," TD/B/1008.

45. The "U.S. national study on trade in services" (Washington, D.C., Office of the U.S. Trade Representative, 1983) noted for service trade in general that "undervaluation of trade transactions (in services) is likely to be widespread," (p. 13) and "there is substantial cause to believe that current methods of data collection on service industries trade may regularly underestimate total transaction value" (p. 108).

46. T. P. Hill, "On goods and services," *The Review of Income and Wealth* 23 (December 1977): 315.

47. The country reports on services submitted by Canada and the United States to GATT, for instance, do not contain systematic data on data services.

48. *International Herald Tribune*, 26 March 1984, p. 9.

49. In this context, see the two computer inquiries of the U.S. Federal Communications Commission (FCC).

50. See OECD, *Development Co-operation* (Paris, OECD, various years).

51. See, for example, H. J. Welke, *Data Processing in Japan* (Amsterdam: North Holland, 1982), p. 92.

52. See United States, International Trade Commission, "The relationship of exports in selected U.S. service industries to U.S. merchandise exports" (Washington, D.C., 1982), mimeo, p. 23.

53. See Ibid., p. 21, and Harold Seneker, "The growth industry's growth industry," *Forbes*, 6 July 1981.

54. See also "L'étude de la Dieli sur les SSCI francaises," *Ol Hebdo*, no. 686 (1 March 1982): 13. The firms responding to the survey represented 70 percent of the total sales of French computer-service firms.

55. See John Eliott, "Electronics: new policies may soon emerge," *Financial Times*, 26 January 1983, p. X.

56. "Informe nacional de Chile a la CALAI" (Montevideo, 1983), mimeo, p. 9.

57. See Raul L. Katz, "Politicas nacionales de informatica en Mexico: estudio realizado para la Subsecretaria de Informatica" (Buenos Aires, 1984), mimeo, p. 107.

58. See for the following, *Transborder Data Flows: Access to the International On-line Data-base Market*, op. cit., annex 2.

59. See *Transborder Data Flows and Brazil*, op. cit.

60. See M. Malek Asghar, Y. Senuma, and R. Pinez, "Work of the World Plan Committee for the development of telecommunications," Paris, 1980, mimeo; and "The evolution of telephone traffic," *Telecommunication Journal* 17 (September 1980): 559.

61. See OECD, *The Usage of International Data Networks in Europe* (Paris, OECD, 1979).

62. See IBI, "Transborder data flow: its environment and consequences" (Rome, 1980), p. 20.

63. See United States, International Trade Commission, "The relationship of exports in selected U.S. service industries to U.S. merchandise exports," op. cit., p. 13. Telephone and telegraph services account for about 80 percent of total communication revenues.

64. AT&T, *Annual Report*, 1982.

65. See OECD, "International data communications in the OECD area: 1976 and 1981," DSTI/ICCP/82.27 of 5 July 1982.

66. See Raul L. Katz, "Nationalism and computer technology transfer: the Brazilian case" (Cambridge, Mass., 1981), mimeo, p. 78.

67. See Katz, "Politicas nacionales de informatica en Mexico," p. 117.

68. See in this context, for instance, the efforts of the Working Party on Facilitation of International Trade Procedures of the Economic Commission for Europe, described in Appendix C.

69. For the following, see OECD, "Transborder data flows in international enterprises: based on results of a joint BIAC/OECD survey and interviews with firms," DSTI/ICCP/83.23.

70. SITA, *Annual Report*, 1982.

71. According to SWIFT, "A member bank is defined as the headquarters bank meeting certain specified criteria. Only headquarters banks may be shareholding members and thus hold voting rights. All wholly-owned (90% or more) or controlled branches or affiliates of a member bank may become a 'User.' User bank traffic is attributed to the headquarters member bank whether or not they are physically located in the same country as the member bank. However, user banks must be located in a country connected for 'live' system operations before they can physically connect to the SWIFT system. In some instances, a bank may become a 'User' without the headquarters country being connected for 'live' system service" (*SWIFT: Special Anniversary Issue* [1983], p. 17). Conditions for country membership consist essentially of approval by the SWIFT board of a request by the national bank authorities and sufficient traffic volume potential to justify an economic breakeven for SWIFT.

72. See "The role of transnational corporations in transborder data flows," E/C.10/1984/14 of 24 January 1984.

73. United States, Congress, Senate, Committee on Commerce, Science, and Transportation, "Long-range goals on international telecommunications and information: an outline for United States policy" (Washington, D.C., Government Printing Office, 1983), Committee print, p. 168.

74. Business International, *Transborder Data Flow: Issues, Barriers and Corporate Responses* (New York, Business International, 1983), p. 8.

75. See "The role of transnational corporations in transborder data flows," op. cit.

76. See OECD, "Transborder data flows in international enterprises," op. cit.; Business International, *Transborder Data Flow*, op. cit.; and IBI, "IBI world survey of national policies and company practices concerning transborder data flows: description and tabulation of results" (Rome, 1983), mimeo. The last of these studies is summarized in G. Russell Pipe, "IBI survey on TNCs and TDF," *The CTC Reporter*, no. 17 (spring 1984), pp. 42–43.

77. See OECD, "Transborder data flows in international enterprises," op. cit.

78. Business International, *Transborder Data Flow*, p. 275.

79. *International Herald Tribune*, 26 March 1984, p. 7.

80. *Neue Züricher Zeitung*, 19–20 May 1984, p. 18.

81. See *International Herald Tribune*, 26 March 1984, p. 9.

82. Apparently, McDonnell, the aviation corporation, entered the computer-service market precisely because it had a sophisticated computer-communication system whose capacity was by far not exhausted by internal uses.

83. As Harold Malmgren stated: "A few institutions have carried their strategic reasoning to a broad conclusion: a global computer-telecommunications-information process network can enable them to provide a comprehensive, all-purpose services capability. This conception for some of them involves over the next five to ten years a gradual extension of the range of services offered far beyond the traditional boundaries of banking. For example, leading banks have started to offer use of their grids to other institutions, including customers as well as other banks. It is a short step further to offer technical and engineering services to help other institutions, whether customers or competitors, to build their own network" ("Negotiating international rules for services" [Washington, D.C., Malmgren, 1983], p. 7).

84. Ibid., p. 6.

85. See the McDonnell example mentioned in note 82. Malmgren remarked in this context that it may well be possible "that non-bank, non-financial enterprises that are leaders in computers and telecommunication systems *could* play a growing and increasingly direct role in the provision of financial services and finance-related services. For example, it is quite conceivable that corporations like IBM and AT+T might evolve over ten or twenty years from the provision of equipment and communication grids to provision of information, management and even financial services" ("Negotiating international rules for services," p. 8). Since Malmgren wrote in 1983, IBM entered into an agreement (in February 1984) with Sears Robuck and Co. and Central Broadcasting Station (CBS), to develop a communication videotex service in the United States for households with personal and home computers.

86. See Jagdish N. Bhagwati, "Splintering and disembodiment of services and developing nations," *The World Economy* 7 (June 1984): 133–144.

87. Op. cit.

88. See John H. Dunning, *International Production and the Multinational Enterprise* (London, Allen & Unwin, 1981).

89. See Jean-Hervé Lorenzi and Joelle Tolédano, *The International On-Line Information Retrieval Market: An Economic Analysis* (Paris, OECD, 1982).

90. See OECD, *Software: A New Industry*, op. cit.

91. See India, Engineering Export Promotion Council, "Report of EEPC computer software delegation to USA" (New Delhi, 1983), mimeo, pp. 74–75.

92. For continuing coverage of these developments see the periodical *Transnational Data Report*. See also George V. Coombe, "Privacy, data protection and transborder data flow: A corporate response to international expectation," *Business Lawyer* 39 (November 1983); and G. Michael Epperson, "Contracts for transnational information services: securing functional equivalency of personal data protection," *Harvard International Law Journal* 22 (1981).

93. Op. cit.

94. In a document on transborder data flows, the OECD observed: "A major problem encountered in an examination of TBDF issues is the inter-relationship that exists among many of them, and the inability to draw clear and distinct lines of demarcation between various categories. This, in turn, means that a particular question may be viewed solely in terms of trade or economics by one country, while it is viewed primarily in terms of national sovereignty by another, with the virtual inevitability of disagreement. . . . Resolving difficulties raised by competing public policy objectives is not easy, even when dealing with relatively mature technologies in a relatively well-defined context. In this case, the difficulties are greatly increased by rapid technological developments, rapid changes in organisational structures and changing perceptions. It is possible that a particular issue will touch on economic, social, cultural, political and legal interests at one and the same time. The relative importance that different countries will attach to each of these facets may well differ. We are here involved in a process of reconciling fundamental but competing values in a situation where value systems differ from country to country, and may indeed differ over time within a single country. . . . In this situation it becomes difficult to identify over-riding general principles, which take precedence under all circumstances, and with which all can agree." (OECD, "Transborder data flows: An overview of issues," DSTI/ICCP/83.29 of 24 October 1983, pp. 5–6).

95. See especially OECD, *An Exploration of Legal Issues in Information and Communication Technologies* (Paris, OECD, 1983). For issues related to foreign direct investment and transnational corporations, see also "Bilateral, regional and international arrangements on matters relating to transnational corporations," E/C.10/1984/8 of 6 February 1984, and the underlying technical paper (forthcoming).

96. For a review of the current status of the international policy discussion, see Karl P. Sauvant, "Transborder data flows: importance, impact, policies," *Information Services and Use* 4 (1984): 3–30, and Sauvant, *International Transactions in Services*, op. cit.

97. OECD, *Code of Liberalisation of Capital Movements* (Paris, OECD, 1982). For a report on the current review of this instrument, see Bernard Hugonnier, "TNCs and the OECD liberalisation codes," *The CTC Reporter* 16 (autumn 1983): 30–31.

98. OECD, *Code of Liberalisation of Current Invisible Operations* (Paris, OECD, 1973). See also Hugonnier, op. cit.

99. United States, Office of the United States Trade Representative, "US national study," op. cit., p. 87.

100. OECD, *International Investment and Multinational Enterprises,* rev. ed. (Paris, OECD, 1979). This instrument was reviewed in 1984. For a summary of this review, see *The CTC Reporter*, 18 (autumn 1984).

101. Reproduced in *Transnational Corporations and Transborder Data Flows: A Technical Paper*, UN publication, Sales no. E.82.II.A.4; also contained in UNCTC, *Transnational Corporations and Transborder Data Flows: Background and Overview*, op. cit.

102. Contained in ibid.

103. See OECD, "Decision of the Council," op. cit.

104. For the draft text of this code, see *The CTC Reporter* nos. ,12 and 16 (summer 1982 and autumn 1983).

105. See Seventh CALAI, "Resolución 4/83" (Montevideo, 1983), mimeo.

106. See Seventh CALAI, "Informe de la Secretaría Permanente a cargo de la delegación de Brasil" (Montevideo, 1983), p. 8.

107. See Seventh CALAI, "Resolución 4/83" (Montevideo, 1983), mimeo.

108. In the annex of the treaty, each party reserved the right to make or to maintain limited exceptions within each of the following sectors or matters:

The United States of America. Air transportation; ocean and coastal shipping; banking; insurance; government grants; government insurance and loan programs; energy and power production; use of lands and natural resources; custom house brokers; ownership of real estate; radio and television broadcasting; telephone and telegraph services; submarine cable services; satellite communications.

Panama. Communications; representation of foreign firms, distribution and sale of imported products; retail trade; insurance; state companies; energy production; practice of liberal professions; banking; rights to the exploitation of natural resources including fisheries and hydroelectric power production; ownership of land located within ten kilometers of the Panamanian border.

(See "Treaty between the United States of America and the Republic of Panama Concerning the Treatment and Protection of Investment," mimeo.) Similar treaties have been drafted with Costa Rica and Egypt.

109. See Rowland C. Frazee, "Trade and technology: It's Canada's move" (Montreal, Royal Bank of Canada, 1983).

110. See *Transborder Data Flows and Brazil*, op. cit., and *Transborder Data Flows and Poland: Polish Case Study*, UN publication, Sales no. E.84.II.A.8. The latter study is summarized by Z. Bogdanowicz, in "Transborder data flows and Poland," *The CTC Reporter* 18 (autumn 1984).

111. A case in point was the repeated government funding of Consolidated Computer, Inc. Similar issues have been discussed in other countries, like France.

112. More recently, these issues have been focused by the impact of the AT&T divesture. With the division of the local telephone service into separate regional companies, the U.S. equipment market is open to import competition. This has given rise to pressures for the harmonization of tariff levels, that is, other countries should reduce import tariffs to the level of U.S. tariffs or face

retaliatory U.S. tariff increases. For comment on a bill to this effect introduced by Senator Danforth, see Fred Harrison, "Threat to our stake in US communications market," *Financial Post* (Toronto), 12 May 1984.

113. See, United Kingdon, Cabinet Office, *Making a Business of Information* (London, HMSO, 1983).

114. See *Transborder Data Flows and Brazil*, op. cit., on which the text for this section draws, as well as Joubert de Oliveira Brizida, "Transborder data flows and Brazil," *The CTC Reporter*, 13 (fall 1982): 11–12, 38–40, and Joao C.F. Albernaz, "Brazil's TDF policy builds national independence," *Transnational Data Report* 8 (January-February 1984).

115. See TIES, *Newsletter*, no. 25 (April 1984), p. 12.

116. See Uruguay, "Informe nacional de Uruguay a la VII CALAI" (Montevideo, 1983), mimeo, p. 62.

117. United States, Department of Commerce, International Trade Administration, Office of Report Planning and Evaluation, "Country market survey: telecommunications equipment in Guatemala" (Washington, D.C., 1983), mimeo, p. 6.

118. See, Paraguay, "Informe nacional de Paraguay a la VI CALAI" (Montevideo, 1983), mimeo, p. 3.

119. The concept that nationality of ownership and corporate control do matter in the data sector is obviously not being ignored in the context of defence policy. In this area, countries often consider it critical that essential data resources (and especially computer communication links) are in the hands of domestically controlled corporations.

120. See "IBM's wish to join ESPRIT stirs fear and controversy," *Wall Street Journal Europe*, 15 March 1984.

121. See Kevin Pearson, "Twelve say no to IBM's Euro plan," *The Times*, 24 April 1984.

122. See "La Commission Européenne continue d'accuser IBM d'abuse de sa 'position dominante'," *Le Monde*, 27 April 1984. The antitrust case of the Commission of the European Communities against IBM was, however, settled at the beginning of August 1984.

123. See, for instance, the various statements on services issued by the International Chamber of Commerce, the U.S. national study on services, and the proposal by William E. Brock, the United States Trade Representative, "A simple plan for negotiating on trade in services," *The World Economy* 5 (November 1982): 229–240.

124. See especially Rodney de C. Grey, "Traded computer services: an analysis of a proposal for Canada/U.S.A. agreement" (Montreal, Royal Bank of Canada, 1983), as well as Geza Feketekuty and Jonathan D. Aronson, "Meeting the challenges of the world information economy," *World Economy* 7 (March 1984): 63–86.

125. See *Business Week*, 18 October 1982, p. 50.

126. This case, which arose in 1958-1959, involved antitrust actions against alleged restraints of U.S. exports through the operation of a pool of patents necessary for the construction of radio-receiving and television-receiving sets.

It was alleged that a number of companies operating outside the United States combined to operate the patents pool. The government of Canada formally objected to the U.S. antitrust action, and discussions between the two governments led to an understanding about procedures on consultations between Canada and the United States on antitrust cases—the so-called Fulton-Rogers Understanding.

127. An example is the jurisdiction asserted by a Florida court regarding information about transactions in the Bahamas by a Bahamian subsidiary of a Canadian bank (the Bank of Nova Scotia), which also had a U.S. subsidiary. See 691 *Federal Reporter*, pp. 1383–1391.

In view of this situation, the proposal by a Canadian trade policy expert for a sort of U.S.-Canadian common market in computer services stated that "the U.S. will have to understand that their position on extra-territoriality in the anti-trust and other areas provides an impressive rationale for Canada imposing restrictions or establishment conditions on U.S. subsidiaries. It also provides a rationale for developing a Canadian computer service industry, in order that Canadian users not expose themselves to U.S. control merely by filing data in U.S. data banks." See Grey, op. cit., no pagination.

128. See GATT, *Basic Instruments and Selected Documents: Twenty-sixth Supplement* (Geneva, 1980).

129. See Michael Cohen and Thomas Morante, "Elimination of non-tariff barriers to trade in services: recommendations for future negotiations," *Law and Policy in International Business* 13 (1981): 495–519.

130. United States, Office of the United States Trade Representative, "U.S. national study," op. cit., p. 93.

131. Grey, op. cit., no pagination.

132. These cases are documented, in detail, in the daily issues of the U.S. *Federal Register* and in the European Community's *Journal Officiel.*

133. See, for example, Rodney de C. Grey, *US Trade Policy Legislation: A Canadian View* (Montreal, Institute for Research in Public Policy, 1982).

134. Examples of a developing country's recourse to antidumping measures are rare. The secretariat of the Andean Pact, did, however, invoke an antidumping measure in regard to imports of a product from the European Community. Few developing countries (Colombia is one) have established a fully developed antidumping system.

135. See, for example, the complaint against Argentine practices in regard to marine insurance; 45 *Federal Register*, no. 145, 25 July 1980.

136. U.S. authorities have been seeking information on trade barriers and restrictive government practices in international trade and foreign direct investment in data services for some time; see, for example, 45 *Federal Register*, no. 147, 29 July 1980, for a solicitation of information in this area.

137. See Harold Malmgren, "American technology policies and world trade," *World Trade Outlook* 6 (1984).

138. See GATT, *Basic Instruments and Selected Documents*, op. cit.

139. See the references for Chapter 3.

140. See, for example, Grey, "Traded computer services," op. cit., and United States, "US national study," op. cit.

141. See especially *Transborder Data Flows and Brazil*, op. cit.

142. See *Transnational Corporations in World Development: Third Survey*, UN publication, Sales no. E.83.II.A.14.

143. See, for example, OECD, "Transborder data flows: an overview of issues," op. cit.

144. See also "The role of transnational corporations in transborder data flows," E/C.10/1984/14 of 24 January 1984, paras. 23–29.

145. OECD, "Transborder data flows in international enterprises," op. cit.

146. See Thomas G. Parry, "Multinational enterprises' structure and transborder data flows: main trends in the evolution of multinational enterprise structure," DSTI/ICCP/83.24 of 4 October 1983.

147. See C. Antonelli, "Transborder data flows and international business: a pilot study," DSTI/ICCP/81.16 of 2 June 1981.

148. For a broader discussion of the role of services in development, see UNCTAD, "Services in the development process," op. cit.

149. The importance of the telecommunication sector for economic and technical cooperation among developing countries was also stressed at a Group of 77 meeting of experts on services related to trade, held in Guatemala City from 23–27 January 1984. The meeting emphasized the need to gain more knowledge from each other in advanced technology sectors such as computer services and communication media. See "Report of the Meeting of Experts on Services related to trade," G77/ECDC/TD 1 and 3.

150. In the framework of UNCTC's country case studies on the developmental impact of transborder data flows, the governments of Brazil and Poland have undertaken comprehensive assessments (see *Transborder Data Flows and Brazil*, op. cit., and *Transborder Data Flows and Poland*, op. cit.). By analyzing a country's telecommunication, informatics, and telematics infrastructure, the authors of these studies attempt to assess empirically the role of transnational corporations in transborder data flows, the economic impact of these flows on countries, particularly developing ones, and the policy responses to transborder data flows. They enable countries to take stock of their capacity (especially in terms of infrastructure) to utilize transborder data flows; they can serve as a vehicle for the exchange of views with other governments on issues regarding transborder data flows; and they provide governments with the empirical material needed to formulate appropriate national policies and to participate effectively in international discussions on transborder data flows.

151. MSIN is an information network designed to provide the infrastructure for greater economic and technical cooperation among developing countries, with special emphasis on the areas of cooperation identified in the Caracas Programme of Action. The priority areas for initial implementation are exchange of information on technical cooperation, energy, commodities, investment opportunities, and international tenders. The system will link the national focal points on economic and technical cooperation of the countries participating in the project and provide access to automated data bases in member countries. It will start with a combination of conventional means of communication and later shift to computer-based telecommunication links. At present, a preliminary systems study is being undertaken and regional focal points are being identified.

152. TIPS is a user-oriented mechanism that strengthens information flows in science and technology among developing countries and facilitates the utilization of current information for development purposes. The main purpose of the pilot project is to demonstrate, initially on a limited scale, the technical and economic viability of establishing such a mechanism. Even at the pilot stage, services are to be provided on a subscription basis, so that the potential for establishing a financially self-sufficient system in the future can be tested. The information subjects covered by the pilot project involve industrial and energy technologies and have been selected on the basis of priority sectors of cooperation identified by the Caracas Programme of Action and the recent experiences of UNFSSTD. Data flows are envisaged by way of dedicated leased satellite channels and public telephone lines through a central switching facility connected to the national bureaus in the ten developing countries participating in the pilot project. The experience gained and the conclusions offered by this demonstration project will constitute important input for the establishment of larger information networks.

153. See Sauvant, *International Transactions in Services*, op. cit.

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Appendix A
SELA Actions on Services

1. NINTH REGULAR MEETING OF THE LATIN AMERICAN COUNCIL: LATIN AMERICA'S CONCERTED ACTION IN THE AREA OF SERVICES

(Decision No. 153, adopted by the Ninth Regular Meeting of the Latin American Council, 12–21 September 1983, contained in the "Final Report of the IX Regular Meeting of the Latin American Council," CL/IX.0/DF No. 1 of 19 September 1983.)

THE LATIN AMERICAN COUNCIL

HAVING SEEN,

The report on the results of UNCTAD VI from a Latin American perspective (SP/CL/IX.0/DT No. 6);

The VII Annual Report on Activities of the Permanent Secretariat (SP/CL/IX.0/DT No. 2).

WHEREAS,

The services sector is of great importance for the development of the Latin American countries;

The services-related matters shall be reviewed by the Trade and Development Board and other international fora.

It is necessary for the Member States to perform a comprehensive analysis of the role of services in the development process and of the impact of the sector's international transactions on their economies;

There is the need to adopt a common Latin American position vis-à-vis trade in services so as to maximize the sector's activities in the countries of the region, increase incomes, and prevent the negative effects of the present structure of international transactions, as well as promote the concerted action of the region in international discussions on the matter.

DECIDES:

Article 1. To carry out a comprehensive analysis of the role of services and of international transactions of the sector in the development process and in the economies of the member states.

Article 2. To request the permanent secretariat to carry out the basic studies required for the analyses referred to in Article 1; to this end, it is to hold consultations during the final quarter of 1983 with governmental experts of the member states so as to establish the terms of reference for the aforementioned studies.

Article 3. To convene a high-level Latin American Co-ordination Meeting no later than the third quarter of 1984, with a view to adopting a joint regional position for the scheduled international discussion.

Article 4. To recommend that the permanent secretariat seek the support of UNCTAD's secretariat for the implementation of this decision.

2. LATIN AMERICAN ECONOMIC CONFERENCE: PLAN OF ACTION

(SELA, Permanent Secretariat, "Declaration of Quito and Plan of Action" (Caracas, 1984), adopted by the Latin American Economic Conference, Quito, 9–13 January 1984.)

SERVICES

Aware of the growing importance of the services sector for the economic development of the countries of the region and recognizing the need for adopting joint and coordinated positions in international organizations truly competent to deal with this subject, we believe it necessary to:

i. Reaffirm the need to adopt a joint regional position with regard to the topic of the international trade of services, for which purpose a Latin American Co-ordination Meeting has been called under Decision 153 of the Latin American Council of SELA;

ii. Co-ordinate the position of the Latin American and Caribbean countries with respect to initiatives or actions which can bring about true development of indigenous technologies in the region in accordance with the national interests of our countries, particularly with regard to the most advanced technologies;

iii. Undertake joint efforts to define and implement appropriate mechanisms for the dissemination and transfer of new technologies to direct users in the different fields of production;

iv. Carry out consultations among our countries and with regional and subregional organizations in order to identify specific areas for the promotion of regional and subregional co-operation plans with respect to services, especially in the transportation, insurance, and reinsurance sectors;

v. Grant, in the implementation of national or multinational projects, preferential treatment to Latin America and Caribbean firms that provide national services, particularly with regard to consulting;
vi. Request the Inter-American Development Bank to take necessary steps to establish systems to reduce the cost of insurance and reinsurance in the region, taking into account systems included in carrying out projects financed by that bank.

In any consultations and actions undertaken to comply with the provisions of this chapter, account will be taken of the diversity of national legislation in some of the areas related to services.

3. HIGH-LEVEL LATIN AMERICAN CO-ORDINATION MEETING ON SERVICES: CONCLUSIONS AND RECOMMENDATIONS

("Final Report of the Tenth Regular Meeting of the Latin American Council," SP/CL/X.0/DT no. 14.)

The High-Level Latin American Co-ordination Meeting on Services, held at the headquarters of the Latin American Economic System (SELA), in Caracas, from 22 to 24 August 1984.

Taking into account the provisions of Decision 153 of the Latin American Council regarding the necessity to perform a comprehensive analysis of the role of services and of international transactions of the sector in the development process and in the economies of the Member States and to adopt a joint regional position for the international discussions on the subject;

Stressing the importance of promoting the earliest possible implementation of the agreements on services adopted in the Declaration and Plan of Action of the Latin American Economic Conferences held in Quito, Ecuador;

Considering that services play an increasingly important and dynamic role in the development process, due to their contribution to gross domestic product and employment, their share in international transactions and their relationship with scientific and technological progress; and that, therefore, the topic of services must be broached from the perspective of their contribution to the development process of the developing countries;

Considering that international service transactions are of great importance for Latin American countries and that in this field the region, as well as the other developing countries, has been experiencing sizeable and growing deficits in recent years;

Bearing in mind that, because the service sector in Latin America is in its infancy, the strategy to be followed must be aimed at strengthening indigenous national and regional capabilities in the sector, with a view to improving their international trading position;

Considering that regional co-operation in their field of services must be strengthened, for the purpose of consolidating the efforts traditionally made in

this area and promoting the development of new service activities that can reinforce our countries' productive capacity;

Stressing the need of having a broader and more thorough knowledge of the role services play in development;

A. At the National Level

1. To underline the importance for Member States to analyze, as soon as possible, the services sector in their economies and its contribution to the development process, with the aim of working out a national service production and marketing strategy. In formulating this strategy, special attention should be paid to the potential for regional co-operation, as well as the possibility of adopting import substitution policies and promoting imports in those service activities in which this may be considered appropriate.

2. To request the Permanent Secretariat, in close consultation and with the collaboration of Member States, to draw up a methodology for use by the countries in the analyses mentioned in the foregoing paragraph which will meet the objectives provided for in this document and facilitate their harmonization.

B. At the Regional Level

1. To study the situation of various service activities, with a view to mobilizing the potential for regional cooperation, including the possible areas of complementarity among the countries of the region. In order to give impetus to the implementation of the recommendations of the Quito Declaration and Plan of Action, these studies must pay special attention to the need to identify actions that make it feasible to develop indigenous technologies in the region; the definition and implementation of appropriate mechanisms for the diffusion and transfer of new technologies; the identification of specific areas which lend themselves to regional co-operation schemes; and, in the execution of the national and multilateral projects, the granting of preferential treatment for national service enterprises in Latin America and the Caribbean.

2. To recommend that the Latin American Council adopt a work program for the SELA Permanent Secretariat designed to promote these actions at the regional level. This work programme would envisage, *inter alia*, the following activities:

a. Furthering the studies under way in the areas of informatics, insurance and reinsurance, banking, transport and consultancy, and engineering; and preparing studies on tourism, taking into account existing analyses in this area;

b. Considering the possibility of preparing studies on other traditional and nontraditional service activities;

c. Studying the possibility of setting up new Latin American firms to market services, as well as strengthening existing ones;

d. The improvement of the statistical base concerning traditional and nontraditional service activities;

e. The identification of service activities with a potential for autonomous development in the region, so as to determine the possibilities for industrial, technical, and technological co-operation which they may offer;

f. The analysis of the obstacles encountered by the region's service exports in external markets; and the study of the obstacles in their countries which hamper or complicate the acquisition of services by the countries of the region;

g. The analysis of the interrelationships existing in some service activities between national and foreign capital, the external debt and international transactions.

3. To recommend the holding of seminars, in order to expand and deepen knowledge of the problems and importance of the service sector for the countries of the region.

4. To recommend that, for the implementation of this work programme, the permanent secretariat seek the cooperation of relevant regional and international agencies and institutions, bearing in mind the work they are carrying out in this area.

C. At the International Level

1. As regards the international discussions on services it is felt that, in the light of the present and future economic importance of services, any international discussion of the subject, whatever its scope, should seek to safeguard the economic development roles pursued by the developing countries.

2. A greater knowledge of services in the development and economies of the region is fundamental and should be a precondition of any decision about the expedience or otherwise of launching discussions on services.

3. In this regard, it is the view that UNCTAD, whose central purpose relates to development problems and services, should play a more important role in analyzing and discussing the sundry ramifications of services and development.

4. During the Twenty-ninth Session of the Trade and Development Board, to attempt to get UNCTAD to include in its work programme the following activities envisioned in the Buenos Aires Platform:

a. To conduct studies to identify and establish priorities with regard to services of special importance to developing countries and draft programmes that permit the developing countries a larger share of international trade in services. These studies must also cover those services that do not fall within the specific competence of existing international organizations;

b. To include in these studies recommendations for the establishment of multilateral cooperation mechanisms in services which may benefit developing countries. To this end, the UNCTAD secretariat may seek the support of member countries and international organizations in gathering the statistical data and information needed for that purpose. Those mechanisms ought to ensure differential and more favourable treatment for developing countries in the service

sector. The UNCTAD secretariat must also systematically gather and disseminate all relevant information on services;

c. To establish technical assistance programs for developing countries in the area of services;

d. In tackling the tasks mentioned above, to take into account the special problems of the least-developed countries.

5. Concerning the consideration of services at the Fortieth Session of the GATT Contracting Parties, it is reiterated that that body was conceived for the sole purpose of regulating the goods trade and, therefore, has no competence in the area of services.

6. Likewise, to reaffirm the position taken on 4 May 1984 by the developing countries which are contracting parties to the General Agreement that "urgent and undivided attention must be given to the implementation of measures and commitments" benefiting developing country trade, as is set out in the work programme adopted at the 1982 Ministerial Meeting. As was indicated in that statement, "unless and until the work programme is fully implemented in this manner any initiative such as the holding of a new round of negotiations in GATT would be lacking in credibility and devoid of relevance particularly for developing countries."

7. In this context, the unity of developing countries is essential to co-ordinated action in international discussions on services, to which end it would be appropriate to promote the adoption of common positions with the remaining developing countries on this matter. Concerted action by developing countries would, moreover, counteract the trend toward bilateralism advocated by some developed countries and strengthen their individual and collective bargaining position. The inclusion in bilateral agreements of rules and principles applicable to service transactions can weaken the position of developing countries and lead, in the long run, to the granting of concessions which replace multilateral effort and co-ordination among all countries.

8. In view of initiatives to obtain service-related concessions from developing countries as a condition for maintaining advantages for merchandise exports under the Generalized System of Preferences, to reject such procedures and reiterate that those schemes must be guided by the principles of non-discrimination and non-reciprocity, without being subject to any form of "graduation."

9. The importance of the initiatives in the field of services being undertaken by the Group of 77 within the Caracas Action Programme was underlined, and all Latin American countries are exhorted to play an active role in those activities.

10. Finally, it is decided to distribute these conclusions and recommendations, as well as the report prepared by the SELA Permanent Secretariat on "Services and the Development of Latin America," at the Twenty-ninth Session of the Trade and Development Board.

4. TENTH REGULAR MEETING OF THE LATIN AMERICAN COUNCIL: SERVICES AND THE DEVELOPMENT OF LATIN AMERICA

(SELA, "Final Report of the Tenth Regular Meeting of the Latin American Council," CL/X.0/DT no. 1, pp. 81-83, Decision no. 192.)

THE LATIN AMERICAN COUNCIL

HAVING SEEN:

Article 5 of the Panama Convention;

Decision 153 of the Ninth Regular Meeting;

The Quito Declaration and Plan of Action;

The Permanent Secretariat's report on "Services and the Development of Latin America" (SP/RCLA/SERV/DT No. 2/Rev. 1);

The Final Report of the High-Level Latin American Co-ordination Meeting on Services (SP/CL/X.0/DT No. 14), held at Headquarters from 22 to 24 August 1984.

WHEREAS:

It is necessary to promote the earliest possible implementation of the agreements on services adopted in the Declaration and Plan of Action of the Latin American Economic Conference held in Quito, Ecuador;

The subject of services must be approached from the perspective of their contribution to the development process of developing countries;

Given the infancy of the service sector in Latin America and its importance, the strategy to be followed must be aimed at strengthening indigenous national and regional capabilities in the sector, with a view to improving their international trading position;

Regional co-operation in the field of services must be strengthened, for the purpose of consolidating the efforts traditionally made in this area and promoting the development of new service activities that can reinforce our countries' productive capacity,

DECIDES:

Article 1. To approve the Conclusions and Recommendations of the High-Level Latin American Co-ordination Meeting on Services;

Article 2. To underline the importance for Member States to analyze, as soon as possible, the services sector in their economies and its contribution to the development process, with the aim of working out a national service production and marketing strategy. To that end, to request the permanent secretariat, in close consultation and collaboration with Member States, to draw up as soon as possible a methodology for use by the countries in rendering said analyses compatible;

Article 3. To request the permanent secretariat to carry out the work programme approved in the High-Level Latin American Co-ordination Meeting on Services with the collaboration of regional organizations and institutions and UNCTAD, establishing priorities on the basis of the sector's importance for the region's development and taking into account the need to create indigenous capabilities. In carrying out this work programme, existing inter-relationships in some service activities between national and foreign capital, external indebtedness, and international transactions shall be kept in mind.

Article 4. To implement the actions required for mobilising the potential for regional cooperation, including the possible areas of complementarity among the countries of the region.

Article 5. To reaffirm that, in the light of the present and future economic importance of services, any international discussion of the subject, whatever its scope, must seek to safeguard the economic developmental goals pursued by the developing countries and that a greater knowledge of services in the development and economies of the region is fundamental and must be a precondition of any decision about the expedience or otherwise of launching discussions on services.

Article 6. To reiterate that the GATT forum is exclusively restricted to regulating merchandise trade and, therefore, has no competence in the area of services.

Article 7. To underline that the unity of developing countries is essential to coordinated action in international discussions on services, to which end it is necessary to strengthen actions relating to the adoption of a common stand at the regional level, in the Group of 77 and at other levels of interregional coordination.

5. TENTH REGULAR MEETING OF THE LATIN AMERICAN COUNCIL: ACTION COMMITTEE ON THE INFORMATICS AND ELECTRONICS INDUSTRY (CASIE)

(SELA, "Final Report of the Tenth Regular Meeting of the Latin American Council," CL/X.0/DT no. 1, pp. 271–272, Decision no. 221.)

THE LATIN AMERICAN COUNCIL

HAVING SEEN:

Articles 3, 5, and 20 of the Panama Convention;

The Quito Declaration and Plan of Action;

The permanent secretariat's report on "Services and the Development of Latin America" (SP/RCLA/SERV./DT. No.2/Rev. 1);

The Final Report of the High-Level Latin American Co-ordination Meeting on Services (SP/CL/X.0/DT No. 14), held at Headquarters from 22 to 24 August 1984;

WHEREAS:

It is necessary to strengthen regional cooperation in the area of services in order to foster indigenous national and regional capabilities in the sector and to promote the development of new service activities that can bolster the production capacity of our countries;

DECIDES:

Article 1. To authorize the permanent secretary to hold consultations with the member states in order to identify possible forms of co-operation in the field of informatics and electronics.

Article 2. That the objectives of this cooperation could include:

a. Promoting initiatives for the purpose of buttressing regional self-sufficiency in the sector and closing the technological and industrial gap vis-à-vis the developed countries;
b. Information sharing on national legislation concerning informatics and electronics;
c. Undertaking industrial complementarity activities in the informatics and electronics fields;
d. Examining the possibilities of harmonizing national legislations on the subject.

Article 3. To request the permanent secretary to present to the member states a report on the consultations mentioned in Article 1 of this decision within a maximum of 180 days and, in the light of these consultations, take the necessary action in some of the areas related to services.

Appendix B
Statistical Tables

Table B.1 Composition of U.S. computer sales, by main computer types, 1975, 1980, and 1985

Computer type	1975		1980		1985 a/	
	Billion dollars	Percent	Billion dollars	Percent	Billion dollars	Percent
Annual shipments						
General purpose computers	10.610	86.9	17.060	63	22.900	39.9
Minicomputers	1.555	12.7	8.255	30.5	21.620	37.6
Microcomputers	0.05	0.4	1.746	6.5	12.900	22.5
TOTAL	12.215	100	27.061	100	57.420	100
Installed stock						
General purpose computers	61.2	93	108.8	76.8	170.5	54.6
Minicomputers	4.5	6.8	28.7	20.3	99.8	32
Microcomputers	0.1	0.2	4.1	2.9	41.8	13.4
TOTAL	65.8	100	141.6	100	312.1	100

Source: IDC, EDP France, September 1981.

a/ Estimated.

Table B.2 The computer base in selected Latin American countries, 1973 and early 1980s

(number of units)

Country	Computer class				Total	Total per 10,000 population	Total per billion dollars of GNP
	Mini/micro	Small	Medium	Large			
Argentina							
1973	...	...	...	...	446	0.19	12
1982	7,664		3,909		11,575	4.11	161
Brazil							
1973	...	...	...	...	754	0.08	10
1982	15,037	3,107	301	148	18,593	1.54	69
Bolivia a/							
1973	...	...	...	...	...	...	...
1980	...	...	...	...	85	0.15	25
Chile							
1973	...	...	...	...	52	0.05	8
1981	907	209	51	28	1,195	1.06	41
Colombia							
1973	...	...	...	...	86	0.04	8
1983	...	...	...	...	2,381	0.90	65
Costa Rica							
1973	...	...	...	...	29	0.16	19
1981	91	118	30	9	248	1.06	74
Honduras							
1973	...	...	...	...	...	...	...
1981	...	...	...	...	100	0.26	44
Mexico a/							
1973	...	...	...	...	573	0.11	12
1982	7,300	2,195	499	62	10,056	1.41	63
Paraguay							
1973	...	...	...	...	6	0.02	6
1983	...	...	...	...	350	1.14	70
Uruguay							
1973	...	...	...	...	34	0.11	12
1983	699	331	25	18	1,073	3.66	130
Venezuela							
1973	...	...	...	...	302	9.29	17
1983	5,500	1,700	165	70	7,435	4.82	114
For comparison							
Germany, Fed. Rep. of (1980)	...	...	...	...	225,636	36.72	273
France (1980)	...	...	...	...	73,290	13.67	117
Czechoslovakia (1980) a/	...	...	...	...	2,015	1.32	23
Belgium (1980)	...	...	...	...	19,000	19.79	160

Sources: UN Centre on Transnational Corporations, based on national sources, and United Nations, Statistical Yearbook, various years.

a/ Estimated.

Table B.3 The fragmentation of the computer park in Latin America
(number of units)

Corporation	Argentina a/ 1982	Brazil 1980	Mexico 1978	Uruguay 1983	Venezuela b/ 1982
Bull	(136)	134	250	145	12
Burroughs	(217)	1,741	677	90	660
T.I.	794	-	...	143	...
DEC	(164)	251	213	49	80
Wang	(288)	18	...	41	220
Apple	381	-	...	25	...
INTEL	(5)	-	...	29	4
IBM	(832)	1,197	737	188	772
Olivetti	(322)	2,290	496	353	400
R. Shack	614	-	...	10	...
CBM	124	-	...	-	...
H.P.	(223)	701	34	-	66
UNIVAC	(38)	95	187	-	...
CDC	...	1	61	-	7
NCR	(363)	275	508	-	439
Philips	...	261	195	-	150
Basic Four	(9)	-	69	-	250
TOTAL	...	8,844	3,510	1,073	3,380

Source: UN Centre on Transnational Corporations, based on national sources.

a/ Figures in parentheses are for 1979.
b/ Minicomputers excluded.

Table B.4 The fifty largest data-processing equipment manufacturers, 1981

Rank	Corporation	Country	Data-processing revenues (million dollars)	Growth rate 1980-1981 (%)	Total revenues 1981
1	IBM	U.S.	26,340	16.7	29,070
2	Digital Equipment	U.S.	3,586	30.7	3,586
3	Control Data	U.S.	3,103	12.2	4,162
4	NCR	U.S.	3,071	4.1	3,432
5	Burroughs	U.S.	2,934	24.6	3,405
6	Sperry Corp.	U.S.	2,781	8.9	5,544
7	Fujitsu	Japan	1,950	15.0	2,900
8	Hewlett Packard	U.S.	1,875	18.4	3,695
9	Honeywell	U.S.	1,774	8.5	5,351
10	Olivetti	Italy	1,674	18.0	2,541
11	ICL	UK	1,442	-13.0	1,442
12	CII-HB	France	1,353	-9.0	1,350
13	Hitachi	Japan	1,340	20.0	9,700
14	Xerox	U.S.	1,100	15.7	8,619
15	Wang	U.S.	1,008	48.0	1,008
16	Nixdorf	FRG	1,000	20.0	4,900
17	Storage	U.S.	922	53.0	922
18	TRW	U.S.	855	11.1	5,285
19	Data General	U.S.	764	13.6	764
20	General Electric	U.S.	750	57.8	27,854
21	Siemens	FRG	700	-40.0	12,000
22	Texas Instruments	U.S.	668	6.7	4,206
23	Computer Sciences	U.S.	625	11.4	625
24	Automatic Data	U.S.	613	21.0	613
25	ITT Corp.	U.S.	540	33.0	23,200
26	Electronic Data	U.S.	480	17.6	487
27	Datapoint	U.S.	474	30.2	474
28	Tandy Corp.	U.S.	400	109.0	1,885
29	Amdahl Corp.	U.S.	443	12.2	443
30	Apple Computer	U.S.	401	143.0	401
31	McDonnell-Douglas	U.S.	377	23.7	7,385
32	Prime Computer	U.S.	365	36.1	365
33	Management Assist.	U.S.	349	12.4	349
34	Comdisco	U.S.	344	25.0	344
35	Rolm Corp.	U.S.	331	32.1	331
36	National Semiconductor	U.S.	330	10.0	1,095
37	Mohawk Data Sciences	U.S.	321	11.6	321
38	Harris Corp.	U.S.	313	20.3	1,636
39	Tektronix	U.S.	309	7.8	1,100
40	Tymshare	U.S.	290	23.2	290
41	Computervision	U.S.	271	41.7	271
42	Dataproducts	U.S.	270	8.7	270
43	Gould Inc.	U.S.	270	44.3	1,846
44	Raytheon	U.S.	245	8.8	5,636
45	Tandem Computer	U.S.	242	88.4	242
46	Racal Corp.	U.S.	240	13.2	240
47	Four-Phase Systems	U.S.	234	18.5	234
48	Perkin-Elmer	U.S.	230	1.7	1,096
49	Northern Telecom	U.S.	230	5.7	2,152
50	Lanier Business	U.S.	228	18.4	325

Source: Temps Réel, 20 September 1982.

Table B.5 Distribution of general-purpose computers, by region and corporation, beginning 1981

(millions of dollars)

Corporation	Developed market economies			Developing countries					Eastern Europe	Others	TOTAL world
	United States	Western Europe	Japan	Latin America and Caribbean	Africa	Middle East	Asia and Oceania	Total developing countries			
IBM	39,403	22,219	4,514	2,104	183	356	1,018	3,661	427	3,322	75,546
HIS	3,979	4,049	42	174	4	33	19	230	180	684	9,164
Univac	3,910	2,480	823	91	1	32	134	258	81	579	8,131
Burroughs	3,649	1,020	280	443	1	27	127	598	13	339	5,899
CDC	1,740	896	58	50	7	48	61	166	27	230	3,117
NCR	1,261	502	238	61	11	48	72	192	23	118	2,334
DEC	670	214	-	74	-	-	17	91	3	118	1,096
ICL	-	2,883	-	17	52	24	152	245	142	381	3,651
Siemens	-	2,440	-	1	-	-	-	1	32	11	2,484
CII-HB	-	620	-	1	13	6	5	25	10	2	665
Fujitsu	-	15	3,221	44	-	-	49	93	7	88	3,424
Hitachi	-	-	2,410	-	-	-	20	20	-	-	2,430
NEC	-	-	2,033	-	-	-	-	-	-	-	2,033

Source: IDC reports.

Table B.6 The twenty principal data-processing services corporations in Brazil, 1980

Rank	Name	Year of establishment	Major stockholders a/ Name	Share	Country	Sales (thousands of dollars) b/	Equity (thousands of dollars) b/	Main services
1	Serpro	...	Federal government	100	Brazil	161,500	...	Data-processing services
2	Dataprev	...	Federal government	100	Brazil	67,500	33,500	Data-processing services
3	Prodesp	1969	State of São Paulo government	100	Brazil	49,200	27,600	Data-processing services
4	IBM do Brasil	1960	IBM World Trade	100	United States	47,300 c/	32,600	Data-processing services, training, consulting,
5	Datamec	1959	Caixa Econômica Federal	100	Brazil	37,000	12,200	Data-processing services, software
6	Prodam	...	São Paulo city government	100	Brazil	34,100	7,500	Data-processing services
7	Procergs	...	State of Rio Grande do Sul government	100	Brazil	11,700	11,000	Data-processing services
8	Prodemge	...	State of Minas Gerais government	100	Brazil	9,700	1,800	Data-processing services
9	Commicromation	...	Bradesco Group	...	Brazil	9,400	3,800	Data-processing services
10	CETIL-Processamento de Dados Ltd a/	1969	Individual	100	Brazil	8,800	2,200	Data-processing services, software
11	Prodasc	...	State of Santa Catarina government	100	Brazil	8,100	400	Data-processing services
12	Celepar	...	State of Paraná government	100	Brazil	8,000	2,900	Data-processing services
13	Prodeb	...	State of Bahia government	100	Brazil	6,400	1,300	Data-processing services
14	UPSI	1976	Individual	100	Brazil	5,000	2,000	Data-processing services, consulting, software
15	Control Data do Brasil Computadores Ltd a/	1973	Control Data Corporation	100	United States	5,000 c/	3,800	Data-processing services, software, data-base services
16	Cronin	...	Individual	100	Brazil	4,900	1,000	Consulting, data-processing services

(Table B.6 continued)

Rank	Name	Year of establishment	Major stockholders a/ Name	Share	Country	Sales (thousands of dollars) b/	Equity (thousands of dollars) b/	Main services
17	Medidata - Informática e Tecnologia S.A.	1976	Forsa - Emp. e Part.	50	Brazil	4,600	950	Data-processing services,
			Individual	49	Brazil			software, system-house services
18	Proconsult Ltd a/	1967	Individual	100	Brazil	4,300	1,600	Data-processing services, software
19	Servimec S.A. Proc. de Dados	1955	Individual	100	Brazil	4,100	800	Data-processing services, software
20	Superdata	1973	Supergasbrás	100	Brazil	3,900	800	Data-processing services, software

Source: Transborder Data Flows and Brazil: Brazilian Case Study, UN publication, Sales no. E.83.II.A.3, pp. 217-218.

a/ At least 10 percent participation.
b/ Exchange rates: 1 U.S. dollar = 52.835 cruzeiros.
c/ Services only; estimated.

Table B.7 Projected revenues for U.S. on-line data-base market, by subject area, 1979 and 1985

(million dollars)

Subject area	1979	Estimated 1985 a/	Average annual growth rate, 1979-1985 (%)
Credit	240	710	20
Securities and commodities	140	300	14
Economics and finance	125	400	22
Marketing	105	510	30
Law, accounting	75	360	30
Econometrics	67	200	20
Bibliography	62	255	27
Real estate	45	175	25
News	40	235	34
Industry	37	126	23
Demography	36	135	25
Patents	22	95	28
Natural resources	16	96	35
International	18	70	25
Other	140	560	26
TOTAL	1,168	4,227	24

Source: Transborder Data Flows: Access to the International On-line Data-base Market, UN publication, Sales no. 83.II.A.1.

a/ Estimated.

Table B.8 Projected revenues for Western European on-line data-base market, by subject area, 1980 and 1985 (million dollars)

Subject area	1980	1985 a/	Average annual growth rate, 1980-1985 (%)
Economics and financial	42	320	50
Securities and commodities	20	103	39
Professional (legal, medical, patents, and so on) b/	14	141	59
Technical and scientific b/	13	95	49
Econometrics	11	201	79
Industry	8	224	95
Marketing	5	132	93
Business b/	4	75	80
Credit	3	43	70
Others	1	66	131
TOTAL	123	1,400	63

Source: Same as for Table B.7.

a/ Estimated.
b/ Bibliographic information.

Table B.9 Present and future telecommunication services

Basic services (Current basic telecommunication infrastructure)	New services (Enhancement of basic telecommunication infrastructure)	Advanced services (New telecommunication infrastructure)
Telephony	Integrated basic services with some speed enhancement (ISDN)	Videotelephony
Telex, teletex	Digitized voice	Videoconferencing
Low-speed data	Textfax	Fast facsimile
Mobile telephone	Audiographic teleconferencing	Bulk document transfer
Low-speed facsimile	Electronic mail	High speed data
	Wider availability of mobile telephony	On-line graphical design
	Higher resolution videotex	Remote printing and publishing
		Dynamic computer Load-sharing
		Burst-mode host-to-host transfer

Source: UN Centre on Transnational Corporations.

Table B.10 Total number of telephones in use and number per 100 inhabitants, by region, 1970 and 1980

Region/country	Number (thousands of units) 1970	1980	Number per 100 inhabitants 1970	1980	Average annual growth rate of number (%) 1970-1980
TOTAL world	272,657	508,286	7.5	11.5	6.4
North America	129,969	196,955	41.8 a/	58.0 a/	4.2
Canada 9,751	16,531	45.4	68.6	5.4	
United States	120,218	180,424	58.3	78.8	4.2
Europe	80,776	164,288	17.6	33.9	7.4
Czechoslovakia	2,003	3,150	13.8	20.6	4.6
France	8,774	24,686	17.2	45.9	10.9
Germany, Fed. Rep. of	13,835	28,554	22.5	46.4	7.5
Italy	9,371	19,277	17.4	33.7	7.5
United Kingdom	13,946	26,651	25.1	47.7	6.7
Africa	3,342	5,028	1.0	1.1	4.2
Algeria	184	485	1.3	2.5	10.2
Egypt	406	534	1.2	1.2	2.8
South Africa	1,482	2,662	7.0	11.2	6.0
Asia	33,229	77,304	1.6	3.1	8.8
Hong Kong	583	1,676	14.7	32.6	11.1
Iran	307	1,227	1.1	3.2	14.8
Japan	19,899	53,634	19.3	46.0	10.4
Oceania					
Australia	3,913	7,153	31.2	48.9	6.2
New Zealand	1,203	1,730	42.7	55.0	3.7
Papua New Guinea	23	49	0.9	1.6	7.9
USSR	11 000	23 707	4.5	8.9	8.0
Central America and other W. Hemisphere	2,782	17,780	...	...	20.0
Bahamas	44	72	25.5	34.3	5.1
Barbados	29	67	12.0	26.6	8.7
Bermuda	30	46	53.9	84.6	4.4
Belize	3	6b/	2.3	4.4b/	9.1b/
Cayman Islands	1	7	12.9	39.2	21.0
Costa Rica	62	236	3.5	10.7	14.3
Cuba	269	362c/	3.2	3.7c/	3.3c/
Dominica	2	1	2.3	1.3	-6.7

(Table B.10 continued)

Region/country	Number (thousands of units) 1970	1980	Number per 100 inhabitants 1970	1980	Average annual growth rate of number (%) 1970-1980
Dominican Rep.	47	165	1.2	2.9	13.4
El Salvador	39	86	1.1	1.9	8.3
Grenada	3	6	3.1	5.4	7.2
Guadeloupe	14	39	4.0	14.1	10.8
Honduras	14	27c/	0.5	0.8c/	7.5c/
Jamaica	72	119	3.8	6.0	5.1
Martinique	17	52	4.8	16.8	11.8
Mexico	1,506	4,992	3.1	7.2	12.8
Montserrat	1	2	5.8	18.3	7.2
Neth. Antilles	28	56	11.9	22.1	7.2
Nicaragua	26	58c/	1.3	2.2c/	9.4c/
Panama	85	173	6.0	9.5	7.3
St. Kitts & Nevis	1	3b/	2.4	5.3b/	14.8b/
St. Lucia	3	8	3.0	6.9	10.3
St. Vincent and Grenada	2	6	2.2	4.6	11.7
Trinidad and Tobago	56	77b/	5.5	6.8b/	4.1b/
South America	6,137	13,538	3.2	5.5	8.2
Argentina	1,591	2,588	6.8	9.3	5.0
Brazil	1,980	7,496	2.1	6.3	14.2
Chile	354	551	4.0	5.0	4.5
Colombia	809	1,718	3.8	6.4	7.8
Ecuador	104	272	1.7	3.3	10.1
Guyana	15	(21)d/	2.0	(2.7)d/	40.0
Paraguay	24	59	1.0	1.8	9.4
Peru	221	475	1.7	2.7	7.9
Suriname e/	12	15	4.4	4.3	2.9
Uruguay	215	287	7.4	9.9	2.9
Venezuela	406	789c/	3.9	5.8c/	6.9c/

Source: United Nations, Statistical Yearbook, 1981, 1975, UN publication, Sales no. E.79.XVII.1.

a/ Includes Central America and other Western Hemisphere countries.
b/ 1978 data; growth rate is for 1970-1978.
c/ 1979 data; growth rate is for 1970-1979.
d/ 1975 data; growth rate is for 1970-1975.
e/ 1971 and 1979 data; growth rate is for 1971-1979.

Table B.11 Selected applications of computer capabilities

Application	Usual type of computer
Data Processing	
Business records (accounting, order processing and billing, production control, inventories, taxes, banking)	Mainframe, mini, or micro, depending on size of business
Government records and statistics (census and other data bases, tax records, social security, economic data)	Mainframe
Scientific and technical (social-science data bases, engineering calculations, modeling of complex systems)	Mainframes for batch and interactive processing; micros and minis for laboratory automation as well as specialized applications, such as modeling chemical reactions
Medical records	Mini or mainframe
Airline reservations	Mini or mainframe
Point-of-sale terminals, electronic cash registers	Micro, but may be part of distributed system
Communications and Control	
Multiplexing and transmission of voice and alphanumeric data	Varies
Telephone exchanges	Mainframes
Private exchanges (PBX, PABX)	Micros and minis
Facsimile transmission	Minis and micros
Teletext, viewdata	Micros
Air traffic control	Mainframes
Military Systems	
Signal processing (radar, sonar)	Mainframe or mini, depending on need for portability
Navigation	As above, or micros
Fire control	As above, or micros
Flight control	Micros
Industrial Systems	
Batch process control (machine tools, assembly robots, heat treating, materials handling, steelmaking, typesetting)	Minis and micros
Continuous process control (petroleum refining, rubber and synthetic fibers, basic chemicals, paper products, foods)	Mainframes and minis
Computer-aided design	Mainframes and minis

(Table B.11 continued)

Application	Usual type of computer
Energy production, conservation and control (turbine startup, electric utility load management, process heat, building heating, ventilation, and air-conditioning)	Varies
Environmental monitoring and pollution control	Minis and micros
Education and training (computer-assisted instruction)	Varies
Measurement and testing (medical diagnostics, nondestructive inspection, chemical analysis)	Minis and micros
Office Automation	
Word processors	Micros and minis
Copiers	Micros
Calculators and accounting machines	Micros
Consumer Products	
Automobiles (engine control, driver information, diagnostics)	Micros
Home entertainment (electronic and video games, personal computers)	Micros
Appliances (refrigerators, microwave ovens, sewing machines)	Micros
Thermostats and environmental controls	Micros
Calculators	Micros
Cameras	Micros
Electronic watches	Micros

Source: United States, Congress, Office of Technology Assessment, International Competitiveness in Electronics (Washington, D.C., 1983), p. 91.

Table B.12 Trade and foreign direct investment in goods and services, by region, 1970, 1975, and 1982

(billion dollars)

Transaction	World	Developing countries	Latin America	Developing countries as percentage of world	Latin America as percentage of world
Export of merchandise					
1970	268	62	16	23	6
1975	723	145	39	20	5
1982	1,687	492	95	29	6
Annual average growth rate (percent)					
1970-1982	17	19	16		
1975-1982	13	19	14		
Export in services a/					
1970	98	14	4	14	4
1975	246	35	12	14	5
1982	680	148	34	22	5
Annual average growth rate (percent)					
1970-1982	18	22	19		
1975-1982	16	23	16		
Average total foreign-direct-investment flows b/					
1970-1972	13	3	2	23	12
1975-1977	33	9	4	28	13
1980-1982	38	11	6	29	16

Sources: UN Centre on Transnational Corporations, based on International Monetary Fund, Balance of Payments Statistics Yearbook, pt. 2, vol. 28, 1970-1976; vol. 33, 1982; vol. 34, 1984; OECD, Development Co-operation (Paris, OECD, various issues), and national sources.

a/ Excluding unrequited transfers.
b/ The figures for the world are for all reporting member countries of the IMF; the figures for developing countries and Latin American countries are for Development Assistance Committee countries only.

Table B.13 Off-shore investment in developing countries, by major U.S., Japanese, and Western European semiconductor manufacturers, a/ 1971, 1974, 1976, and 1979

(number of firms present b/)

Region/country	1971	1974	1976	1979
East and Southeast Asia				
Korea, Rep. of	6	8	8	8
Hong Kong	1	6	6	7
Indonesia	-	3	3	3
Malaysia	-	11	13	14
Philippines	-	-	1	6+1 planned
Singapore	9	10	12	13
Thailand	...	...	1	1
Other	3	3	6	8
Latin America				
Brazil	-	2	5	5+3 planned
Mexico	...	...	12	13
Barbados	-	-	-	1
El Salvador	...	1	1	2
Mediterranean basin				
Morocco	...	...	1	1
Malta	...	...	1	1
Portugal	...	...	2	3

Source: Jean-Louis Truel, "Les nouvelles stratégies de localisation internationale: le cas des semi-conducteurs," Revue d'économie industrielle, no. 14 (1980), p. 12.

a/ The sample includes twenty-four U.S. firms, six Western European firms, and seven Japanese firms.

b/ Each firm is counted only once in each country, even if it owns more than one plant.

Table B.14 Major cooperation agreements and joint ventures, 1982

	CDC	NCR	Fijitsu	HIS	Hitachi	ICL	CII-HB	Olivetti	NEC	Siemens	Others
IBM											1
Burroughs	2, 3		4		5			6			
CDC →		7		8	9	7	8				10, 11
Sperry Corp. →						12					13, 14
Fujitsu →						15				16	17 to 21
HIS →							22		23		24
Hitachi →								25			26 to 28
ICL →							42			42	29 to 32
Olivetti →											33 to 39
Xerox →										40	
Nixdorf →											41

Source: Transnational Corporations in the Computer and Data-processing Industry, UN publication, forthcoming.

Note: The numbers in the table refer to the notes that follow.

Notes to Table B.14

1. IBM and Matsushita: Joint production of microcomputers.
2 & 3. CDC and Memorex (a Burrough's subsidiary): two joint ventures: Peripherals Components, Inc. (with CDC equity majority), Disk Media Inc. (with Memorex majority).
4. Memorex and Fujitsu: Fujitsu provides Memorex with magnetic tape drives and word-processing systems on an OEM basis. Burroughs with Fijitsu: facsimile on supply contract.
5. Burroughs and Hitachi: technical cooperation.
6. Memorex and Olivetti: a joint venture in Italy manufacturing magnetic disks.
7. CDC-NCR-ICL: a joint venture, Computer Peripherals Inc.
8. CDC-HIS-CII-HB: a joint venture, Magnetic Peripherals.
9. CDC-Hitachi: technological cooperation in terminals.
10. CDC-Centronics (U.S.): CDC holds a 45 percent share in Centronics equity (1982).
11. CDC-Systime (UK): CDC holds a 35 percent share in Systime equity (1983).
12. Sperry-ICL: a marketing agreement.
13. Sperry Rand-Mitsubishi-Oki: a joint venture, Nippon-Univac, to develop a medium-sized system.
14. Sperry Rand-Oki: a joint venture, Oki Univac.
15. Fujitsu-ICL: Fujitsu provides ICL with big IBM compatible mainframes; moreover the two firms cooperate in microprocessor technology and large scale computer development.
16. Fujitsu-Siemens: Fujitsu provides Siemens with big IBM compatible mainframes directed to the market of the Federal Republic of Germany; Fujitsu distributes Siemens's laser printers in Japan.
17. Fujitsu-TRW: a joint venture to distribute peripherals and small and medium-sized computers in the U.S. market under Fujitsu brand name.
18. Fujitsu-Amdhal: a joint venture, Amdhal International Ltd. Fujitsu equity share is 50 percent. It must be recalled that Fujitsu holds a 28.7 percent share in Amdhal on an OEM basis.
19. Fujitsu-Martel Group (Philippines): a joint venture, Facom Computers Philippines, Inc.
20. Fujitsu-Consolidated Computer, Inc. (Canada): to manufacture and distribute peripherals. (Fujitsu's share is 20 percent.)
21. Fujitsu-Secomsa (Spain): to manufacture and distribute peripherals (Fujitsu's share is 28 percent).
22. Honeywell Information Systems-CII-HB: after the French CII-HB nationalization, HIS share was reduced to 19.9 per cent; nevertheless, the technical co-operation between the two companies will be maintained.
23. HIS-NEC: an agreement for computer technology cooperation (has not been renewed in 1982).
24. HIS-Mitsubishi: a joint venture, HIS Japan, to manufacture office machines.
25. Hitachi-Olivetti: Hitachi provides Olivetti with M-series, large models on an OEM basis.
26. Hitachi-National Advanced Systems (a National semi-conductor corporation's subsidiary): Hitachi provides NAS with CPU and large computers on an OEM basis.

27. Hitachi-BASF: Hitachi provides BASF with CPU, disk controllers, and tape drivers on an OEM basis; an R&D agreement exists for magnetic disks.
28. Hitachi-ICL: cross-licensing agreement.
29. ICL-Three Rivers (U.S.): TR supplies ICL with its Perq scientific workstation.
30. ICL-Sinclair (UK): an agreement for voice/data processing.
31. ICL-Logica VTS: ICL has acquired the Logica VTS's 2200 word-processor licence.
32. ICL-Rair (UK): Rair will sell its "black box" to ICL to be included in ICL's personal computer line.
33. Olivetti-IPL (U.S.): Olivetti holds a 23.8 percent share in IPL.
34. Olivetti-Docutel (U.S. bank terminals): a merger, Docutel-Olivetti.
35. Olivetti-Syntex (U.S. word processing): Olivetti holds 18.9 percent of Syntex.
36. Olivetti-Data Terminal Systems (U.S.A.): Olivetti controls 12.7 percent of Data Terminal Systems (point of sales terminal) and has a majority position in DTS's affiliate in the Federal Republic of Germany.
37. Olivetti Peripheral Equipment (U.S.)-Irwin International Corp. (U.S.): a joint venture-Irwin-Olivetti (35 percent Olivetti); specialized in production and sales of magnetic disks and printers, also R&D activities.
38. Olivetti-Sharp: technical agreement concerning office computers.
39. Olivetti-Micro Age Computer Store: Olivetti took 49 percent of MAC's equity, the second large U.S. distributor of data-processing products, specialized in microcomputers and small business systems.
40. Xerox-Siemens: a distribution agreement. Siemens diffuses Ethernet and Xerox 8000 in the Federal Republic of Germany.
41. Nixdorf established a technical cooperation with various Japanese companies and set up a R&D center in Japan.
42. ICL, Bull, Siemens: joint R&D center in Munich known as European Computer Industry Research Center GmbH, with special emphasis on artificial intelligence.

Table B.15 Trade in data-processing equipment, by region, 1973-1980

Region	1973	1974	1975	1976	1977	1978	1979	1980
Developed market economies								
Imports								
Billion dollars	3.0	3.8	4.1	4.8	5.7	7.2	9.5	12.1
Percentage	94.0	93.7	92.0	94.5	94.2	92.3	92.3	91.6
Exports								
Billion dollars	1.8	2.6	2.9	3.5	4.2	7.0	9.2	12.4
Percentage	98.3	97.6	97.2	98.1	97.8	98.6	98.5	97.9
Developing countries								
Imports								
Million dollars	190	260	338	283	353	594	793	1,114 a/
Percentage	6.0	6.3	8.0	5.5	5.8	7.7a/	7.7a/	8.4a/
Exports								
Million dollars	31	67	84	67	98	100	136	265 a/
Percentage	1.7	2.4	2.8	1.9	2.2	1.4a/	1.5a/	2.1a/

Source: United Nations, Yearbook of International Trade Statistics, various years.

a/ Estimated.

Table B.16 The fifty most important computer and office-equipment import markets, 1977 and 1978
(million dollars)

Country a/	1978 Rank	1978 Imports	1977 Rank	1977 Imports	Percentage change 1977 to 1978	Percentage change 1976 to 1977
TOTAL world	-	14,542.4	-	11,391.8	27.6	10.9
	28.2	10.9				
United States	1	1,961.5	2	1,369.8	43.2	15.9
Germany, Fed. Rep. of	2	1,875.4	1	1,382.9	35.6	18.0
United Kingdom	3	1,533.1	4	1,159.8	32.2	18.6
France	4	1,531.3	3	1,335.4	14.7	11.3
Canada	5	787.4	5	669.5	17.6	10.1
Italy	6	782.1	6	620.0	26.1	8.7
The Netherlands	7	640.1	8	483.3	32.4	17.8
Japan	8	544.1	7	499.6	8.9	15.4
Belgium/Luxembourg	9	436.3	9	431.7	27.7	29.6
Switzerland	10	366.9	13	261.4	40.3	16.3
Sweden	11	362.5	10	302.7	19.7	15.2
Australia	12	361.9	11	281.7	28.1	21.7
Spain	13	296.2	12	273.9	8.1	7.8
Denmark	14	219.1	14	173.6	26.2	32.3
Austria	15	210.7	15	169.0	24.6	20.3
Brazil	16	193.7	17	135.2	43.3	0.9
Hong Kong	17	180.4	21	111.4	61.9	10.6
Ireland	18	175.3	16	156.8	11.7	66.1
South Africa	19	167.4	20	113.0	48.1	8.1
Mexico	20	160.8	22	106.8	50.6	-27.1
USSR	21	152.8	18	115.6	32.2	-63.4
Norway	22	132.7	19	114.3	16.1	38.7
Czechoslovakia	23	113.5	25	82.7	37.2	-43.7
Argentina	24	99.8	26	81.0	23.2	107.1
Finland	25	99.8	24	88.6	12.6	4.9
Venezuela	26	97.2	23	89.3	8.8	28.6
Yugoslavia	27	96.9	27	76.2	27.1	62.5
Republic of Korea	28	96.2	28	64.6	48.9	41.3
Saudi Arabia	29	80.1	36	39.0	105.3	51.2
Iran	30	63.3	33	44.2	43.2	-3.0

(Table B.16 continued)

Country a/	1978 Rank	1978 Imports	1977 Rank	1977 Imports	Percentage change 1977 to 1978	Percentage change 1976 to 1977
Singapore	31	61.3	30	49.9	22.8	24.7
Israel	32	58.7	35	41.6	41.1	-1.6
German Democratic Republic	33	57.3	31	49.1	16.7	14.7
Hungary	34	53.4	32	48.9	9.2	-37.3
Poland	35	49.8	29	53.0	-6.0	-62.3
Iraq	36	47.0	50	14.7	219.7	58.1
Portugal	37	45.8	37	35.9	27.5	42.5
New Zealand	38	41.1	34	42.2	-2.6	-0.7
Philippines	39	35.3	39	30.2	16.8	1.6
Algeria	40	29.7	42	21.0	41.4	7.7
Greece	41	29.5	43	20.7	42.5	23.2
Nigeria	42	29.4	38	34.6	-15.0	38.9
Chile	43	26.7	45	19.5	36.9	65.3
Bulgaria	44	25.9	40	23.4	10.6	-46.9
Romania	45	24.7	47	16.5	49.7	-40.2
Panama	46	23.8	41	22.4	6.2	27.3
Colombia	47	21.6	46	18.0	20.0	71.4
Thailand	48	21.0	-	13.2	59.1	-
China	49	21.0	-	7.9	164.5	-
Kuwait	50	20.9	48	16.1	29.8	62.6

Source: B. Szuprowicz, "The world's top 50 computer import markets," Datamation, January 1981, p. 142. Reprinted with permission of DATAMATION® magazine, Copyright by Technical Publishing Company, A Dun & Bradstreet Company, 1981--all rights reserved.

a/ Underlined countries are mentioned in Chapter 2 discussion of table.

Table B.17 Recipients of Latin American exports of automated data-processing equipment, 1980 and 1981 a/

(thousand dollars)

Export market	Brazil 1980	Brazil 1981	Argentina 1980
Japan	79,471	77,225	13,284
Italy	19,831	19,606	332
Australia	13,149	30,261	3,713
United States	2,761	5,375	106
France	2,422	1,867	156
United Kingdom	2,019	2,272	7,534
Federal Republic of Germany	811	584	35
Netherlands	755	817	103
Belgium/Luxembourg	455	1,441	99
Switzerland	293	493	...
Spain	252	63	...
Sweden	193	131	7
Canada	178	7,475	...
Finland	105	75	...
Norway	104	86	...
Austria	72	20	110
TOTAL	122,871	477,791	25,479

Source: United Nations, 1981 Yearbook of International Trade Statistics (New York, 1982).

a/ Data are available for the twenty-two largest exporting countries only.

Table B.18 Products made in IBM's factories in Latin America, 1983

Country	Products
Argentina	Printers
Brazil	Intermediate processors (43xx series), disk drives (model 3370), displays, controllers, printers, ribbons
Colombia	Ribbons, typewriters
Mexico	Typewriters, ribbons, minicomputers (S/34 and S/36 models)

Sources: IDC, EDP Industry Report, 31 March 1983, p. 7; Raul L. Katz, "Politicas informaticas en Mexico" (Buenos Aires, 1984), mimeo, p. 101, and "Nationalism and computer technology transfers: the Brazilian case" (Boston, MIT, 1981), mimeo, p. 78.

Appendix C
International Activities Relating to Transborder Data Flows

International activities relating to transborder data flows are increasing. Since the First Symposium on Transborder Data Flows convened by the Organisation for Economic Co-operation and Development (OECD) in 1977, the First World Conference on Transborder Data Flow Policies organized by the Intergovernmental Bureau for Informatics (IBI) in June 1980, and the High Level Conference on Information, Computer and Communications Policies for the '80s convened by OECD in October of the same year, an increasing number of countries have begun to pay greater attention to transborder data flows, and various regional conferences in the developing world have addressed this subject. Furthermore, since the adoption of the "Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data" by the Council of OECD in September 1980 and the completion of the "Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data" by the Council of Europe in January 1981,[1] attention is shifting from the transborder flow of personal data to that of economic data. The events unfolding may well involve intensive discussions about the adoption of a data pledge (by which the members of OECD would commit themselves to foster free trade in information goods and services) and of guidelines for the transborder flow of personal and economic data by IBI, as well as negotiations on a framework for data services by GATT and UNCTAD.

UN Bodies

Economic Commission for Europe

While continuing to work toward the preparation of the technical instruments necessary for data exchange in international trade,[2] the Working Party on Facilitation of International Trade Procedures has identified a number of obstacles that hampered the utilization of telematics in international trade. Since solutions

to some of those obstacles could not be found at the national level nor through agreements between trading partners, the question had to be referred to UNCITRAL, which would consider its introduction into the commission's program of work at its June 1984 meeting.

Pending the development of adequate international legal instruments, the working party will prepare guidelines for the drafting of private law contracts governing the interchange of information between trade partners. These "uniform rules for communication agreements" will address particularly the issue of allocation of responsibilities between interchange partners, for example, in case of errors or delays in data transmission.

UN Commission on International Trade Law

Legal dimensions of one aspect of transborder data flows—electronic funds transfers—are examined by the UN Commission on International Trade Law (UNCITRAL). Recent developments in electronics and in computer technology have made it possible to transfer funds between parties to an international commercial transaction almost instantaneously, rather than through the time-consuming paper process. The advent of this complex technological advance presents certain legal problems that could raise obstacles to international trade. They include such issues as when payments become final, liability for loss caused by delayed or incorrect payment instructions, and the evidential value of payment records kept in electronic form. UNCITRAL has begun work on the preparation of a guide to legal problems arising in connection with electronic funds transfers that would identify the legal problems involved and discuss various possible solutions.[3]

By summer 1984, the UNCITRAL secretariat had prepared a preface and several draft chapters for a legal guide on electronic funds transfers. Four of the draft chapters—those dealing with "Terminology used in this Guide," "Electronic funds transfer systems in general," "Agreements to transfer funds and funds transfer instructions," and "Fraud, errors, improper handling of transfer instruction, and related liability"—were submitted to the commission at its seventeenth session, held in New York from 25 June to 10 July 1984.[4] The commission instructed the secretariat to complete the legal guide. At the same session, the commission had before it a report prepared by the UNCITRAL secretariat that described some legal problems arising from the use of automatic data processing in international trade.[5] The commission decided to place this topic on its work program as a priority item.

UN Commission on Transnational Corporations

The UN Commission on Transnational Corporations, supported by the UN Centre on Transnational Corporations (UNCTC), has been dealing with transborder-data-flows issues since 1981. The research by these institutions has focused on research on the role of transborder data flows in transnational corporations and the implications this role has especially for developing countries, although broader issues are also taken into account.[6]

Since the preparation of an initial overview study on *Transnational Corporations and Transborder Data Flows: A Technical Paper* in 1981,[7] the centre, under the guidance of the commission, has focused on three priority areas: (1) country case studies on transborder data flows; (2) access to the international data market; and (3) transnational corporations and remote-sensing data.[8]

Work on country case studies is continuing. By an examination of a country's telecommunication, informatics, and telematics infrastructure, the country case studies attempt to assess empirically the role of transnational corporations in transborder data flows, the economic impact of these flows on countries, particularly developing ones, and policy responses to transborder data flows. They enable countries to take stock of their capacity, especially in terms of infrastructure, so that they can utilize transborder data flows; they can serve as a vehicle for the exchange of views with other governments on issues regarding transborder data flows; and they provide governments with the empirical material needed to formulate appropriate national policies and to participate effectively in international discussions on transborder data flows.

By August 1984, case studies by Brazil and Poland had been completed.[9] Studies by the Federal Republic of Germany, Mexico, and the United States were scheduled for completion before the end of 1984. Eventually, a general analysis will be prepared on the basis of these case studies to review the experience of various countries, the policies adopted by them, and the applicability of such policies to countries at different levels of development and in different circumstances.

In 1984, UNCTC initiated a study on international trade and foreign direct investment in data services, since these transactions are increasingly important and policy attention given to them is growing (for instance, in GATT and UNCTAD) in the general framework of trade in services. The study will deal with a number of the conceptual issues relating to these transactions, their nature, volume, and determinants, the obstacles facing them, the regimes most appropriate to them and, most important from UNCTC's viewpoint, the role of transnational corporations in them and their impact on the development process in general and developing countries in particular.

UNCTC is also preparing industry studies on telecommunications, computer and computer equipment, and computer services; in addition, a technical paper on transnational corporations and the semiconductor industry has been completed.[10] Since these studies deal with parts of the infrastructure of transborder data flows and bear on commercial as well as corporate data flows, they provide background for the work on transborder data flows and shed light on specific aspects of these flows.

Finally, the Group of 77 suggested during the tenth session of the commission (following a similar proposal during the ninth session) to establish an ad hoc working group of experts who, in their personal capacity, would deal with issues related to transborder data flows. A number of other delegations felt, however, that such an action was premature, although they were not necessarily against the creation of a working group.

UN Conference on Trade and Development

Since its establishment, UNCTAD has been involved in specific service sectors, notably transport, insurance, and financing related to trade, and service issues related to the transfer of technology. This work has led to the negotiation of certain instruments in UNCTAD, particularly in the area of maritime transport, as well as resolutions and guidelines in this and other areas.[11] The UNCTAD secretariat has also been executing technical assistance programs with respect to these services. UNCTAD's role with respect to services intensified in 1982 as a result of the Trade and Development Board's decision 250 (XXIV) in which it was agreed that when dealing with factors of relevance to the issues of protectionism and structural adjustment and with policies influencing,structural adjustment and trade, commensurate attention should be paid to services. The first study undertaken in this context and presented to the twenty-sixth session of the board led to the overall issue of services being dealt with in the documentation presented to UNCTAD VI.[12] Resolution 159 (VI) of that conference directed the UNCTAD secretariat to continue its studies of services and stated that UNCTAD shall, inter alia, consider the role of services in the development process, keeping in view the special problems of least-developed countries. The Trade and Development Board was invited to consider, at its twenty-ninth session in September 1984, appropriate future work on services. In preparation for that session, the secretariat prepared a report that dealt with a range of service issues within a development-oriented framework.[13]

UN Development Programme

The UN Development Programme (UNDP) supports the creation of the technological infrastructure for transborder data flows by assisting in the establishment of networks and data bases. These include the Pan-African Documentation and Information System (PADIS), the Pan-African Telecommunication Network (PANAFTEL), and the Asian Telecommunication Network. Reference to the TIPS project has been made in the main body of the text.

PADIS is being set up by UNDP in cooperation with the Economic Commission for Africa as a coordinated all-African documentation system available to policymakers and containing data relating to economic, social, scientific, and technological developments. The system is also intended to link up with data bases and networks outside Africa. It is to be built up gradually during the 1980s at an estimated total cost of $170 million. Activities started in 1980, and PADIS was efficiently inaugurated in January 1981. PANAFTEL is meant to provide an integrated pan-African telecommunication network with a regional tariff structure based on actual costs. Similarly, the long-range objective of the Asian Telecommunication Network is to ensure a systematic and coordinated development of an Asian intraregional network capable of being linked with major global networks.

Specialized UN Agencies

UN Educational, Scientific and Cultural Organization

The work of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in this area began with the First Intergovernmental Conference on Strategies and Policies for Informatics (SPIN I), organized with IBI in Torremolinos, Spain, in 1978.[14] The conference was attended by seventy-eight official national delegations, as well as a number of international governmental and nongovernmental organizations. Among the recommendations that emerged from the conference was one calling for concerted action at the international level to examine problems of transborder data flows, with a view to formulating international agreements on the rights of states in respect of transborder data flows.

In UNESCO's Informatics Programme, emphasis is placed on the implementation of other recommendations of SPIN I. The Informatics Programme proposal for the 1984-1985 biennium submitted by the sciences sector consists of five areas concerning support for the establishment of strategies in informatics development; reinforcement and development of institutions and means for education, training and information on informatics; study of social consequences of the applications of informatics; acquisition and adaptation of technologies; and international cooperation for the development of informatics.

The 1983 UNESCO General Conference decided to establish a Committee on Informatics. This committee, whose agenda is likely to include transborder data flows, will hold its first meeting in autumn of 1984.

International Telecommunication Union

The International Telecommunication Union (ITU) plays a key role in the establishment of the technological infrastructure that permits transborder data flows. The various protocols adopted by the union, its format prescriptions for data networks, and the regulations for international leased lines for data transmission are particularly important.[15] In fact, most of the basic technical and operational aspects connected with the telecommunication side of the application of transborder data flows are the subject of ITU regulatory, quasi-regulatory, or standard-setting texts.

A large majority of the ITU texts concerning public correspondence services are drawn up by the International Telegraph and Telephone Consultative Committee (CCITT) of the ITU. The CCITT is composed of a Plenary Assembly, eighteen study groups—each of which has various working parties—and six special autonomous groups. The recommendations of the CCITT are not mandatory in contrast to the ITU Administrative Regulations, which may be both technical and operational. The latter are drawn up by administrative conferences and have treaty force between nations.

As regards transborder data flows, resolution no. 10 on the World Administrative Telegraph and Telephone Conference, adopted by the Plenipotentiary Conference (the supreme organ of ITU) in Nairobi in late 1982, is particularly noteworthy. There, the conference considered "that it is advisable to establish, to the extent necessary, a broad international regulatory framework for all existing and foreseen new telecommunication services," and it resolved "that a World Administrative Telegraph and Telephone Conference shall be convened immediately after the CCITT Plenary Assembly in 1988 to consider proposals for a new regulatory framework to cater to the new situation in the field of new telecommunication services."

Other Organizations

General Agreement on Tariffs and Trade

During the November 1982 ministerial meeting of the General Agreement on Tariffs and Trade (GATT), discussions took place on services in general. The ministerial meeting recommended to each contracting party with an interest in services to undertake pertinent national studies, and it invited an exchange of information on the issues involved. By June 1984, the United States, Canada, the United Kingdom and The Netherlands had prepared national studies, and a number of informal discussions to exchange information have taken place in accordance with the decision of the Ministerial Meeting. The contracting parties decided to consider at their Autumn 1984 session whether any multilateral action in this area is "appropriate and desirable."[16]

Intergovernmental Bodies

Council of Europe

The Committee of Ministers of the Council of Europe, an international organization that brings together twenty-one Western European states, adopted in 1973 and 1974 two resolutions on the protection of the privacy of individuals vis-à-vis electronic data banks in the private sector (resolution [73] 22) and in the public sector (resolution [74] 29). Although the principles enunciated in these two resolutions inspired national data protection laws, the provisions of these laws could be circumvented to a certain extent by transborder data flows. For this reason, the Committee of Ministers of the Council of Europe decided, in 1976, to entrust a Committee of Experts with the preparation of a convention for the protection of privacy in relation to transborder data processing. This task was accomplished by the beginning of 1981 and, on 28 January 1981, the Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data was opened for signature. By June 1984, it had been signed by Austria, Belgium, Denmark, France (which ratified it on 24 March 1983), the Federal Republic of Germany, Greece, Iceland, Italy, Luxembourg, Norway

(which ratified it on 29 February 1984), Portugal, Spain (which ratified it on 31 January 1984), Sweden (which ratified it on 29 September 1982), Turkey, and the United Kingdom. The condition for the entry into force of the convention—which is expected to take place during 1984—is ratification by five member states of the Council of Europe. After its entry into force, the Committee of Ministers of the Council of Europe may invite any state not a member of the council to accede to the convention.

The convention contains three groups of provisions. First, it confirms, as rules of international law binding on the parties, those data protection principles that the Council of Europe recommended in 1973 and 1974 to its member states for voluntary adoption. Second, it regulates data protection in the case of transborder data flows. Third, it helps data subjects in one country defend their rights with regard to information about them being automatically processed in another country.[17]

The convention does not contain a definition of transnational corporations nor any rules that apply directly to them. However, transnational corporations are affected by the instrument's provisions not only as users but also in their capacity as data subjects in so far as states extend the application of the convention to nonphysical persons.[18]

Although an important achievement, the convention is only one stage in the work on data protection being carried out within the Council of Europe. Efforts have been initiated to extend the application of the basic principles set out in this instrument to specific sectors of activity. The result was recommendation no. R (81) 1 on automated medical data banks, which was adopted by the Committee of Ministers of the Council of Europe on 23 January 1981, and recommendation no. R (83) 10 on the protection of personal data used for purposes of scientific research and statistics, adopted in September 1983. A committee of experts is currently examining a draft recommendation on the protection of personal data used for direct marketing purposes, as well as one on the protection of personal data used for social-security purposes. It has, furthermore, embarked upon a study of the problems that may arise from the use of personal data in travel and identity documents, as well as in the police sector. A colloquy entitled "Beyond 1984" will be organized by the Council of Europe in Lisbon in September 1984.

The European Community

The European Community (EC) is in the process of formulating a common position on a wide range of issues pertaining to transborder data flows. One important area concerns research and development in the field of information technologies. The European Strategic Programme for Research in Information Technology (ESPRIT) has been launched in recognition of the need for common actions to strengthen the efficiency of the community's research and innovation capabilities to maintain the industrial competitiveness of Western Europe.[19] A number of pilot research projects within the framework of this program are scheduled for launching in 1983.

In the areas of telecommunications and telematics, the Interinstitutional Integrated Services Information System (INSIS) program is an example of another community initiative. A further achievement of cooperation among national telecommunications systems has been the creation of the transmission network EURONET-DIANE, permitting access to Western European data-base services. This network has stimulated and accelerated the creation of national data networks and their interconnection. Among its characteristics are technical standardization, distance-independent tariffs, and greatly improved access to data-base services.[20]

In the specific field of transborder data flows, the EC member states and institutions have participated in the formulation of the Convention of the Council of Europe dealing with the protection of individuals with regard to automatic processing of personal data and the formulation of the OECD guidelines on the transborder flow of personal data. They are also participating in OECD activities concerning economic and trade-related aspects of transborder data flows.

Intergovernmental Bureau for Informatics

Apart from the Commission on Transnational Corporations, the IBI is the only international institution in which the effects of transborder data flows are currently being discussed with the participation of developing countries. In fact, thirty-three of IBI's thirty-six members are developing countries. The bureau's mandate is to promote the introduction and use of informatics for national planning and economic development, especially in developing countries.

IBI's activities regarding transborder data flows began with SPIN I, organized by IBI with UNESCO in 1978. As a follow-up to the recommendations adopted on that occasion, IBI organized the First World Conference on Transborder Data Flow Policies, held in Rome in June 1980.[21] A general consensus emerged on that occasion that countries should make an effort to work toward the formulation of international principles and cooperative arrangements that are accepted by the international community. To this end, the conference set up three working groups to discuss legal aspects, economic and commercial implications, and technological questions related to transborder data flows.[22]

Partly to follow up on the discussions of the working groups, IBI launched, during the first quarter of 1982, a world survey of the transborder-data-flow policies and practices of governments, post and telecommunication administrations, and transnational corporations. Questionnaires were sent to ministries of foreign affairs and national informatics and telecommunication authorities in 134 countries, as well as to some 5,000 transnational corporations and their foreign affiliates in over 100 countries.[23]

Furthermore, a number of regional meetings have been held in developing countries to inform them about the issues surrounding transborder data flows and provide an opportunity for the expression of regional concerns and positions on transborder data flows.[24]

In June 1984, the Second World Conference on Transborder Data Flow Policies was held.[25] Its objectives were to promote a better knowledge of the

transborder-data-flow phenomenon; to begin a debate on possible general principles that could inspire future negotiations in a forum open to all developing countries; and to put into action a cooperation program in this field. The conference invited the General Assembly of IBI to establish a Committee of Reflection on Long-Term Strategies; to create an international body on transborder data flows; to initiate a program of awareness-raising regarding transborder data flows; to cooperate with other institutions, especially to strengthen the telecommunication and informatics infrastructure in developing countries; and to convene a Third Conference on Transborder Data Flows Policies in less than four years. The General Assembly of IBI, which meets in December 1984, will decide on these suggestions.

It is planned to submit the materials prepared during these various activities to SPIN II, which is scheduled to take place in Havana at a later date. The resolutions adopted so far, as well as the results of the studies conducted in the framework of IBI indicate that participating governments will discuss measures dealing with transborder data flows. It is not intended to achieve this by creating prohibitive barriers to trade in data and data services but rather by tempering the principle of the free flow of data and information with the legitimate and internationally recognized rights of sovereignty, economic development, and privacy protection in the framework of an international regime for data and information flows.

The Organisation for Economic Co-operation and Development

To date, OECD is the intergovernmental institution that has done most work on transborder data flows. Its initial work centered on the privacy aspects of transborder data flows. More recently, emphasis has shifted to broader economic and legal aspects.

Since the mid-1960s, OECD has concerned itself with trends in information technology as part of its broad work on science and technology policy. Recognizing the growing importance of information technology, the Committee on Scientific and Technological Policy established a working party on Information, Computer and Communications Policy in 1977, which in 1981 was elevated by the council of OECD to a committee in its own right—the Committee on Information, Computer and Communications Policy (CICCP).

The original stimulus for OECD's efforts regarding transborder data flows came from work on privacy protection. In the early 1970s, a number of countries introduced or considered broad-ranging legislation aimed at protecting personal privacy from possible abuses of computer files. However, it soon became clear that not all countries believed that this type of legislation was necessary or feasible and that the laws introduced differed substantially from country to country. These differences between countries created at least a potential issue in regard to the free flow of data between OECD countries. To ensure the full enforcement of their privacy laws, countries having such laws might restrict the flow of data to countries that either did not have privacy laws or whose laws accorded a lesser measure of privacy protection. Concern about such possible

restrictions was heightened by the inclusion in a number of privacy or data-protection laws of licensing procedures for transferring data files abroad.

Potential international implications of privacy protection were examined in considerable depth at the First OECD Symposium on Transborder Data Flows, held in Vienna in 1977. On the basis of the results of the symposium, the working party established an Expert Group on Transborder Data Flows to develop guidelines covering these flows and the protection of privacy. The basic objective of these guidelines was to establish a set of agreed-upon fundamental principles of privacy protection acceptable to all OECD member countries and thus to ensure at least a minimum level of homogeneity throughout the OECD area.

The OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data were adopted by the Council of the Organisation on 23 September 1980.[26] All OECD member countries have adhered to them, although reservations with regard to their implementation have been made by Australia, Canada, and Ireland. Following the adoption of the guidelines, the organization monitors developments in the field of privacy protection, particularly as they concern the implementation of the instrument. In this context, ad hoc meetings to survey developments in this area were convened in 1982 and 1983, bringing together senior officials involved in privacy legislation and transborder data flows. As part of the organization's efforts to keep abreast of privacy developments having a potential impact on transborder data flows, the 1983 meeting also examined the interaction of privacy and freedom-of-information legislation.

During the elaboration of the guidelines, it became clear that although transborder data flows were a rapidly growing and increasingly significant phenomenon, relatively little was known about their broader economic and legal impacts. The expert group responsible for drafting the guidelines therefore recommended that work on transborder data flows should be continued but with a broader focus. This recommendation was adopted by the working party and reaffirmed by the High Level Conference on Information, Computer and Communications Policies for the '80s held in Paris in October 1980.[27] More recently, the newly created CICCP decided to transform the expert group—whose mandate had been extended—into a Working Party on Transborder Data Flows, thus recognizing the importance of this area to the committee's overall program.

The activities of the new working party are broadly divided into two areas: the economic implications of transborder data flows and the legal aspects of these flows. With regard to the economic aspects, the new working party distinguishes two broad types of transborder data flows: (1) those that occur among independent firms and involve an arm's-length market transaction (for example, when a firm located in one country accesses a commercial data base located in another); and (2) those that occur within transnational corporations (for example, between a company headquarters in one country and an affiliate abroad) and do not involve an arm's-length market transaction. Given this typology, the new working party has undertaken two projects on the economic aspects of transborder data flows. The first deals with data bases and time-

sharing services and is being carried out through case studies.[28] The second deals with transborder data flows and transnational corporations and has been carried out through a combination of questionnaire survey and in-depth interviews. It involved a detailed study by OECD of the use of transborder data flows in a number of transnational corporations based throughout the OECD area.[29]

The organization's work on the legal aspects of transborder data flows is—except in the area of privacy—still mainly in the project definition stage, with exploratory work being carried out on specific legal questions. A detailed study of liability questions in transborder data flows is now being undertaken, and results of this work should be available in 1984.

To take stock of its work and examine its future orientation, the CICCP held a Second Symposium on Transborder Data Flows in London in November/December 1983. The final results of the studies on the economic aspects of transborder data flows were presented to the symposium, as were the preliminary results of the work on legal aspects. The symposium members discussed these results, explored options with regard for future work, and assessed the overall policy implications of OECD's work to date.[30] This symposium follows a special session of CICCP in December 1982, which focused on issues relating to telecommunications.[31]

Latin American Economic System

Within the overall program of work on trade in services of the Latin American Economic System (SELA), the permanent secretariat of SELA has been paying increasing attention to trade in data services, with a view of studying the impact of this trade on the development process in Latin America and of formulating policy options for consideration by member countries. More specifically, SELA established a Working Group on Trade in Services during autumn 1983, which had several meetings to discuss a background report on trade and foreign direct investment in data services. The present report resulted from these discussions. Furthermore, a report on "Services and development in Latin America" (which also dealt with data services) was prepared for a Latin America Co-ordination Meeting on Services, to be held 22–24 August 1984 in Caracas. At that occasion, the Latin American position on the international services discussion is to be adopted.

Nongovernmental Bodies

The Business Community

Within the business community, two principal international organizations are occupied with issues pertaining to transborder data flows and transnational corporations: the International Chamber of Commerce (ICC) and the Business and Industry Advisory Committee of OECD (BIAC). Since its founding in 1919, the International Chamber of Commerce has advocated and promoted the free

flow of goods and capital and supported a competitive market-oriented economy as the most appropriate system for creating greater prosperity throughout the world. Recently, ICC has begun to consider issues pertaining to the liberalization of trade in services, which includes trade in data and data services. This work is being carried out by the Commission on Computing, Telecommunications and Information Policies, one of the most active commissions of ICC. Composed of business persons nominated for their expertise by national committees, it was established in 1981 and provides a forum for suppliers and business users of hardware, software, and value-added services to focus on two main streams of issues of common interest: transborder data flows (including data protection) and telecommunications. The overall objective of the commission's work is to promote an international environment for the optimal growth and development of computer communication and information systems, thereby stimulating their beneficial applications in business and their contributions to economic development.

In 1982, the commission's program of work included the preparation of a position paper on telecommunication services;[32] the analysis of proposals concerning data protection by the European Parliament and several national governments; and the participation in the work of intergovernmental organizations regarding transborder data flows. Most of the commission's work focused on telecommunications.

ICC's work program for 1983 foresaw research and the preparation of position papers in the areas of telecommunications and transborder data flows. As regards the former, the topics examined included questions relating to international private leased circuits (mostly used by transnational corporations) and related public facilities; a liberal approach to homologation, the type of approval or certification required for customer premises equipment for connection to telecommunication networks; and nonterrestrial-based telecommunication services. As regards transborder data flows, the commission's work focused on recommendations on international and national aspects of business data flows; the inclusion of legal persons in legislation to protect the privacy of personal data; and other specific aspects of data protection. Contacts and cooperation with intergovernmental bodies active in this area continued.

The Business and Industry Advisory Committee is the officially accredited representative of private enterprise to OECD. One of the fifteen committees established by BIAC is the Committee on Information, Computer and Communications Policy. At the beginning of 1982, its status was upgraded from that of a working party to parallel a corresponding change in the status of the OECD Working Party on Information, Computer and Communications Policy and to signal recognition of the growing importance of the subjects it handles.

During 1982, the main topics of its work were issues pertaining to legal persons in Western European data-protection legislation, a pilot study by OECD on transborder data flows and transnational corporations and the telecommunication equipment industry. The committee's work program for 1983 centered on preparing documentation for the Second OECD Symposium on Transborder Data Flows. This input included the analysis of the results of a joint BIAC/

OECD questionnaire on the use of transborder data flows by transnational and other corporations. Other topics were data trade (such as trade barriers and tariffs) and legal issues (such as liability and confidentiality).

Trade Unions

In the view of trade unions, the transnationalization of data flows through the convergence of telecommunication and computer technologies is inseparable from the wider context of the increasing internationalization of the production of goods and services.[33] Indeed, transborder data flows are seen to constitute a highly functional instrument for transnational corporate activities. In this context transborder data flows raise questions of major concern to trade unions, especially at a time when corporate planning seems to be increasingly focused on the international restructuring of operations and production methods and the introduction of new technologies. The technological developments that now offer the possibility of storing, retrieving, processing, and transmitting vast amounts of information from one country to another can increase the flexibility of the planning and decisionmaking process of transnational corporations. Trade unions are concerned about the way in which such corporations are exploiting these new possibilities.

A whole range of issues has been raised in this context, including the impact of the new technologies on workers' information and consultation rights, employment patterns and levels, job security, job satisfaction, work organization, health and safety, and levels of worker control over the working environment. Of major concern is the way in which, through increased centralization, the centers of decisionmaking within transnational corporations could become more remote, thereby reducing the ability of national unions to obtain relevant and timely information to negotiate and influence corporate decisions in the workers' interests.

Trade unions are concerned that—compared with the area of transborder flows of personal data—relatively little intergovernmental action has taken place on the question of nonpersonal transborder data flows, although the potential problems may be even more far reaching. Although transborder data flows are useful for the wider dissemination of information, unions are convinced that most transnational corporations are applying transborder data flows to increase the degree of central monitoring of decisionmaking at global and regional corporate headquarters. The rationalization of corporate activities on a global basis, in which transborder data flows can play an important role, may lead to significant changes in the international division of labor within companies operating in different countries. There is also evidence that corporations are using transborder data flows to exploit the advantages of locating labor-intensive data-entry activities in low-labor-cost locations, while exporting the results for use in high-cost countries where the more technically sophisticated aspects of data processing and information handling are concentrated. The employment problems in both the low-cost and high-cost countries, which arise from such a division of labor call, in the view of trade unions, for careful consideration.

The growth of transborder data flows does not so much pose new problems for trade unions; rather it intensifies and changes the character of long-established trade-union concerns. The influence of trade unions is largely a function of their ability to exert pressure on decisionmakers. The new information technologies now available, including transborder data flows, are beginning to affect the bargaining relations of trade unions. The first stage of the trade-union response to this situation has been to inform union officials and members of the potential of the new technologies and to review the way in which bargaining strategies need to be adapted. A second aspect of evolving trade union policies is increased attention to international cooperation among trade unions in terms of general economic policy, more specific measures to build up common norms and standards, and measures to strengthen union bargaining positions vis-à-vis individual transnational corporations. With more unions investing in computing facilities at the national level, the possibilities of an international trade-union closed user-group network may become a more practical possibility.

Notes

1. Both instruments are reprinted in *Transnational Corporations and Transborder Data Flows: A Technical Paper*, UN publication, Sales no. E.82.II.A.4.

2. See "Trade data elements directory," E/ECE/TRADE WP.4/INF 76.

3. See "Electronic funds transfer: report of the Secretary-General," A/CN.9/221 of 17 May 1982.

4. See document A/CN.9/250 and Add. 1–4.

5. See document A/CN.9/254.

6. The various reports prepared by UNCTC for the commission, as well as the decisions by the commission regarding its work in this area, are contained in UNCTC, *Transnational Corporations and Transborder Data Flows: Background and Overview* (Amsterdam, North Holland, 1984).

7. UN publication, Sales no. E.82.II.A.4, summarized in "Transnational corporations and transborder data flows: an overview," E/C.10/87 and Corr. 1 of 6 July 1981.

8. See *Transborder Data Flows: Access to the International On-line Database Market*, UN publication, Sales no. E.83.II.A.1, and *Transborder Data Flows: Transnational Corporations and Remote-sensing Data. A Technical Paper*, UN publication, Sales no. E.84.II.A.11.

9. *Transborder Data Flows and Brazil: Brazilian Case Study*, UN publication, Sales no. E.83.II.A.3, and *Transborder Data Flows and Poland: Polish Case Study*, UN publication, Sales no. E.84.II.A.8.

10. See *Transnational Corporations in the International Semiconductor Industry*, UN publication, forthcoming.

11. See *Liner Convention*, UN publication, Sales no. E.75.II.D.12.

12. UNCTAD, "Production and trade in services, policies and their underlying factors bearing upon international services transaction," TD/B/941 and Corr. 1 of 1 March 1983.

13. See UNCTAD, "Services in the development process," TD/B/1008.

14. See UNESCO, *Final Report of the Intergovernmental Conference on Strategies and Policies for Informatics, Torremolinos (Spain), 28 August–6 September 1978* (Paris, 1978).

15. See, for instance, ITU, *Provisional Recommendations X.3, X.25, X.28, and X.29 on Packet-Switched Data Transmission Services* (Geneva, 1978), as well as the Series D Recommendations.

16. GATT, "Ministerial Declaration," *Press Release*, GATT 1328 of 29 November 1982.

17. For further discussion, see *Transnational Corporations and Transborder Data Flows*, op. cit.

18. This has been done by four Western European states.

19. Based on European Community Council Decision 82/878/CEE, published in *Official Journal*, no. L369/37 of 29 December 1982.

20. For a discussion of EURONET-DIANE, see *Transnational Corporations and Transborder Data Flows, op. cit.*, and *Access to the International On-line Data-base Market*, UN publication, Sales no. E.83.II.A.1.

21. See IBI, *Transborder Data Flow Policies: Papers Presented at the IBI Conference on Transborder Data Flow Policies, Rome, Italy, 23–27 June 1980* (New York, UNIPUB, 1981).

22. See "Transborder data flows, data protection and international law" (Rome, IBI, 1981), mimeo; "First meeting of the International Working Group on Data Protection and International Law: summary records" (Rome, IBI, 1981), mimeo; "First meeting of the International Working Group for the Analysis of Economic and Commercial Impacts of Transborder Data Flows: summary records" (Rome, IBI, 1981), mimeo; and "New techniques in informatics and telecommunications: their consequences" (Rome, IBI, 1981), mimeo.

23. The results have been published in "IBI world survey of national policies and company practices concerning transborder data flows: description and tabulation of results" (Rome, IBI, 1983). For a summary, see G. Russell Pipe, "IBI survey on TNCs and TDF," *The CTC Reporter* 17 (spring 1984): 42–43.

24. Regional meetings were held in Abidjan, 22–30 November 1979; Santiago de Chile, 19–20 November 1981; Dakar, February 1982; and Buenos Aires, 20 April 1983.

25. See the "Working document" (Rome, IBI, 1984), mimeo, prepared for the conference, as well as "The legal framework of international data flows" (Rome, IBI, 1984), mimeo.

26. For a discussion of the contents of the guidelines, see *Transnational Corporations and Transborder Data Flows*, op. cit. For a discussion of the implications of these guidelines for transnational corporations, see Martine Briat, "TNCs and the OECD TDF Guidelines," *The CTC Reporter* 20 (autumn 1986).

27. See Hans-Peter Gassmann, *Information, Computer and Communications Policies for the '80s: An OECD Report. Proceedings of the High Level Conference on Information, Computer and Communications Policies for the '80s, Paris, 6th–8th October, 1980* (Amsterdam, North Holland, 1982).

28. See G. Anderla and J. H. Petrie, "The international data market revisited," DSTI/ICCP/83.25.

29. The results are contained in OECD, "Transborder data flows in international enterprises: based on results of a joint BIAC/OECD survey and interviews with firms," DSTI/ICCP/83.23.

30. The various papers prepared for the symposium will be published in one volume.

31. The various papers prepared for this session were published in one volume.

32. ICC, Commission on Computing, Telecommunications and Information Policies, "The liberalization of telecommunication services: needs and limits" (Paris, 1982), mimeo.

33. The International Confederation of Free Trade Unions, the Trade Union Advisory Committee to OECD, and the European Trade Union Institute are the three main international trade union organizations undertaking some work on transborder data flows. This subject matter was also touched upon in an ad hoc meeting of trade union experts held in Brussels on 15 October 1982; see European Trade Union Institute, "Trade union use of information technology" (Brussels, 1983), mimeo. See also in this context John Evans, "Computers without frontiers: a union view of transborder data flows," *Free Labour World*, February 1982.

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Acronyms and Abbreviations

ADAPSO	Association of Data Processing Service Organizations
AT&T	American Telephone and Telegraph
BIAC	Business and Industry Advisory Committee (of OECD)
CAD	Computer-aided design
CAE	Computer-aided engineering
CALAI	Conference de Autoridades Latinoamericanas de Informatica (Conference of Latin American Informatics Authorities)
CAM	Computer-aided manufacturing
CASIE	Action Committee on the Informatics and Electronics Industry
CCITT	International Telegraph and Telephone Consultative Committee (of ITU)
CICCP	Committee for Information, Computer and Communications Policy (of OECD)
c.i.f.	Cost, insurance, and freight
COMECON	Council for Mututal Economic Assistance
CPU	Central processing unit
EC	European Community
EDP	Electronic data processing
ESPRIT	European Strategic Programme for Research in Information Technology
FIRA	Foreign Investment Review Agency (of Canada)
f.o.b.	Free on board
FRG	Federal Republic of Germany
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GNP	Gross national product
GSP	Generalized System of Preferences
IBI	Intergovernmental Bureau for Informatics
IBM	International Business Machines

ICAO	International Civil Aviation Organization
ICC	International Chamber of Commerce
IMF	International Monetary Fund
INSIS	Interinstitutional Integrated Services Information Systems
ISDN	Integrated services digital network
ITT	International Telephone and Telegraph
ITU	International Telecommunication Union
LSI	Large-scale integration
MNC(s)	Multinational corporation(s)
modem	modulator/demodulator
MSIN	Multisectoral information network
NCR	National Cash Register
OECD	Organisation for Economic Co-operation and Development
PADIS	Pan-African Documentation and Information System
PANAFTEL	Pan-African Telecommunication Network
PSTN	Public switched telephone network
PTT	Post, telegraph, and telephone
RITLA	Red de Información Technólogica para Latinoamérica (Latin American Technology Information Network)
SBS	Satellite Business Systems
SECOBI	Servicio de Consulta a Bancos de Informacíon
SEI	Special Secretariat of Informatics (of Brazil)
SELA	Systema Económico Latinoaméricano (Latin American Economic System
SITA	Société International de Télécommunicationes Aéronautique
SNA	System network architecture (that is, IBM's interface specifications of a computer system)
SPIN I	First Intergovernmental Conference on Strategies and Policies for Informatics
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TDF	Transborder data flow
TIPS	Technological Information Pilot System
TNC	Transnational corporation
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

UNFSSD	United Nations Financing System for Science and Technology for Development
UNCITRAL	United Nations Commission on International Trade Law
UNCTAD	United Nations Conference on Trade and Development
UNCTC	United Nations Centre on Transnational Corporations

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