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Science and technology for development: a selection of background papers for the main comparative report of the STPI project

PART C:

Technology transfer in developing countries

Contributors

Carlos Contreras
Francisco Colman Sercovich
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Alejandro Nadal E.

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SCIENCE AND TECHNOLOGY FOR DEVELOPMENT:

A SELECTION OF BACKGROUND PAPERS FOR THE

MAIN COMPARATIVE REPORT OF THE STPI PROJECT[1]

PART C:

TECHNOLOGY TRANSFER

IN DEVELOPING COUNTRIES

CONTRIBUTORS

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[1] This series of selections includes four volumes - Part A: Science and Technology Policy and Development (IDRC-MR21), Part B: Consulting and Design Engineering Capabilities in Developing Countries (IDRC-MR22), Part C: Technology Transfer in Developing Countries (IDRC-MR23), Part D: State Enterprises and Technological Development (IDRC-MR24).

A complete key to the full range of STPI publications is given at the end of this book.

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PREFACE

The STPI project was a large undertaking involving more than 150 researchers in the 10 participating countries. In addition, several consultants prepared background papers on topics identified by the teams. The main results of the project were presented to policymakers in a series of regional meetings held in Africa and the Middle East in 1977 and 1978.

The research, consultants' work, and dissemination meetings resulted in many reports. Some of these have already been published by IDRC, but several of the papers on specialized themes did not fit the general summary publications nor did they fit into the more detailed modules or monographs on the STPI project, also in the process of publication. It has therefore been decided to prepare these selections from STPI in order to ensure that the work receives a wider distribution. It should be remembered that the work leading to the articles was done and most of the articles prepared in the mid-1970s. Nevertheless, the work they report and topics they cover still have relevance for development in the 1980s.

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INTRODUCTION

This volume is one of a series published within the framework of the Science and Technology Policy Instruments (STPI) Project. The STPI Project, a large collaborative research effort that involved 10 teams from Latin America, the Middle East, Southern Europe, and Asia, was sponsored by the International Development Research Centre. Its principal aim was to examine the ways in which developing countries could ensure the effective contribution of science and technology (S&T) to development.

The central concern of the STPI Project was the process of S&T policy design and implementation. A detailed examination was conducted of the policymaking process, the ways in which policies were transformed into sources of influence through government action, and the impact that various policy instruments at the disposal of government had on the development of S&T capabilities (1). In addition, a number of complementary research topics were chosen for detailed analysis, and two volumes have been published on S&T planning in less developed countries and on S&T policies in China (2).

Other topics chosen for study to complement the central line of research of the STPI Project are the development of consulting and engineering design capabilities, the problems of technology transfer from industrialized to less developed countries, and the role of public or state enterprises in the process of S&T development. The participating teams worked on these topics according to their research interests, and there was not a uniform coverage of these topics complementary to the main line of research.

Volume A gathers a selection of reports prepared by the STPI teams on the above topics. The first chapter contains an overview of the field of S&T policy research for development, written by Geoffrey Oldham, IDRC's Associate Director for S&T policy, as an introduction to a series of meetings organized to disseminate the results of the STPI Project. The second chapter contains a compilation of statements on technological dependence/self-reliance, prepared by Onelia Cardettini on the basis of reports submitted to the Office of the Field Coordinator of the STPI Project. The third chapter contains an essay by Máximo Halty, a former IDRC Senior Research Fellow, commissioned

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(1) Sagasti, Francisco R., Science and Technology for Development: Main Comparative Report of the STPI Project, Ottawa, International Development Research Centre, IDRC-109e, 1978.

(2) Sagasti, Francisco R. and Aráoz, Alberto (Editors), Science and Technology for Development: Planning in the STPI Countries, Ottawa, International Development Research Centre, IDRC-133e, 1979 and Dean, Genevieve C., Science and Technology for Development: Technology Policy and Industrialization in the People's Republic of China, Ottawa, International Development Research Centre, IDRC-130e, 1979.

for the STPI dissemination meetings. This was one of the last essays written by Máximo Halty before his untimely death in December 1978.

Volume B contains two chapters written by Anil Malhotra, who coordinated the Indian contributions to the STPI Project, and undertook to prepare a synthesis report of the results of STPI research on the subject of consulting and engineering. Chapter 4 describes a conceptual framework developed by Malhotra, and Chapter 5 summarizes the findings of the STPI teams on the development of consulting and engineering design capabilities.

Volume C consists of four chapters on the issue of technology transfer, written in 1974-1975. In Chapter 6 Carlos Contreras surveys the main problems faced by the developing countries and suggests a policy framework to deal with them. In Chapter 7, Francisco C. Sercovich undertakes a preliminary assessment of the Argentinian system for the regulation of technology imports, and Anil Malhotra examines the evolution of Indian policies on foreign collaboration in Chapter 8. The Mexican Registry of Technology/Transfer Agreements is examined in detail by Alejandro Nadal in Chapter 9.

Volume D contains five essays on state enterprises and their role in technology policies. This was a complex and rather unexplored subject that engaged the preferential attention of the Brazilian team, and in which other country teams also became interested. Chapter 10 contains an essay written by Fabio Erber, describing the main issues involved in making public enterprises more active in promoting technological development. In Chapter 11 Sulamis Dain summarizes some of the key findings of the Brazilian team, and Dulce María Monteiro examines in Chapter 12 the research activities of PETROBRAS, the state's oil monopoly in Brazil. Ignacio Avalos and Rafael Rengifo summarize the findings of the Venezuelan team on this subject in Chapter 13, and in the last chapter Alejandro Nadal describes some features of the technological behaviour of the Mexican oil corporation, PEMEX.

Two criteria have been employed in selecting the essays to be included in these volumes from among the nearly 200 reports prepared in the STPI Project. The first is representativity, in the sense of providing a sampling of the various topics covered by the STPI Project in addition to the main research theme of policy design and implementation. The second is accessibility, in the sense of choosing reports that are not included in other STPI publications.

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CHAPTER 6

THE MAIN PROBLEM AREAS IN TECHNOLOGY TRANSFER

Carlos Contreras

Underdeveloped countries have problems in technology transfer because (a) they lack autonomy in the acquisition of technology; (b) the productive system is not able to select and absorb the technology obtained; and (c) it does not have the necessary support from technological institutions, which could help in selecting and absorbing foreign technology. As a result, (d) the technologies acquired are generally inadequate for national development needs, and (e) they are purchased in such a manner that no effective transfer takes place, only a mere rental of production techniques, and often at high cost.

These five problem areas characterize, in general, the difficulties encountered by the less developed countries in technology transfer. Each of these will be dealt with in sequence as follows: the problem area will be identified and briefly described; then the main policies, or general criteria for decision-making, will be suggested, continuing with an identification of the main policy instruments required for their implementation, the institutional structure necessary to administer them, and the operational mechanisms that would make the policy instruments operative (1).

From the description given below, it will be seen that there is practically a common institutional structure for the implementation of some of the policies, and also that several policy instruments and operational controls serve more than one function. Furthermore, it will be noted that legal devices of an inhibitory nature do not require specific operational mechanisms for their implementation, since it is automatically ensured by the explicit or implicit sanctions contained in the legal device. Therefore, when no additional operational mechanisms are required, they are not mentioned in the text.

First Problem Area - Lack of Autonomy in Decisions Referring to Technology

The decision to acquire a particular technology by an enterprise in an underdeveloped country is generally not independent or autonomous. This is due to the fact that (i) in underdeveloped countries a very large proportion of production techniques in use is acquired by the subsidiaries of transnational enterprises that operate in these countries; (ii) another substantial part of production techniques is acquired by mixed enterprises, with local and foreign capital, where decisions proposed by the foreign investor are generally followed, especially those which concern the acquisition of technology, capital, intermediate goods, raw materials, and other factors of production; and (iii) a lesser percentage of the technology is acquired by national entrepreneurs who

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(1) See: Sagasti, F. and Aráoz, A. 1974. Methodological Guidelines for the STPI Project, Office of the Field Coordinator, STPI Project, Lima.

lack technical knowledge and information, and therefore are in a situation of virtual dependence upon foreign corporations that supply technology, technical advice, engineering know-how, machinery and equipment, intermediate goods, and even raw materials, that are essential for their production processes (2). The situation with regard to international technical cooperation, which is another channel for technology transfer, is not too different. Foreign technical assistance is frequently oriented (from abroad) towards non-priority fields with no real impact on national development objectives, and where the recipient country's authorities have little or no regulatory intervention. This poses a difficult problem because the technology content of investment projects is often determined by foreign experts who provide technical assistance at the early stages of project development. Lastly, autonomy is lost when financial assistance is made conditional to the purchase of goods and services (technology) from specific suppliers or countries (tied-credit), both through bilateral and multilateral agencies. Thus, we can conclude that, in most cases, underdeveloped countries have few alternatives in their selection, and that in general there is no autonomy in the decisions made by the enterprise or agency in charge of acquiring a particular technology.

Policy

To achieve the maximum possible decision autonomy in the acquisition of technology with the purpose of orienting it towards the needs of economic and social development of the recipient country, the specific objectives to be pursued should be: (i) to achieve the progressive nationalization of the subsidiaries of foreign firms; (ii) to augment the decision-making capacity of the national investor participating in joint ventures with foreign investors; (iii) to orient technology acquisition towards achieving the economic and social development objectives of the country; (iv) to guarantee State control in the administration of international technical assistance; and (v) to abolish (or reduce to a minimum) tied financial aid and credit, which is made conditional to the acquisition of goods and services from specific suppliers.

Policy Implementation

Instrument: Legal measures should be taken to establish that foreign enterprises and joint ventures transfer a percentage of their shares within a specific period of time, so that commercial, administrative, and technical management of the firm will be put into the hands of national investors. (For instance, a target of 85 percent of shares belonging to national investors in 10 years should be established). Enterprises not complying with the above should not be able to benefit from incentives such as favourable terms for bank credits and tariff rebates granted for exports according to regional or subregional integration agreements, and should also be subjected to increased

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(2) The main exception to this pattern of dominance and lack of autonomy in technology decision-making are the traditional productive activities, particularly in rural and fringe urban areas, which do not involve any inputs of modern technology and are generally based on archaic or obsolete techniques. Although they may be important for generating employment, their contribution to capital formation and growth is rather limited.

progressive taxes on profits.

Operational Mechanisms: The enterprises that do not comply with the above regulations should be subject to the following sanctions: (i) The national banking system should not grant credits to them. (ii) The pertinent national committee (i.e. royalties committee, external credit committee, etc.) should reject their agreements involving technology acquisition. (iii) The customs administration should reject their applications for tariff rebates for exports, according to regional or subregional integration agreements. (iv) The tax administration should apply increased progressive tax rates on their profits.

Instrument: With the aim of achieving national development goals, agreements involving technology acquisition must be approved by a specialized national agency (e.g., a foreign investments committee, and external credit committee, a royalties committee, and industry committee, which approve the installation of new industries and the expansion of existing ones, and a committee in charge of the administration of international technical assistance). If this requisite is not fulfilled, the agreement will not have any legal effect and therefore no payments abroad can be effected for capital amortization, debt, service, royalty payments, etc. and the benefits that correspond to certain industrial activities will not be enjoyed. Note that this latter sanction is of special importance in those countries where there is no foreign exchange control.

Operational Mechanisms: (i) The appropriate agency should orient the acquisition of technology in accordance with definite priorities in the national development plan and should only approve contracts with conditions similar to those existing in the international market. (ii) Agreements on technology transfer should be revised and renegotiated within a given period in order to update and bring them into line with the national development goals. (iii) When agreements involving technology acquisition have not been approved by a specialized national agency, the National or Central Bank should not authorize payments abroad for capital amortization debts services or royalties payments. (iv) The national banking system should not grant credits to enterprises that acquired technology without the approval of the competent national committee.

Instrument: International technical assistance, which may come from multilateral, international (UNDP), regional (OAS, IDE), bilateral (government to government), and private (private corporation to State, or public or private entity), must be channeled to priority areas of the national development strategy. To this effect, the State should control international technical assistance, under terms that allow for its rational use.

Operational Mechanisms: International technical assistance must be oriented towards strengthening the productive system through the establishment of governmental research and development institutes, of research and development sectorial units within the productive system, and of training programs. This may require establishing a committee to oversee technical assistance agreements.

Instrument: All external credits conditional to the acquisition of goods and services from specific suppliers or countries should be rejected, or kept at the minimum possible level, since the application of such conditions

may be detrimental to national interests. Credits generally have the same origin as that of international technical assistance, although tied-credit practices are not usually common to international organizations.

Instrument: An information system to compile, classify, and disseminate technological information must be established, in order to allow the national productive system to identify those problems requiring imported technology, to search for alternative technologies, and to negotiate their acquisition under the most favourable terms in the international market. (This instrument is common to all policies proposed, and for this reason we thought it convenient to include it under the first one).

Operational Mechanisms: The technological information system should be organized and operated in such a way as to cover three main aspects: (i) Importation of technology - data on foreign investment and licensing agreements, data on imports of equipment, raw materials, intermediate products and their international prices, and information related to the industrial property in general. (ii) Technological capabilities and infrastructure, including data on: types of projects under the national and regional plans for development in relation to the investments and technology they require; local capability to obtain, adapt, or generate the technology required; scientific and technological programs under way, or under study; relationship between the demand of goods and services and the programs for the purchase of foreign intermediate goods and technology; the existence and experience of engineering consulting firms and other services; centres capable of giving technical advice and information; and existing governmental dispositions and regulations to promote technical development. (iii) Scientific and technical knowledge, including the search, obtention, and diffusion of information based on technological sources, solutions, and alternatives; and scientific and technological information made available to research and development specialists. The technological information system should sectorialize its activities and produce a constant flow of information to the different sectors. The services rendered by this system should be publicized in order to encourage the use of available information. The combined application and use of these policies and policy instruments should increase the autonomous decision-making capacity of the productive system in matters referring to technology.

Organizational Structure

The organizational structure necessary for the implementation of policies on technology transfer in a developing country (through the operational mechanisms) should be geared towards two types of requirements: (i) To strengthen the technological capacity within and outside the productive system - To this effect a guiding agency for technological activities should be created. According to the country's development stage, the establishment of two or more such entities should be considered, each in charge of one or more sectors of the economic activity. A national technological information and diffusion system should be established, as well as a university subsystem specialized in production techniques and training centres for personnel in the productive system. (ii) To supervise technology transfer through the different channels in use - This function may be accomplished by interinstitutional units with decision-making power (we have called them "committees" in this report), that should be integrated by representatives of various entities, with power to approve or reject possible transfers. The above mentioned procedure intends to avoid long bureaucratic transactions which often occur in institutions that nominally have full decision-making power, but depend on information to be gathered from various entities

which delays decision-making.

These two types of functions should be carried out by a set of interrelated organizations described below. The same organizations suggested in "prototype form" should be taken into account when dealing with the other problem areas.

The overall guiding agency shall be called the National Technological Institute (3). It should have economic and administrative autonomy, and should be given financial stability through a fixed budget allocation, or through the proceeds of a special law, which assures permanent financing. Its function should be to promote, coordinate, finance, orient, and carry out technological research, promoting and developing technical standardization activities and quality control. It should also provide technical assistance to the productive sector for the identification of problems referring to technology acquisition, search, and selection of technological alternatives, negotiation of technology agreements, as well as incorporation, adaptation, and improvement of technology in the productive system. The National Technological Institute should also evaluate and control research performed by the R&D units of enterprises, or industrial sectors, which the institute subsidizes or finances. It should keep a register of equipment and installations available in the national productive system, universities, and public sector, which may be assigned to research and development tasks to rationalize its use. Finally, it should maintain a register of technological research tasks carried out in the country, and promote the formation and specialization of researchers. The guiding agency for technological activity might be organized in a sectorial way, which would give rise to several divisions or autonomous subagencies (industrial, mining, metallurgical, agricultural, etc.), or it could be divided into specialized multisectorial institutions, with full autonomy, coordinated by a committee of executive directors, under the presidency of a state minister for technological development.

A National Technological Information System (4) should be established and assigned the task of compiling, classifying, and disseminating all information related to world patenting (through newsletters published by licensing offices), patents that have expired (freely available knowledge), conditions for technology transfer in the international market, sources of technology according to sectors, technological alternatives, new production techniques, innovation and improvement of existing ones, conditions prevailing in the award of external credits, and practices followed regarding foreign investment in other countries.

The Technical University should be in charge of training professionals specialized in production techniques, research, adaptation, innovation, and improvement of productive processes. It should be organized on the basis of departments or specialized faculties, and, depending on the magnitude of these units, it could be derived in the formation of specialized higher education technical institutes. It should have research and development units attached to it, which would sell their services to the productive sector. In general, all universities associated with the national system should promote applied research and the formation of research and development units.

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(3) However, it is clear that there might be more than one such agency, and that the name "National Technological Institute" is a convenient name for a variety of entities that may perform one or more of the functions listed.

(4) Again, it is clear that this might refer to one or more organizations in charge of specific functions.

The Centre of Administration of International Technical Assistance should participate in the approval of agreements involving technology transfer through technical assistance to the various sectors of the economic activity, together with representatives from the National Technological Institute, the National Planning Office, the Ministry of Foreign Affairs, and the interested sector.

The Foreign Investment Committee should register, evaluate and approve all foreign investments made in the country. It could be constituted by representatives from the Ministries of Economy and Industry, and of the interested sector; from the National Planning Office, the Central Bank, and the National Institute of Technology.

The External Credit Committee should approve all credit operations that involve the acquisition of technology, for example, loans for the installation of factories or production facilities, and for the acquisition of machinery and equipment. It could be constituted by representatives from the Ministries of Economy and Finance, and of the interested sector, from the National Planning Office, the National Institute of technology, and the Central Bank.

The Royalties Committee should approve all licensing agreements on patents, trademarks, and industrial models. It could be constituted by representatives from the Ministries of Finance and Industry, and the Licensing Bureau, the National Planning Office and the National Institute of Technology.

The Industry Committee should approve the installation and expansion of all industrial enterprises in the country. It could be constituted by representatives from the Ministries of Economy, Industry, and Finance; from the National Planning Office, and from the National Institute of Technology.

Other pertinent organizations include the Mining and Metallurgical Committee, the Agricultural Committee, and other sectorial committees, which would approve the installation of all production plants and of the agreements that involve the acquisition of technology in the respective sector. Other institutions linked to these activities are: National Planning Office, Tax Administration, National University System, Industrial Property Office, Technical Training Centres, etc.

Second Problem Area - Lack of Capacity in the Productive System for the Selection of the Most Suitable Technologies

The national productive system is not prepared to select and fully take advantage of the technology acquired abroad. In most underdeveloped countries there is no capacity to identify the problems that the acquisition of foreign technologies tries to solve, and this makes the search for the most appropriate alternative a difficult task. Moreover, the sources of technology and the different alternative technologies, which may be applied to the same problem, are not known. This limits the selection of appropriate technology, which is further aggravated by the lack of knowledge of the conditions under which the technology is acquired in the world market. Therefore, as there is neither a clear definition of the problem requiring a foreign technology, nor information regarding the sources, technological alternatives, and the conditions under which this is negotiated, there is no bargaining capacity. The lack of information and experience mentioned above leads to the acquisition of inadequate and expensive technology, hinders the incorporation of technology to the productive process (becoming just another input), and makes its absorption difficult, that is, reduces the possibility of modifying and improving the technology, and of giving it a different application from

the one for which it was intended.

Policy

It is necessary to create and develop the technological capabilities of the national productive system, particularly in enterprises and engineering firms, with a view to identifying the problems that require the acquisition of foreign technology, individualizing the appropriate technological alternatives, negotiating favourably the acquisition of the technology, and absorbing it (application, adaptation, innovation and improvement).

Policy Implementation

Instrument: The government should develop the technological capabilities of the productive system, primarily through the use of its financial and economic power.

Operational Mechanisms: (i) The government should give preference to the purchase of goods and services from enterprises using local technology and doing their own R&D work. (ii) Government agencies should award production contracts to selected enterprises as an insurance against eventual risks during the development of appropriate innovations that have been given priority in the development plans. (iii) The government should finance exports of goods made with local technology. (iv) In circumstances previously defined by the specialized authority, when certain national goods and services required for the start-up of a plant are of a higher value than that of the international market, the government should absorb the differential costs. (v) Tax exemptions should be granted to institutes, centres, universities, and enterprises for the importation of equipment and inputs for R&D (5). (vi) Special credit lines should be made available for the performance of R&D and the development of new technologies. The risk should be shared between the enterprise and the government, through loan forfeiture or differential interest rates and payback periods in case the innovation is not successful.

Instrument: All enterprises should assign a percentage of their net income (for example 2 percent (6)) or of their turnover (for example 0.5 percent) to research and development activities. This could be supervised by the National Technological Institute. Enterprises with a large turnover may be able to build up their own R&D units; smaller enterprises could contract out R&D or form research associations. The imported elements required to establish the research and development units should be exempted from customs' taxes. Enterprises that do not comply with the obligations, or that make wrong use of the funds assigned to research and development, should not have access to bank credit during a fixed period and should also be subjected to a fine equivalent to several times the total amount of funds indebted or misused.

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(5) See: Roffe, Pedro. 1972. Un marco legal para el desarrollo de la ciencia y la tecnología en América Latina, OAS/CACTAL. p. 29.

(6) See, for example the ITINTEC system described by: Sagasti, F. 1975. A Framework for the Formulation and Implementation of Industrial Technology Policy: a Case Study of ITINTEC in Peru. In Science Industry and Government for Development, ILAS, Texas University Press, 1975; and The ITINTEC System for Industrial Technology Policy. In World Development, Vol. III, 195, pp. 867-876.

Operational Mechanisms: (i) The National banking system should not award credits to enterprises that have not used properly the funds that were supposed to be allocated to research and development. (ii) The national revenue office should be in charge of collecting the fines from enterprises that have misused the funds allocated to R&D, and should make them available to the National Technology Institute. (iii) Credit lines should be established in favour of research and development institutes, units, and universities working on R&D activities. Credit granting should be based on priorities set by the National Institute of Technology. (iv) In order to back up research work the following measures should be taken: to carry a stock of the imported elements most frequently used in this type of activities (a stock of scientific material); to simplify administrative and bureaucratic transactions involved in the importation of the necessary elements for the project; to facilitate the attendance of researchers to international scientific events such as seminars, awards, "stages," and others; and to give free access to international sources of information.

Instrument: Training centres should be established for professionals, technicians, and workers of the productive sector, in order to develop human resources capable of defining problems whose solution requires the acquisition of foreign technology; of identifying possible technological alternatives and sources; of choosing the most adequate technology; of negotiating its acquisition in the most favourable terms; and of incorporating and adapting technology to the productive process.

Operational Mechanisms: (i) The enterprises can rebate from their incomes the expenditures for training their personnel. (ii) An incentive system should be established at the enterprise level for personnel generating innovations, improvements, and inventions. (iii) The exchange of experience in bargaining for technology acquisition should be fostered among the enterprises.

Instrument: Together with the application of any kind of technology transfer, the national counterpart should submit a detailed time-bound program showing the schemes for research and development, engineering design, training of human resources, and other measures towards the absorption, adaptation, and development of the imported technology. The national counterpart should have to budget sufficient money to achieve the stated objectives. This amount should be at least equal to the net value outflow, which includes dividend repatriations, and other normal technology payments made in the form of foreign flow if a barter deal is involved. The government may designate an agency to monitor the progress of the approved program, along with power to assess and inspect the technological output of the effort made (7).

Instrument: A flexible tax system should be established to grant facilities and exemptions to enterprises involved in research and development activities. The reinvestment of profits of the enterprise in activities of research and development, in accordance with plans sanctioned by a competent governmental agency, should be tax exempt.

Operational Mechanisms: (i) Before the industrial use of the inventive

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(7) This was suggested by Malhotra, A. 1975. Case Study on Changing Policy and Foreign Collaboration, Draft report for the STPI, mimeo, April.

or innovative process, a tax exemption should be granted to the enterprise during the period of investment and research. (ii) During the first years of operation of an enterprise a percentage from income tax should be rebated, determined in proportion to the value of the national technology, including that embodied in capital goods or in services that were or are used in the start-up of the productive process. (iii) A portion or all of the purchase and sales taxes should be deducted from the value of all the national goods and services, particularly technology used in the start-up of a productive process. (iv) Enterprises that export merchandise with at least 50 percent of national components can apply for tax drawbacks. The percentage of these drawbacks can be determined in accordance with the percentage of national integration of the exported merchandise. Higher drawbacks should be given to enterprises that export technology and services.

Operational mechanisms relevant to this issue and referred to in the first problem area are progressive taxation to foreign multinational firms that do not comply with the policies and the monetary and exchange controls of the relevant authorities. The observance of the above dispositions can help to improve the capacity of the productive system in defining the problems that require foreign technology, and also can assist in the search and bargaining capacity for the acquisition of technology.

Third Problem Area - Lack of Capabilities for Search, Evaluation and Absorption of Imported Technology Outside the Productive Sector

The public sector of underdeveloped countries often does not have the capacity to advise the productive system on how to search, evaluate, bargain, incorporate, and absorb technologies acquired abroad and thus supplement the productive system's own capabilities. Furthermore, in these countries, scientific and technological capacity is frequently concentrated in relatively isolated universities and research and development institutes. This means that the greatest potential capabilities for problem identification, search of alternatives, and even negotiation of technology acquisition are located in these centres, which are placed in a marginal situation with regards to the wide range of problems related to technology transfer.

Policy

It is necessary to develop an infrastructure capable of assisting the productive system in the identification, search, evaluation, acquisition, application, and improvement of the necessary technology. To this effect, the use of the existing infrastructure, which is generally not utilized, should be promoted, as well as the development of specialized engineering, design, and consulting firms.

Policy Implementation

Instrument: To promote the collaboration of the science and technology system with the productive system through contracts in the identification of problems requiring new technologies, in the search for technological alternatives (within or outside the country), and in their selection and subsequent absorption by the productive units.

Operational Mechanisms: (i) The entities of the public sector, which need new technologies for their activities, should request the assistance of the National Institute of Technology or other specialized sectorial institutes or

universities for the search of technological alternatives, the selection among them, and the acquisition of the chosen technique. (ii) The entities of the private sector should deduct from their income tax the payments to the National Institute of Technology, other specialized public institutes, or universities for their advice and assistance in the search, selection, and acquisition of technologies. (iii) The National Institute of Technology, or the sectorial institutes, and all other public organizations requesting R&D and other technical activities should sign agreements clearly stipulating the objective of the research, its scope, stages, terms, evaluation method, and form of payment. The latter can include the holding of a portion of the funds against the approval of the final results. (iv) Government agencies should delegate to enterprises, research centres, or universities, the development of a particular research project through contracts covering direct research costs, contracts covering direct research costs plus expenditures, contracts stipulating participation in costs and benefits, or contracts of technical assistance by the corresponding public organizations (8).

Instrument: To provide steady financing for the national technological system through, for example, a constitutional disposition assigning a fixed percentage of the national budget, or a legal device that allocates taxes derived from the consumption of a given product, or by assigning a percentage of the external and internal credit to technological activities. However, these funds would be channeled primarily through contract, rather than straight budget transfers.

Instrument: To foster the establishment of national consulting engineering firms through lowering income taxes derived from the activities of professionals in these firms. They could also be granted exemption on the importation of the necessary elements for their work.

Operational Mechanisms: (i) Government entities requiring the assistance of engineering or project development consulting firms should give preference to those constituted by national professionals, if and when they can fulfill the services required. (ii) The use of services provided by consulting and engineering firms should be promoted by discounting from the enterprises' income tax a certain percentage of the amount spent on these services. (iii) Special treatment should be given to foreign technicians in charge of developing technological processes of national priority in collaboration with local personnel, consulting and engineering firms (immigration facilities, credits for making effective their contracts, customs exemption on the import of their personal effects) (9).

Instrument: To encourage applied research and the constitution of R&D units within the university system. To this effect, special lines of credit should be granted and international technical assistance should be oriented towards the development of human resources and the acquisition of the necessary equipment.

Operational Mechanisms: (i) Feasibility studies and production processes, usually requested from abroad, should be oriented towards (or given in parallel with) national R&D institutes, especially universities, with a view to building

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(8) See: P. Roffe, Op. cit., p. 34.

(9) P. Roffe, Op. cit., p. 31.

a national technological capability and to developing a human resource base capable of evaluating the studies requested abroad. (ii) Measures to promote the profession of researcher should be established, including a special salary system, housing facilities, social recognition, and other incentives, to encourage scientists and engineers to pursue this profession. (iii) The use of services provided by R&D centres should be promoted by discounting from the enterprises' income tax a certain percentage of the amount spent on these services. Government purchasing power should be used to encourage the development of national technology, through a priority given to the goods and services that incorporate national technology inputs, and through the direct purchase of technical services.

Instrument: To establish tax deductions on donations, inheritances, and legacies for the promotion of R&D activities. Operational mechanisms relevant to this problem area include progressive taxation, monetary and exchange controls, tax exemptions, and the facilities given to the performance of research work such as the availability of a stock of research material, simplification of import transactions for the latter, and participation in foreign scientific events, seminars, etc. The application of these mechanisms should improve the capacity of the public sector to advise the productive system on the search, evaluation, acquisition, incorporation, and absorption of technologies.

Instrument: The government should promote the acquisition of the most useful technologies and of those that have priority for socioeconomic development.

Operational Mechanisms: (i) The government should take action to identify the area where foreign technology is most frequently required; should designate engineering design and consultancy firms and research and development units to explore foreign sources for the desired technology; and should negotiate its import for multiple internal utilization. These units should also study the best way of absorbing such technology (10). (ii) In order to search for and evaluate foreign technology, all applications for further import of technology should be submitted at least one year prior to the date of expiration of the agreement (11). (iii) The government should acquire expensive or sophisticated technologies through licensing agreements or other channels for strategic sectors of the economy and sublicense them to the enterprises that agree to produce goods and services under determined conditions of prices and absorption of the technology.

Fourth Problem Area - Purchase of Unsuitable Technologies

Technologies not suited to the socioeconomic reality of underdeveloped countries are acquired. They may be inappropriate because: they correspond to production scales larger than necessary; they are capital intensive when capital is scarce and labour is cheap; they involve special equipment when it may not be required (e.g., pollution-control devices); or conversely, they do not contemplate these when they are required (e.g., adapting the process to local inputs). Technologies oriented towards satisfying the consumption needs of the

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(10) Malhotra, A. 1975. Case Study on Changing Policy on Foreign Collaboration, Draft for STPI Project, April.

(11) Malhotra, A. Op. cit.

higher income classes are acquired, instead of those necessary for the country's development. For example, it is common in underdeveloped countries to see the acquisition of technologies for the manufacture of luxury automobiles, colour television sets, sophisticated electrical appliances, expensive cosmetics, and even dog food, instead of acquiring technologies such as the mass construction of low-cost housing, the extraction of proteins from vegetal elements, the deodorization and preservation of sea products, the inexpensive production of enriched milk, and even, in some cases, the rational exploitation of natural resources. In many cases unnecessary technologies are acquired, or at least technologies that could be dispensed with, impairing the acquisition of those vital for the development of the country.

Policy

To promote the acquisition of technology based on definite priorities of the national development plan, or at least, oriented to the satisfaction of the most urgent socioeconomic needs in the community, if a development plan has not been formulated. This must take into account the natural conditions and socioeconomic context of the country.

Policy Implementation

Instrument: Agreements for the acquisition of technology should be approved by a specialized agency. Preference is given to technologies that contribute to the fulfillment of the scopes of the national development plan, that fulfill social requirements such as food, health, and housing, and that facilitate the reasonable exploitation of national natural resources.

Operational Mechanisms: (i) Agreements involving the acquisition of technology should be allowed a reasonable time for approval, after reception by the specialized national agency, so that consultation can be made with other institutions, both private or public, to examine the suitability of the technology to be imported. Contracts that have not been approved by the specialized national agency should have no legal value, and therefore public institutions and the credit system should reject any application of procedure requested as a result of the implied contract, either directly or indirectly. (ii) It should be mandatory for the national purchaser of technology to submit to the Registry annual statements sanctioned by the Central or Reserve Bank regarding all the direct and indirect foreign exchange payments made towards imported technology.

Instrument: Prohibiting, or taxing heavily, the acquisition of foreign technologies for the production of luxury goods and services not corresponding to national priorities.

Operational Mechanisms: (i) The specialized agency (registry of transfer) should reject contracts for the production of luxury goods. (ii) The national credit system should not give loans for the operation of contracts for technology transfer oriented towards the production of sumptuary goods and services.

Instrument: Priority should be given to the acquisition of technologies that make use of national raw materials and energy resources, with a production scale in accordance with national needs and realistic export potential, requiring the intensive use of labour when this is abundant, and that properly consider the existing local problems.

Operational Mechanisms: The national credit system gives preference to the operation of a contract on transfer of technology that contributes to the fulfillment of the national development plan, that is oriented towards social requirements, and that promotes the exploitation of national natural resources.

Instrument: Grants and fiscal incentives should be established to promote development of industries necessary for social, economic, and technical reasons. The level of the incentive must be determined by the national competent authority, according to the following criteria: importance of the industry for national development; percentage of imported inputs; and plans for absorption and substitution of foreign technology and imported inputs. Operational mechanisms relevant to this problem area include prohibition of credits granted to foreign firms that do not comply with the progressive nationalization policies and other monetary exchange controls. The application of these instruments should lead to the acquisition of technologies that are in accordance with the goals set by the national development plan to satisfy the most important socioeconomic needs.

Fifth Problem Area - Costly and Ineffective Technology Transfer

The conditions under which technology is bought are generally inadequate, expensive, of limited use, and generally imposed by the supplier. Frequently, the sale of technology is conditional to the acquisition of other elements necessary for the operation of the productive process. An extreme case is the selling of turnkey plants, where neither the utilization of peripheral technologies developed in the country, nor the contracting or subcontracting with national enterprises for some of the goods and services required for the new production process, are allowed (12). Technology, whatever its form of acquisition - licensing agreement, purchase of machinery and equipment, credits or foreign investment - is of generally limited benefit because of the so-called "restrictive practices." It should be remembered that some of these preclude the use of licensed knowledge once the license expires, and others lead to a loss of the decision-making capacity regarding the commercialization of goods and services produced with the technology acquired abroad (i.e., export prohibition, limitation of production levels, intervention of the licensor in pricing, etc.).

Policy

The acquisition of foreign technology should be authorized only when it is not available in the country; when it is appropriate to the requirements of the productive process; when it is negotiated in reasonable competitive terms (according to international standards); when its sale and use is not subject to restrictive business practices; when it complies with the socioeconomic needs of the country; and when it is not acquired exclusively in packaged form.

Policy Implementation

(i) The acquisition of the following technologies should be prohibited: technologies that are freely available to the public or available in the country; technologies that do not satisfy the needs of the productive process for

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(12) In special cases, it may be impossible to acquire technologies without a turnkey agreement; however, in such cases appropriate measures should be taken to absorb the technology while the plant is being set up and operated.

which they were acquired; technologies that are not sold under reasonable international competitive terms; technologies whose sale is subjected to the purchase of other goods and services under conditions more unfavourable than those prevailing in the international market for elements of similar quality; technologies whose application proves detrimental to the environmental balance of the recipient country; technologies involving packaged agreements (i.e., simultaneously the acquisition of the production process, capital goods, intermediate goods, technical and administrative consultancy studies, modular and peripheral engineering, infrastructure for civil works, and others in a single deal). However, note that technologies which due to their great complexity require the concurrency of factors that can only be provided by specific suppliers should be exempt from the above. (ii) In contracts for the transfer of technology, it should be agreed that if the seller gives better conditions to another purchaser of the same technology in the future, the same conditions should automatically apply to former contracts. (iii) The following types of contracts should be forbidden: contracts that delay the acquisition of similar technologies, intermediate goods, raw materials, etc., from other suppliers; contracts that directly or indirectly allow the supplier to interfere with administrative decisions by the purchaser of technology; contracts that prohibit the exportation of goods and services against the interest of the country; contracts that limit the volume of production or impose prices for national or international production; contracts on licenses and patents, which are longer than the foreseeable obsolescence period of the technology being acquired; contracts that state or de facto imply the submission to foreign courts of the settlement of lawsuits that may originate from the interpretation of contracts (which should be ruled by the national law); contracts that state or de facto imply the acquisition of technologies in which the licensee must sell to the technology supplier, or to purchasers designated by him, articles produced as a result of the technology transferred at a price lower than that prevailing in the international market; contracts that, from the analysis of explicit and implicit costs, result in a price higher than the benefits derived from the acquired technology; contracts containing clauses whose effects are similar to those produced by restrictive clauses; contracts that refer to the acquisition of technologies corresponding to a technical level that could be achieved in the country should be limited; and contracts containing clauses that directly or indirectly delay the development of national technical capabilities.

Operational Mechanisms: As mentioned before, legal devices of an inhibitory nature do not require specific operational mechanisms for their implementation, since it is automatically ensured by the explicit or implicit sanctions contained in each legal device. Consequently, the competent national organism should apply the sanctions to contracts that transgress the mandatory prohibitions described above. In cases where transfer of technology agreements have not been approved by the competent institutions, these should be considered as having no legal value and consequently should be rejected by the administrative, banking, and customs systems. Operational mechanisms relevant to this problem area include the control of the credit system, the regional, subregional or bilateral facilities, the monetary and exchange controls, and the granting of a reasonable period of time for contract execution by the administrative system. Policies and policy instruments such as those described above can help to diminish the acquisition of technologies that are inadequate, expensive, of limited use, or sold under restrictive practices.

Remarks on the Administrative Requirements for Policy Implementation

The policies and policy instruments outlined would require a model for their application and institutional structure, that would be more or less complex according to the countries' level of economic development, since this determines the complexity of the policies needed. Again, the impossibility of designing a general model for technology transfer policies and policy instruments, applicable to all countries at all times, should be noted. This, in turn, draws attention to the different levels of administrative capabilities required to operate different sets of policy instruments. We are fully conscious of this problem, particularly because some of the policies and policy instruments mentioned here are well beyond the implementation capability of some underdeveloped countries at present. It is not sufficient to design adequate policies, for if they do not correspond to the level of professional and administrative capabilities available in the country, they will lead to collective frustration and may even jeopardize future efforts to deal with the problems for which the policies were oriented.

For example, a country that engages primarily in the exploitation of basic resources and that has a rather weak public administration system, may not need, nor could apply, a policy instrument such as: "Legal measures should be taken to establish that foreign enterprises and joint ventures will transfer a percentage of their shares within a specific period of time so that commercial, administrative, and technical management of the firm would be put into the hands of national investors. (For instance, a target of 85 percent of shares belonging to national investors in 10 years should be established.) Enterprises not complying with the above should not be able to benefit from incentives such as favourable terms for bank credits and tariff rebates granted for exports according to regional or subregional integration agreements, and should also be subjected to increased progressive taxes on profits." This policy instrument would require that local industry be sufficiently advanced, that foreign investment play some role in it, that managerial and technological capabilities be well developed, and also that the banking and foreign trade systems have the necessary experience and manpower to apply the instrument and to determine when sanctions are appropriate.

However, a country with a weak administrative system could certainly apply some non-discretionary instruments that do not impose serious administrative requirements. An example would be: "Licensing agreements that prohibit the exportation of goods and services against the interests of the country should be forbidden." These countries may also find it appropriate to employ instruments that demand increased administrative capabilities, but do not involve complex technical and economic judgements. An example would be: "To encourage applied research and the constitution of R&D units within the university system. To this effect, special lines of credit should be granted and international technical assistance should be oriented towards the development of human resources and the acquisition of the necessary physical plant."

On the other hand, countries at a relatively more advanced stage of development, with a stronger scientific and technological system, and with a more sophisticated public administration, may apply instruments of greater complexity such as: "The reinvestment of profits of the enterprise in activities of research and development, in accordance with plans sanctioned by a competent government agency, should be tax exempt." "Grants and fiscal incentives should be established to promote development of industries necessary for social, economic, and technical reasons. The level of the incentive must be determined by

the national competent authority, according to the following criteria: importance of the industry for national development; percentage of imported inputs; plans for absorption and substitution of foreign technology and imported inputs."

In the first case, it is necessary to have the capacity for evaluating the research and development activities that will be made with the profits reinvested. In the second case, it is necessary to have a complex administrative structure that can evaluate the impact of new industries in the development of the country, as well as the importance of the disaggregation of technology and other elements necessary for a more effective productive process. All this implies the participation of a large interdisciplinary team of engineers, technicians, economists, and other highly qualified professionals. Therefore, in the design and implementation of policies and policy instruments, it is essential to pay attention to the administrative demands imposed on public administration, for they may be out of place with the actual capabilities of government in a particular underdeveloped country. Otherwise, the complex network of regulatory mechanisms for technology transfer may become a factor inhibiting industrial development (13).

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(13) For a sober analysis of the relation between development policies and administrative capabilities see: Myrdal, G. 1968. The Asian Drama, Twentieth Century Fund, New York.

CHAPTER 7

REGULATION AND CONTROL OF TECHNOLOGY IMPORTS IN ARGENTINA

A PRELIMINARY ASSESSMENT

Francisco Colman Sercovich

> "The last thing an executive should do is to draw inferences from say, the fact that Mexico has a transfer of technology law that is similar to the rules created by the Andean Common Market." (1)

Regulation and control devices for foreign technology imports have been operating for several years in various developing countries in Latin America and elsewhere. Most of the literature on the subject has been diagnostic and, therefore, it is time to assess these devices in a methodical way, to enable a problem-solving approach for decision-making at the national policy level.

This chapter aims to give some hypotheses on the operation of the law that regulates the inflow of foreign technology in Argentina and to show the expected results of the law. A preliminary approach to the subject and a few suggestions for further research are presented. There is a discrepancy between intended policy and actual policy - between the letter of the law and the way it operates. It is to this kind of contrast that the opening quotation refers.

The Emergence of the Law: Political and Economic Background

The role played by interest and pressure groups in the formulation and enforcing of laws aimed at or bound to affect the existing balance of power in a capitalist society cannot be overestimated.

The emergence of legislation for foreign technology trade in Argentina at the beginning of the present decade gave rise to sharp debate (2). The origin of this legislation can be traced back to the decree 46/70, when the military Junta ruling at the time set up its basic policy guidelines. In National

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(1) Business Latin America, 2.2.74.

(2) Actually, there have been some previous attempts to control licensing operations but none of them comprehensive or actually put into practice (see, for example, laws 16462 and 16463 and their bylaws). Licensing contracts registered at the ex-Ministry of Public Health according to stipulations of decree 3042/64 have been rarely scrutinized.

Policies number 116 and 152 (3), the Junta gave partial official recognition to the fact that there was something wrong about technology transfers from the point of view of the national interest. It explicitly mentioned export restrictions, which were not to be allowed in the future, "save exceptions for reasons of national interest." Little more was added there on the subject. However, one year later (1971), the debate started again. The CGE (Confederación General Económica), taking advantage of the precedent set by the Junta and of steps taken elsewhere, introduced a project law on technology transfers, which soon brought about a hard attack by the UIA (Unión Industrial Argentina). While the CGE represented the small and medium-sized enterprises, the UIA represented the large and mostly foreign-owned enterprises. Both organizations have recently merged into a single and conflict-prone entity - the CINA.

It is worth quoting a passage from the introductory message of the CGE project: "This type of creative activity (basic and applied research) is still incipient in Argentina. This makes necessary an intense promotional action by the State. But, quite apart from the measures to be adopted in this respect by various government areas, it is necessary to recall that certain clauses to be found in most licensing contracts discourage domestic industry's efforts geared to its own technical progress. This aspect may lead to the stagnation of national technology, or at least, to an unnecessary dependence from foreign licensors."

Though the UIA did not oppose, in principle, the creation of an office in order to collect information on what is purchased or licensed and at what cost, it did not want the government to advance further. The parties to the agreements should have been given the green light to convene on whatever they judged commercially advantageous. Their philosophy was: "The signals of the market should be considered a better indicator of economic (private and social) optimality than discretionary bureaucratic decision-making." This is as true for the technology market as it is for any other market.

With this polarization of opinion, it was most difficult to disentangle technical and economic reasoning from that of ideological or political. It was clear, however, why the small and middle-sized entrepreneurs were most interested in enacting a State regulation and control of the inflow of foreign technology, particularly those connected with large foreign corporations. Their entrepreneurial development was closely linked to the growth of the domestic market, and it required as large a proportion of the economic surplus as possible to be reinvested within the country. Their only chance to improve their bargaining standing vis-à-vis their foreign technology suppliers was by strong government backing.

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(3) National Policies No. 116 and 152 read as follows: 116 - "To assure that technology-acquisition contracts shall not include export-restriction clauses and that those under way shall not be renewed with those clauses. In both cases, exceptions will be considered in the national interest." 152 - "To favour financial and scientific-technical assistance programmes from abroad, needed for national development provided that: (a) clauses affecting the national interest shall not exist; (b) wide participation will be given to national enterprises and entities concerning advice, inspection, execution of works and procurement." Undoubtedly, current efforts realized by other Latin American countries (particularly those of the Andean Pact) at the time have also exerted a strong influence in Argentina.

Clearly, local entrepreneurs had little to lose in changing the status-quo. First, the law per se was not intended to challenge the fundamental nature of their links, that is, their close dependence on foreign technology inputs. They were free to choose whether to undertake local research. In the large majority of cases they chose not to undertake such local research, basically because of the prevailing pattern of industrial organization (4), and the inconsistent scientific, technological, and industrial policies. Secondly, they would obtain short-term benefits by reducing their technology import costs and would gain more freedom in decision-making by relaxing their formerly stringent contractual ties with foreign technology suppliers. There would also be a few calculated risks such as less freedom to disguise capital exports, or to withhold information from government scrutiny. But, in the balance, they would gain with the change.

It was a different situation for technology suppliers and foreign investors. Licensing agreements would not have the same importance for foreign-market penetration (5). It would also have reduced the role played so far by these agreements as an easy device for export expansion (particularly for locally-integrated industries such as the pharmaceuticals) (6). Lastly, their

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(4) See: Sercovich, F.C. 1975. Tecnología y control extranjeros en la en la industria argentina, Siglo XXI, Buenos Aires - Mexico. 1974. Dependencia tecnológica en la industria argentina, Desarrollo económico-revista de ciencias sociales, No. 53, Vol. 14, abril-junio.

(5) It can be noted that, when between the early 50s and late 60s, various Third World country governments started introducing legislation aimed at controlling foreign investment, suggestions and proposals from different quarters began to be made advising the convenience of undertaking licensing agreements, management contracts, and joint-ventures as a way to substitute contractual control for ownership control abroad (see, for instance: Gabriel, P.P. 1967. The International Transfer of Corporate Skills, Harvard University, Boston; and Friedmann, W. and Kalmanoff, G. (Eds.) 1961. Joint International Business Ventures, Columbia University Press, New York and London). The former did not draw much attention from recipient governments at that time. However, in the present decade, the introduction of government regulations on licensing operations, etc., that is, on contractual control over national frontiers, seems to have reversed the situation and there are reasons now to think that the need for ownership control has started to be emphasized again, bringing about a sort of pendulous movement according to circumstances and opportunities.

(6) In fact, we can expect that the application of the statute has induced differential effects according to type of industry, age of licensing links, and ownership patterns.

gains through licensing agreements would have suffered as well (7).

In its final version, the original law (No. 19231) (8), though being nearer the CGE's philosophy in spirit, turns out to follow more closely the UIA's views in practice.

The Operation of the Law

Unfortunately, we are still lacking an overall assessment on how the enforcement of the transfer of technology law in Argentina has affected the firms' decision-making as both supplier and recipient, for ownership, profit repatriation, marketing, R&D, and related policies. This should be considered within the context of the whole package of the State's legal instruments regarding foreign investment and licensing, trade, and innovation. Also, great care is advisable in isolating changes stemming from government policies from those arising from exogenous factors (9).

It appears that there has been little change in the overall results stemming from the enforcement of the Transfer of Technology Law, and other related measures aimed at promoting import-substitution of technology. This seems to be particularly true for domestic innovation and reliance on foreign technology inputs. As was expected, tax incentives to local R&D appear to have

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(7) Actually, foreign lobbies exerted influence in order to stop, or at least interfere with, the process by which the law was ultimately enforced. But they failed. Our hypothesis as regards this failure is that it was the general decline in liberal ideology and policies that set the mechanism into motion; and once it occurred, it became difficult for foreign pressure and interest groups and their domestic adjacents to stop it. Furthermore, they seem to have realized the need to come to terms with these regulations. For instance, Business Latin America advises: "Companies should start now preparing strategies for dealing with these new technology demands. Where possible, it would be wise to eliminate payment discrepancies between countries or be ready to explain fully the unquantifiable factors behind the differences in charges. Local R&D may be more difficult for individual companies, but could be approached on a pooled or funded basis" (BLA. 1.1.75). This advice points to the built-in handicap in negotiating with a purely national horizon vis-à-vis companies that are capable of dealing on a intercountry basis.

(8) Things changed after its successor (Law No. 20794) was passed in October 1974. Henceforth, we shall deal only with this one, which is considered one of the strictest and most comprehensive laws in the world. This is examined with caution because of the way it is actually enforced (see Appendix).

(9) One case in point is that of Koppers' divestment in Argentina. It could be that Koppers chose to sell its majority position in Ipako to local interests because of the lack of incentives for foreign-majority-held firms for access to domestic credit and stock-market operations, but it could also be due to the shift of Koppers' worldwide operations away from production of polyethylene and polystyrene (which are produced by Ipako).

had no effect (10). A similar fate seems to affect the application of social criteria for the choice of imported technologies (11). Nevertheless, costs have been reduced to some extent in various cases, and export restrictions have diminished (12).

Some Special Issues

(1) It is well known that supplier-customer relationships exert a strong influence on the choice of technologies and, hence, on the selection of technology suppliers. Such is the case particularly in assembly industries. In these industries, large assembly enterprises (frequently foreign-controlled) are often able to impose the specifications, tools, and designs to be used by their local part-suppliers in order to be admitted as "eligible." In a good many cases, these foreign firms, which are capable of furnishing the local part-suppliers with the necessary technology inputs required to meet their customers' requirements, are also the part-suppliers of the latter's parent firms. These requirements for customer firms reinforce the technology suppliers' bargaining power. There is then a case of rigidity in the choice of technologies, clearly due to parent-subsidiary and supplier-customer links, which may be disadvantageous from the point of view of the recipient economy (13).

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(10) The main outcome of this scheme seems to have been to provide an easy way for tax evasion. Once more, this outcome should be ascribed to the way the scheme was enforced rather than to the scheme itself, i.e., the lack of any clearly set order of priorities for the projects, the lack of evaluation criteria, and the lack of technical and administrative capacity to control the actual execution of the projects.

(11) Whilst the Transfer of Technology Law states: "the authority of application shall not approve the legal acts ruled by this law when: (a) the technology to be purchased should result contrary to the objectives of national policies or plans concerning technology and development, or it should draw negative effects on consumption or income redistribution, or it should be judged not to contribute to technical, economic and social progress." The government is taking definite steps to introduce a colour-TV system, but government areas dealing with science and technology policies have not yet been asked to pass their judgement on this issue. At the same time, colour-TV techniques are already an obligatory subject in many intermediate technical schools. The whole thing appears to be a costly "prestige operation" linked to Argentina's status as a host for the 1978 soccer world cup. The matter has given way to a parliamentary investigation.

(12) The most dramatic case is that of Ford's and Fiat's exports to Cuba, although this has had little to do with the application of the Transfer of Technology Law. It was the result of a firm political decision coupled with a very shrewd handling of the problem (recall U.S. State Department's opposition, ultimately bended) under favourable international conditions. All this has changed now to a large extent, and it seems quite likely that the whole thing will be left to cool down.

(13) For further development of this point, see: Tecnología y control extranjeros en la industria argentina, particularly chapters 4 and 5.

Some important State-owned-and-controlled enterprises (because of deeply rooted habits, or otherwise) appear to behave in a similar fashion, raising therefore the same type of problems. Normally, State enterprises call a tender for large projects. It specifies a set of economic, technical, and legal requirements to be met by the bidders. Thus, there is an implicit pre-selection of potential technology suppliers, stemming from the preferences set by the State enterprises for those requirements. The problem arises when this procedure favours certain foreign technology suppliers who are thus able to exert a strong pressure for the terms of their license agreements. These terms may conflict with the stipulations of the Transfer of Technology Law (14).

There is the case of a large State enterprise in a Latin American country that called a tender for the supply of capital goods for a vast program aimed at replacing and increasing the existing transportation capacity. This tender stated the requirement of a particular trademark that was owned and controlled worldwide by an American firm. Consequently, notwithstanding preferences granted to local firms vis-à-vis firms from abroad, the only supplier strictly qualified to win the tender was the American firm. In fact, there was also another bidder: the only local producer of the needed line of capital goods, under license by the U.S. firm (this local enterprise is, in turn, a wholly-owned subsidiary of a European corporation). It appears that, for the U.S. firm, it would have been as profitable to bid through the local licensee as to bid in its own name, since in this last case the import-substitution incentive would have been ruled out. The wholly foreign-owned licensee naturally won the tender. The licensing contract was applied for registration, and the technology authority found that not only had the American firm taken undue advantage from its privileged bargaining standing (over and above that which is allowed by the Transfer of Technology Law (15), but that there was no genuine transfer of technology - only the right to use the trademark, since the local firm was capable of supplying the capital goods using its own technical capacity with little, or no, foreign collaboration. Despite this, the technology authority was itself placed before a fait accompli. The tender was already won. The State enterprise did not want to delay the operation any longer. The supplier was already in a position to start production. The authority's refusal to grant legal recognition to the contract would have been viewed - in the most favourable of cases - as a purely bureaucratic obstruction to the realization of the program. Negotiations are still under way.

(2) There is another case of a State enterprise that applied for approval of a contract with an American engineering firm that was to supply process technology, engineering services, training, and supervision for construction and start-up of an important project aimed at substituting imports in the petrochemical industry. The technology authority pointed out a series of

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(14) This type of bias sometimes takes the form of a vicious circle. For instance, preferences are given to local engineering firms provided that they have reasonable previous experience. As they rarely fulfill this condition, they are more often than not disqualified; and because they are disqualified, they cannot build the necessary experience. As a result, foreign-controlled engineering firms obtain the contracts.

(15) The U.S. firm was not prepared, for instance, to reduce the duration of the agreement from 10 to 5 years, in order to reduce the licensee's partial freedom to compete in world markets, and it refused to lower the royalty rate to the 5 percent authorized by the law as a maximum maximorum.

modifications necessary for the contract to be duly registered. The parties to the agreement satisfied most of these observations, but the licensor was not prepared to introduce any changes in a clause relating to the recipient's right to increase capacity unless a new contract was undertaken. This was taken as violating the law on two points: (i) the prohibition for the licensor to regulate licensee's production; and (ii) licensee's right to make free use of the licensed technology at the expiration of the contract, provided that the technology is not protected by industrial property rights. Once again, the project was already well under way and it was considered a first priority because of its forward and backward linkages, and because of the important foreign exchange savings to be gained. The authority could not afford to be rigid in the application of the law. The contract was granted approval.

This case highlights a lack of consistency in the law, in that the word "acquisition" of foreign technology is used, when, in fact local firms do not acquire foreign technology; they are only granted the right to exploit it - licensors' proprietary rights are not transferred. This makes it difficult to enforce article 7 of the Law, by which the licensee should have the right to make free use of the licensed technology provided that it is not protected by industrial property rights. In fact, the law does not prohibit clauses violating this article. They are just considered "nonexistent." Therefore, particularly in process industries where they are more crucial, they remain in the contracts. Since local firms (including those State-owned) are not too keen to take advantage of the law in this respect, the situation is quite acceptable for technology suppliers.

(3) One of the most controversial (and rather technical) points about the Argentinian Transfer of Technology Law is the one concerning the tax treatment to be given to royalty and fee payments abroad. According to the law (art. 5 h.) when there is a tax-credit system in the country of the licensor, the license agreement must set royalty and fee payments on a gross basis. It is the licensor who must afford the Argentinian income tax. The rationale behind this provision seems quite straightforward: the income tax should accrue to the country that is the source of the income. This is a generally accepted principle of international taxation, and seems fair enough.

Obviously, if there were no tax-credit system in the licensor's country of origin, such an obligation would lead to double taxation. This situation would most likely lead, in turn, to higher prices, since the licensor would try to pass the burden on to the licensee. Capital exporting countries usually implement tax-credit systems (thus recognizing the principle of taxation at the source) in order to avoid double taxation on residents with foreign sources of income. The key to these systems is the income-tax differential. If the tax rate is lower abroad than at home, the firm will levy nothing at home. For technology recipient countries, the first is usually the case (that is, their income tax rate is lower than in technology exporting countries, which from a purely fiscal standpoint does not look very wise, although it may be taken as favourably affecting foreign corporations' decision to invest). Hence, for the technology supplier from an advanced industrial country with a tax-credit scheme, it would not matter where the income tax was levied provided that the tax rate was lower abroad than at home and that he could get the after-tax income originally planned.

If the recipient country's policy is oriented to the maximization of income-tax earnings, the following should be done: (a) raise the income rate so as to equalize it with that prevailing in the technology source countries; and (b) tax the licensor (rather than the licensee) so as to obtain the highest

possible taxable income. The first would not pose any problem, but (b) would lead to higher technology import costs, since the licensor would raise the price (royalties and fees) correspondingly, in order to obtain the after-tax income originally planned for the operation. In this way, the recipient country must choose whether to have higher tax earnings with higher technology import costs or lower tax earnings with lower technology import costs. One way to circumvent this difficulty would be to tax royalty and fee remissions abroad only (allowing licensees to afford the income tax). But this may not be practical since the Transfer of Technology Law impedes the capitalization of royalties (as an alternative) in the recipient country. The matter is open to further research.

(4) Export restrictions are usually ruled out by transfer of technology statutes. The question is to what extent are these prohibitions actually effective for promoting exports by firms producing under license, particularly when licensors are not prepared to allow them to do it (over and above what is ruled by the law), even though recipient firms may be capable of engaging in export trade. One example of this difficulty is the case where the licensor grants exclusive rights for commercialization to each licensee within their respective countries. This per se does not appear to violate the Transfer of Technology Law. However, the licensee of one country is, as a result, inhibited to compete in those countries where other licensees of the same technology supplier have been granted exclusive rights. This is equivalent to an export restriction clause. There is little an isolated country can do about it.

Conclusions

Cases (1) and (2) allow for a few interesting conclusions. In the first place, when the projects are very large (and particularly when they are State-sponsored and considered critical for the import substitution strategy), the technology authority usually comes on stage too late in the process, when negotiations and the execution of the projects are already well under way. This situation should be changed by granting the technology authority an active role from the very start.

Secondly, enterprises do not consider themselves responsible for scientific and technical policies. They normally plan their investment projects and business activities without bothering too much about the development of national scientific and technological capabilities. They are, in fact, good customers for turnkey plant suppliers, since this option simplifies things for State enterprise managers, who are not prepared to run the risks involved in disaggregating technology packages or taking an innovative approach in their management of technological matters.

Thirdly, the technology authority behaves quite often as one more negotiator rather than as an agency in charge of drawing the contracts strictly into line within the stipulations of the law. The authority negotiates in order for the contracts to be as advantageous as possible for the national interest.

It should be recalled here that the Argentinian Transfer of Technology Law allows for two types of situations: (i) those contracts that cannot be given local recognition, and (ii) those that may not be given recognition by the technology authority. This allows for a certain degree of flexibility and discretionary power, which will be used to different extents according to circumstances (16).

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(16) Those clauses which may not be accepted concern mainly restrictions on procurement and marketing. For further details on this see Appendix.

Case (3) points out an actual conflict between fiscal objectives and balance of payments, which has not yet been solved.

Finally, case (4) shows a situation where the only solution is to obtain international agreement amongst recipient countries in order to make their respective policies compatible and to avoid one policy being levered against another.

APPENDIX

Although the available empirical basis for technological authority judgements is too scarce to allow significant statistical inferences to be drawn, some figures, as a first quantitative approximation, are provided.

A first indicator refers to the relative number of contracts that have not been admitted for registration owing to their not being suited to the law in a satisfactory manner. The Mexican experience is used as a term of reference, rather than as an exhaustive comparative analysis. According to information from the Mexican Registry of Technology, between February 1973 and December 1974, judgements were passed on 1552 contracts, out of which 430 (28 percent) were not admitted for registration in the first instance. During the period May 1974 to May 1975, out of over 574 contracts scrutinized by the Argentinian technology authority (Secretary of State for Industrial Development), registration was denied to 23 (4 percent) (17).

Table 1

Contracts	Argentina	Mexico
Approval granted	551 (.96)	1,122 (.72)
Approval refused	23 (.04)	430 (.28)
	574 (100)	1,552 (100)

In order to consider this substantial difference, at least three terms of reference should be taken into account: (i) how strict is the law; (ii) how rigorous is its enforcement; and (iii) how flexible is the actors' response.

As far as the law per se is concerned, the Argentinian Law appears to be considerably stricter and more comprehensive than the Mexican

(17) Some important caveats for this comparison should be taken into account. First, the Mexican authority considered some contracts in a second instance, and so the number of contracts granted approval actually increased. Secondly, most of those contracts that have been granted approval by the Argentinian technology authority have been so on a provisional character, that is, the judgements are in those cases subject to revision and so is, a fortiori, our own analysis.

one (18). If we set apart for a moment the third parameter, it would follow that the enforcement of the law has been much more rigorous in Mexico than in Argentina. However, this cannot be considered an entirely conclusive corollary because we are not able to weigh the relative economic importance of the contracts (refused or approved) in Argentina and Mexico, respectively, either in terms of volume of licensed sales or payments committed. This should not be difficult. It should not be so easy to assess the role played by the third parameter, i.e., the actors' flexibility of response. For example, it may be that, in Mexico, technology suppliers count on means other than licensing through which to satisfy their objectives in an easier or simpler way than in Argentina. Hence, they would not be prepared to meet the technology authority's demands as readily in the first as in the second country. Although the comparison seems suggestive, further research is required on this issue (19). Nevertheless, it seems clear that the rigour with which the law has been enforced in Argentina, keeping as a datum the actors' flexibility of response, has been considerably lower than could have been expected starting from the very letter of the law.

Let us examine now the previous information in more detail. Of the 551 contracts with registration approved in Argentina, 491 were in provisional prorogation until December 1974 and 60 were newly inscribed. Of the 491, only one exception was found; that is, approval was granted despite the fact that the contract did not strictly fit within the law, since it included a tie-in clause concerning a raw material not produced in the country, and was justified for technical reasons. The assessment of these reasons was left up to the time of the definite approval of the contract.

Table 2 shows the 60 newly inscribed contracts as follows:

Table 2

	Contracts	
Without judgement by the Advisory Commission	2	.03
With observations	10	.17
Plainly approved	40	.80
	60	100

Exceptions involve 12 cases, that is, 20 percent of the cases. Amongst them two were due to lack of previous judgement of the Advisory Commission. They

(18) The Mexican law is taxative. The Argentinian is not. The Mexican law allows for exceptions for 8 out of 14 causals it taxatively enumerates as originating refusal for registration. The Argentinian law does not deal with exceptions (though, as noted above, it confers to a certain extent discretionary power to the technological authority). The Mexican law appoints the National Council for Science and Technology as the only (apparently not binding) consultation office. The Argentinian law appoints a specific Advisory Commission integrated by representatives of five top government offices. The Argentinian law demands a "most favoured" treatment. The Mexican law does not.

(19) Another point to be taken into account is that of informal negotiations between the parties to the contract and the technological authority previous to the formal submission of the contracts. This may sensibly reduce the rate of rejections.

were founded in "reasons of exceptional urgency and public interest alleged" which enabled the authority to act without the Advisory Commission's judgement in order not to interrupt the continuity in the activity of Public Administration's offices. (Both cases concern State enterprises).

The remainder concerned contracts that were approved in spite of including clauses that did not suit the Law. Amongst them, five belonged to State enterprises. Two contracts involving one of these enterprises included clauses of extraterritoriality and net payments (i.e., the Argentinian income tax was afforded by the technology recipient). Such clauses transgress apps. (k) and (h), respectively, of art. 5 of the Law. The first clause, besides excluding the intervention of local tribunals, transgresses the Procuración del Tesoro de la Nacion's doctrine, according to which such clauses, subscribed by State entities, would damage the Argentinian Judicial Power and deteriorate the Nation's image abroad. Now, the solution adopted in these cases was as follows: the clauses were considered as "accessory" and thus separable from the rest of the contracts. They would not affect their essence and therefore they can be remitted to the criterion taken by art. 16, Decree-Law 19549/72, which expresses: "The invalidity of an accidental or accessory clause on an administrative act will not involve the nullity of the latter, provided that the former will be separable and will not affect the essence of the core act."

The Transfer of Technology Law allows for three kinds of clauses: (i) those whose inclusion may cause the rejection of the contract; (ii) those whose inclusion cannot permit the approval of the contract comprising them; and (iii) those that will be judged invalid, without this involving the invalidity of the contracts comprising them. Now, clauses concerning extraterritoriality, as well as those stipulating tax-free royalty payments, belong, according to the law, to the second category (i.e., those which cannot be granted approval). The question then is to what extent can they be judged accessory clauses. We cannot answer this legal question here.

The summary of clauses related to the ten exceptions mentioned is as follows:

Table 3

Type of Clauses	Number
Extraterritoriality	5 (.42)
Tax-free payments	2 (.17)
Post-contract secrecy and prohibition of subsequent use	2 (.17)
Exchange repatriation	2 (.17)
Not specified	1 (.07)
	12 (100)*

*12 exceptions in 10 contracts.

Let us analyze now the nature of those clauses that have brought about refusal of registration in 23 cases, that is, in 4 percent of the cases (21).

(21) Invalid clauses of Table 3 have been included in Table 4.

Table 4

	Argentina		Mexico	
Excessive period	11	(.22)	170	(.14)
Extraterritoriality	8	(.16)	96	(.08)
Excessive price	7	(.14)	344	(.28)
Technology available	5	(.10)	5	(.00)
Confidential - subsequent use	4	(.07)	100	(.08)
		(.69)		
Exports	3	(.06)	121	(.09)
Scarce guarantees	3	(.06)	-	
Grant-back	2	(.04)	110	(.09)
Market control	2	(.04)	159	(.13)
Unilateral rescission	1	(.02)	-	
Others	5	(.10)	136	(.11)
	51	(100)	1231	(100)

It can be noted that the number of observations for Argentina is relatively low and that they are quite scattered. This makes it difficult to embark upon a significant statistical analysis (for example, about associations amongst variables). It can only be said that the most important causals for refusal have been: (i) period; (ii) extraterritoriality; (iii) availability of technology in the country; (iv) excessive price; and (v) inhibition for recipients to repeat the use of the licensed technology without undertaking a new contract. It can be added that three of these clauses, (i), (iii) and (v), point to a single fact: the difficulty imposed on technology recipient firms for their legal appropriation of the licensed technology and the underlying pressures exerted by technology suppliers in order to lengthen technology dependency links.

Technology transfer laws exert an influence over two dimensions of economic activity: One concerns innovative activity and the domestic learning process; the other refers to the cost of contracting foreign technology, i.e., the effects on the balance of payments and the financial position of the recipient firms. Whilst the latter is a short-term dimension, the former is a medium- and long-term dimension. There is also an intermediate dimension between these two: that regarding the patterns and extent of control exerted by supplier enterprises on the entrepreneurial development of local enterprises. The three types of clauses referred to above concern the medium- and long-term dimension. From this point of view, it is difficult to emphasize that their importance is crucial, since it is not sufficient for recipient enterprises to approach this learning process as a purely technical matter; it is essential for them to develop their capacity to appropriate legally the knowledge they obtained and more often than not improve on the basis of their own efforts. This is a central aspect of any policy oriented towards scientific and technical independence.

The figures for Mexico, which are given in Table 4, show, amongst other things, that the availability of technology as a causal for denying registration is substantially lower in relative terms than in Argentina. This indicates that the Argentinian enterprises run a much graver risk of being offered what is already available in the country.

CHAPTER 8

CASE STUDY OF CHANGING POLICY ON FOREIGN COLLABORATION IN INDIA

Anil Malhotra

General Background

The overall objectives of a country like India are rapid development, democratic socialism, and self-reliance. But a great many issues of policy are involved in executing strategies of self-reliance, especially in the field of technology. Perhaps no other single set of government policies has such a profound influence on the demand for, and utilization of, domestic technology as policies towards foreign investments in the manufacturing and mining industries and the import of foreign technology in such sectors as transport and communications. The considerations relevant to this issue are many and complex, but there are five basic points worth mentioning here: (i) The price one pays for foreign technology (either as a lump-sum or a continuing combination of royalties, dividend repatriations, technical fees, etc.) is not in any way "fixed" by the market for such technology. The market is a monopolistic one and the price of technology is a matter of bargaining between the potential supplier and his client. (ii) The frequent tying of "aid" from the developed countries restricts the "market" from which technology may be bought. Even in normal circumstances the cost of technology items from the aid-giving country may be high in relation to that available elsewhere. When the seller of technology is aware that the buyer is restricted by "tied aid" to his market area, the price of technology invariably rises steeply. Furthermore, the technology imported under "tied aid" has, in the past, often been inappropriate or obsolete. (iii) Our private sector has, by and large, no compulsion to bargain with the suppliers of technology because, internally, it enjoys a seller's market and price is not of prime concern. (iv) The public sector is unable to bargain for two reasons: those who negotiate agreements for imports of technology by the public sector often lack the knowledge of the minutiae of technology needed to estimate its value, and they do not have the detailed knowledge about alternative sources of technology, domestic or foreign, to establish the price. There is only one way to bring down the price in any bargaining situation: to show the possibility of going elsewhere or of developing the technology domestically. (v) Until now, except for some isolated instances, our domestic scientific and technological system, and particularly that part of it dealing with R&D, has not been coupled to the institutions importing technology, and it has not been charged with the responsibility of learning, adapting, improving, and then displacing further imports of similar technologies. It has been argued that this kind of an approach is not feasible in the real world. But the instances where such coupling has come about indicate that the actual problems of adaptation at the enterprise level are entirely manageable. What is needed, therefore, is the enunciation by government of explicit policies for the gearing of the domestic scientific effort to

complement imported technology.

The basic trend of the industrial policy after independence was towards Indian ownership, management, and operation of enterprises, and this was enunciated by the government resolution on Industrial Policy on 6 April 1943. This statement did not refer to import of technology, but subsequently, when the issue arose, the government took a similar line in technical collaboration as on employment of Indian personnel.

On 25 January 1969, the government issued a press release presenting an illustrative list of 121 items that could have a sustained demand and for which foreign investment or collaboration was to be decided on individual merit, within the broad framework of government policy announced from time to time. The present situation is that these guidelines and procedures are still in vogue.

Scientists and technologists working in the indigenous industry felt that the policy guidelines enunciated by the government in 1969 through the press release and through internal memoranda to the concerned administrative ministries should be reviewed. The NCST thus set up a committee to revise and review these guidelines in 1972. This case study traces the attempts to change the government's policy in this area. Basically, the study falls under three headings: establishing the need for a policy change; devising a new policy; and making the new policy acceptable to the government, i.e., formal adaptation of the new policy by the government.

Establishing the Need for Policy Change

Background: During the period from 1947 to 1969 India entered into 2792 foreign collaborations, i.e. an average rate of one every two to three days. While figures on the outflow of foreign exchange through dividends, repatriation, royalties, technical fees, etc. are not available, an estimate has been made that these have amounted to the order of Rs. 300 to 400 million per year. Besides the outflow of foreign currency, the prevalence of foreign collaboration has indirect effects on the growth of indigenous science and technology, as well as the hidden cost of importing equipment and material from abroad, which could have been made available from indigenous sources. The bases for this are: (i) a study commissioned by the Planning Commission in 1970; (ii) an independent study done by a professor; (iii) a case study done in industry; and (iv) a study of data by an NCST Committee.

Some of the major issues, which indicate the need for policy changes, are the following:

Royalty Payments: Because the government has never legislated criteria for collaboration, every such proposal must be submitted to it for approval. The procedure is one of scrutiny and judgement; government officials do not negotiate with applicants across the table. The government's effort is directed towards reducing royalty payments, and this would seem to indicate that the government acts on the assumption that either Indian importers of technology are ignorant or that they are willing to pay too much for it owing to high profits from sheltered markets.

The government does not have any data to fix fair royalties, and in the absence of data conventions have grown up mainly around the rate of royalties on sales. In brief, royalties up to 3 percent are admissible and might go up to 5 percent in exceptional cases. The crucial point about these conventions

is that the maxima are fixed by product and not by technology. More advanced techniques that earn over 5 percent in different areas of the world or that entail higher royalties owing to India's small market are kept out of the country. Another result is that payments are made through means other than royalties, for instance by way of fixed sums. The effects of the government procedures are that advanced technologies are not introduced into India, and that even the obsolete technologies, which are introduced, end up being paid 5 percent.

Choice of Collaborator: It was revealed that in 33 percent of the cases Indian businessmen had considered no alternatives for their foreign collaboration venture, and that 33 percent had obtained their collaboration from internationally reputed foreign associates without any "shopping" around.

Continued Interest of Foreign Collaborator in Technology Transfer: The majority of the foreign collaborators seem to be either totally uninterested, or to restrict their association to problem-solving. Therefore, there are no steps taken towards the adaptation and absorption of imported technology.

The Age of the Supplied Technology: In most cases, it is accepted by the Indian party that the foreign collaborator rarely parts with its latest design, even under license. The general opinion is that, in spite of foreign collaboration, the Indian party will be always a good 15 years behind.

Role of Foreign Collaborator as Supplier of Equipment, Raw Material, and Components: In a number of cases, redundant or unusable machinery has been purchased primarily because it was available with "tied" aid. In one case, in addition to the equipment purchased from a collaborator, almost all the equipment components came from him. Many felt that these components were overpriced and that the foreign collaborator often exploited his monopoly situation.

Nature and Expertise of Foreign Technicians: It is generally agreed that the best foreign technicians are rarely sent out, and even when they are, the foreign expert is specialized in a limited sphere.

Multiple Import of Technology (1): Over a 10-year period, a large number of multiple collaborations took place: for example, 18 for transformers, 23 for cranes and 12 for gramophone records; in nonessential goods, 8 for dry batteries and 6 for ball point pens.

Emphasis on Consumer Goods: On the basis of the study of 457 technical collaboration agreements from 1969 to 1971, it was noticed that a very small proportion of such agreements was for the manufacture of capital machinery, whereas end-point goods constituted 33 percent of the collaboration and intermediate products 39 percent.

Indigenous Technology Utilization (2): Offtake from CSIR to industry has been small: in 1967-68, value of output of processes leased out was Rs. 50 million (about $6.6 million) against a gross output of industry of Rs. 75 billion (about $10 billion), i.e. less than (0.7 percent). CSIR earned only Rs. 1 million, whereas expenditure was Rs. 187 million. This seems to have occurred

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(1) Subramanian KK. 1972. Import of Capital & Technology - A Study of Foreign Collaboration in Indian Industry. p. 119.

(2) NCAER Study, p. 49.

because (i) the know-how developed was obsolete; (ii) there was no manufacturing experience, and therefore no follow-up help was available; and (iii) there was no cost-consciousness in setting up production.

Administrative Delays: Another problem in the system was that it took an average of one year and nine months for the government to approve collaboration proposals. In over half the cases, the government took over one year, and in one case over five years. These delays refer to approved proposals, for in many cases the effect of the delay is to effectively drive away the supplier of technology. One such case was regarding a proposal for the manufacture of vital pieces of textile machinery whose technology is controlled by four or five firms in the world.

Devising a New Policy

Objective of a New Policy: The objectives are an in-built preference for utilization of indigenous technology where it is developed, available, and appropriate; mechanisms for constant techno-economic evaluation and selection of appropriate technologies to be imported; mechanisms for the adaptation, absorption, and diffusion of imported technology and its further indigenous development without continuing dependence on the foreign technology supplier, in such forms as renewals, etc.; reduction of foreign exchange remittances, direct or indirect; incentives to increase productivity, export and import substitution; and mechanisms for expeditious disposal of applications for technology imports, and measures to prevent repetitive technology imports.

New Guidelines: The basic framework of the new guidelines are: (i) Selection of Technology - it should be done in association with engineering design organizations and through open competitive bids; (ii) Engineering Design Organizations - three kinds of EDCs (public, private, R&D, exemptions given to small sector, time to set up new EDCs, registration of EDCs to ensure linkage with indigenous R&D); and (iii) Open Competitive Bids - advertisements, minimum of three offers.

Assessment of Technology: Technology assessment forms have been designed, which should be utilized for the assessment of the technology being imported. These would be, inter alia, the assessment of indigenous offers versus foreign, as a package, and an assessment of the total foreign exchange outflow over the life of the contract; in addition, a technical data bank should be set up in the reorganized technology import board.

Absorption and Development of Imported Technology: The Indian party seeking approval for importing technology, other than the entrepreneur with a small scale industry, shall be required, under the industrial license/import issued to him, to undertake the following specific steps towards the absorption/adaptation/development of the acquired technology; (i) At the time of seeking approval, the Indian party must submit a detailed time-bound program showing the schemes for R&D, engineering design, training of technological personnel, and other measures essential for the absorption/adaptation/development of the imported technology. (ii) The above program may be undertaken by the registered in-house R&D facilities, but, in those cases considered necessary by the government, it must be undertaken in collaboration with recognized and registered engineering/design/consultancy/R&D organizations in the public or private sector and/or with recognized scientific, educational institutions where the desired research capabilities exist. In the event the above scientific

and technological facilities/capabilities are not adequately developed, the Indian party must enter into agreements with suitable government agencies to promote the development of these technological capabilities. (iii) For the activity required in the above paragraph the Indian party must budget sufficient money to achieve the stated objectives. The amount budgeted per annum must be at least equal to the net value outflow, which includes dividend repatriations, if applicable, along with the other normal technology payments made in the form of foreign exchange outflows, and/or the value of the commodity outflow if a barter deal is involved. (iv) The government may designate an agency to monitor the progress of the approved program, along with powers to assess and inspect the technological output of the effort made.

Specific clauses were framed, whereby the companies importing technology would present detailed, time-bound R&D programs for absorbing such technology and to develop it further. Furthermore, technology-importing companies would make explicit budgetary provisions for a technology absorption program, which should at least equal the amount in foreign exchange paid to the foreign suppliers for the technology required. There would also be a government mechanism for monitoring the foreign technology absorption program.

Technology Import for Multiple Internal Utilization

In areas where the government foresees the need for additional/new capacities and regards a multiplicity of Indian ventures as essential, as well as in those areas where, as a policy, the government desires to actively encourage and promote a multiplicity of Indian producers, the government should take advance action to identify such areas and designate engineering design/consultancy/R&D organizations, including the NRDC where necessary, to explore foreign sources for the desired technology and negotiate its import for multiple internal utilization. The government should adopt the practice of issuing letters of intent to various Indian parties only after such agreements have been satisfactorily signed. The lists of areas where the import of technology is to be routed through an Indian engineering/design/consultancy/R&D organization could be notified from time to time by the Technology Import Board.

The government should not accept any renewal or extension of technology import agreements. The government may be prepared to consider purchase of fresh technology but only in the following circumstances: when the new technology to be imported leads to a significant reduction in the cost of production and price; and when the new technology to be imported enhances very substantially the export earnings. In all cases, any proposal to purchase new technology should be considered a fresh proposal and subject to the following scrutiny: (i) The Indian party must state specific problems - scientific, technical, managerial, etc. - that have prevented the development of improved technology. (ii) The Indian party must also state the expenditure that he has already incurred for the absorption/adaptation of the imported technology, during the validity of the technology agreement which has expired or will expire. (iii) Along with the application for purchase of this new technology, the applicant must submit a detailed scheme giving steps that he will take to avoid any further import of technology. Schemes of research and development that he is prepared to take up should be mentioned by a government-designated agency. (iv) All applications for further import of technology must be submitted at least one year prior to the date of the expiration of the agreement.

Registration of Import Agreements

It should be obligatory for the Indian party to submit copies of the

signed agreement for import of technology to a "Central Registry of Technology Import." It should also be obligatory for the Indian party to submit to the Registry annual statements sanctioned by the Reserve Bank of India regarding foreign exchange payments made towards the imported technology.

Delegation of Powers and Devising of a Mechanism for Expeditious Disposal of Applications

The presence of the following clauses/arrangements for import of technology shall not be approved by the government: (i) turnkey jobs and/or package deals as a means of technology import (not permitted by the government as a matter of policy); (ii) payments for technology in the form of equity shares, brandnames, etc. issued to the foreign party; (iii) arrangements or clauses that, in any manner, bind the Indian party to any foreign party with regard to procurement of raw materials, intermediate materials and products, capital goods, components, spares, etc.; (iv) in technology import agreements, stipulations that would restrict, in any manner, the Indian party's choice to adopt production procedures, product specifications, volume of production and/or any program for absorption and adoption of imported technology; (v) clauses that make it obligatory or mandatory for the Indian party to pass on to the foreign collaborator any changes/improvements made in the imported technology without any financial compensation, except where the foreign collaborator is able to show that this is inconsistent with the most-favoured-nation treatment; (vi) payment by way of contribution/fees by the Indian party towards R&D undertaken abroad by the foreign collaborator; and (vii) clauses that would restrict the Indian party's freedom, consistent with secrecy clauses, to exercise a choice of personnel to manage and run the production facilities.

Policy Towards Foreign/Equity Participation

The government should not regard foreign equity participation as essential for technology import. Foreign equity participation should not be permitted, unless exceptional circumstances arise, wherein a case-by-case analysis has been undertaken and has shown that no other source exists for that technology or a comparable one, and that the only mode left for acquiring the technology is through foreign equity participation. Even if such an exception occurs, the government would prefer that the aggregate foreign equity holdings are less than the largest single Indian equity holding or less than the aggregate equity holding of the Indian financial institutions to ensure that management policies are such as to promote technological self-reliance. The fact that foreign investment is allowed should not be a ground for allowing the import of capital goods, which would otherwise not have been allowed. There should be appropriate scrutiny from the indigenous availability angle to ensure that the maximum possible fabrication of indigenous machinery is insisted upon. It is highly desirable for investment to be in the form of cash, with purchase of equipment from the cheapest source. This should be determined by a process of competitive bidding against the free foreign exchange, and should be carried out jointly by the Indian and foreign parties. Where the capital participation exceeds the value of imported machinery, the balance should be bought in cash.

Implementing the Change

Chronology of Events

(1) January 1969, Guidelines and Internal Memoranda
(2) NCST letter of 1971 regarding foreign collaboration in the services areas

(3) NCST committee of November 1972
(4) NCST report on New Guidelines for Foreign Collaboration (April 1973)
(5) Report of the Sub-Group of Industrial Development appointed by the Department of Administrative Reforms (January 1974)
(6) Report of Secretary (Economic Affairs) to the Group of Ministers of the Administrative Reforms (November 1974).

Some Lessons

The case study reveals that, if policy changes are to be effectively implemented, the following are required: (i) the need for data and their analyses in sufficient detail and specificity; (ii) the need for generating forces in the science and technology system regarding their interest and in mobilizing them on a policy level; (iii) the need to identify the external forces at work that inhibit the growth of the indigenous science and technology system by their emphasis on foreign collaboration - political, economic, and organizational; (iv) the need for persistence in generating a general consensus so that policy when accepted could be implemented in the spirit in which it was drafted.

CHAPTER 9

THE MEXICAN NATIONAL REGISTER FOR TECHNOLOGY TRANSFER AGREEMENTS[1] (A Preliminary Evaluation)

Alejandro Nadal E.

National Registry of Transfer of Technology

Objectives

Following the example of other countries, Mexico has set up since 1972 the requirement of registering technology agreements in order to analyze them and eliminate abuses. These registries have been created because of an increasing balance of payments deficit and an increase in royalty and technical assistance payments. In addition, the payments to foreign countries, in direct foreign investments, for these concepts have been artificially inflated in order to maximize the effective profitability rate. Consequently, the first royalty committees appeared in Latin American countries (Colombia, Chile) in the late 1960s. With Decision 24 of the Commission of the Cartagena Agreement on foreign capital and trademarks, patents, licenses and royalties, this instrument began to be used in more ample industrialization policy aims, and later, in the Common Technological Policies found in Decisions 84 and 85.

In Japan and India, technology marketing regulations were linked to industrial development policies and to foreign investments from the beginning. These have had significant repercussions on the structure and operation of these instruments.

The Mexican National Registry of Transfer of Technology (RNTT) is similar to other Latin American experiences. In the late 1960s, it became evident that, in many cases, payments on imported technology included profit remittances towards foreign countries, and frequently royalty payments were being channelled as technical assistance due to lower taxation. In 1969 this situation was modified; nevertheless, the authorities' concern for the problem of imported technological payments initiated discussion in other institutions. The UNCTAD studies, and those from other countries, on restrictions included in the contracts also showed that technological purchases can suffer an implicit cost, as well as an explicit one.

The number of contracts or license agreements in force between enterprises operating in Mexico and the number of contracts signed per year were unavailable. Nevertheless, it was well known that the greater part of the technology used by industry came from abroad. The industrialization strategy by means of import substitution has simply shown a demand for technology previously

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(1) Taken from: Instruments of Science and Technology Policy in Mexico. A final report for the STPI project.

incorporated into the goods being imported. Neither the national scientific and technological system nor the existing enterprises have proved the capacity of satisfying this demand. The income concentration and the demand structure caused by it have generated consumption patterns in which goods and services are similar (or identical) to the ones consumed in highly industrialized countries. Consequently, there has been a great demand for foreign technology, brandnames, and trademarks, which have possibly been increased by the proximity of the United States.

Foreign technology can be acquired through various means: purchase of capital goods, intermediate inputs and final goods (technology is incorporated to each one of these articles); agreements on patented or unpatented technology licenses (disembodied technology); hiring technical personnel (technology incorporated to the experience and abilities found in this type of personnel); and acquiring without reserve any available disembodied technology (public domain patents, published articles, etc.). Technology marketing (incorporated or not) plays a key role in prolonging monopoly advantages that originate in the innovative process (2). In the first case, the goods in which technology is "crystallyzed" belong to a monopolistic market similar to the one of the intangible goods "technology". In the case of license or technical assistance contracts, the seller (or licensor) attempts to incorporate "linking" clauses that will expand the monopolistic characteristics of technology to other inputs. By using these monopoly advantages, he endeavours to include restrictive clauses that will enable him to protect his international markets from exports of the technology purchaser, which would aggravate the trade deficit and would also enable him to interfere in the steps taken by the receptive enterprise.

The first channel reglementation is very difficult to put into practice, for a careful analysis is required of imports, and also a well-defined strategy on internally produced goods, on goods that will continue to be imported, and on goods that do not belong to either of these two groups is difficult to implement. The contractual type of channels for acquisition of disembodied technology require, for their regulation and control, an analysis of the corresponding legal documents: license agreements (patents, technical know-how, and trademarks), technical assistance contracts, and rendering of engineering and administrative services. Briefly, the technological marketing reglementation is carried out indirectly, by examining documents that rule the transaction.

Operation of the Instrument

If access to the contracts is required, how can the parties be put under the obligation of presenting them? In countries with foreign exchange control, the answer is simple; this control forces anyone who requests authorization for payments to foreign countries for technology licenses or technical assistance to submit the contracts for scrutiny by the credit and monetary authorities. However, in countries lacking this control, the procedure of denying juridical validity to contracts that have not been presented before or approved by an official organism must be followed.

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(2) These monopoly advantages are generated in the innovations of the first phase of a product's vital cycle. See: Vaitsos, C. 1970. Transfer of resources and preservation of monopoly rents. Paper presented at the Dubrovnik Conference of the Harvard Development Advisory Service, 1970. Also Vernon, R. 1966. International Investment and international trade in the product cycle. Quarterly Journal of Economics, May. Johnson, H. 1970. The efficiency and welfare implications of the international corporation. In The International Corporation, Ch. Kindleberger (Ed.), The MIT Press, p. 35.

This procedure was adopted by Mexico in 1972. A brief description and preliminary criticism of the Registry Law is called for here. Once the Law on the RNTT was profitably employed the registration of all contracts, whose aim was one or more licenses on patent uses (of all types), trademarks, know-how, supply, personnel training, providing basic or detail engineering, technical assistance in general, and administrative services, became compulsory (3). This obligation prevails even for transactions between two enterprises, operating in Mexico, that imply no payments to foreign countries. Unfortunately, neither the Law nor the internal criteria have defined clearly these items in Article 2. This reveals the instrument's fundamental weakness: the main objective is to regulate the formal conditions in disembodied transfer of technology operations, in order to eliminate abuses and restrictions. It is almost impossible, however, to evaluate a contract without defining its components. Some of the contracts analyzed in this work (4) show the difficulty in setting the limits or the reach of the services included in the contract. The Registry demands that a questionnaire be filled with basic data when the procedure is initiated, and frequently elements that were not included are presented as forming part of the contract. For example, a technical assistance contract concerned with engineering in an industrial project can be presented as a contract on engineering services and, therefore, higher payments seem to be justified. Frequently contracts refer to the object in abstract terms ("technology for machinery production") making its evaluation impossible. The situation can be more complicated in the case of contracts of multiple content. Besides, the difference between contracts not subjected to registry and contracts that must be submitted is not well defined. Among the first are (i) those referring to services of foreign technicians who are in charge of the installation of machinery, factories, or repairs (this is one of the forms that technical assistance adopts); (ii) design or catalog supply along with the machinery (which must be considered as necessary for its installation), only when the obligation to perform subsequent payments is not implied (this type of services can be found in basic and detailed engineering: for example, in the supply of operation manuals; (iii) assistance in repairs or emergencies (another form of technical assistance); (iv) technical instruction or training given through research centres or by enterprises to its workers (it is not clear why this type of service rendered by a foreign research centre, which might belong to one or many transnational enterprises, does not have to submit itself to the Registry's control); and (v) operations of in-bond enterprises that are ruled by special regulations. Contracts whose objective is the transfer of a patent or of a trademark, as well as of commercial names, which, in many cases, can be treated as trademarks, are excluded, through omission, from the obligation of being registered.

Another serious fault in this law is that it sets the same time limit to register all types of contracts: they must be presented to the Registry during a period comprising the first 60 days after the contract is signed. This time limit could be justified for those contracts whose object is a license or the rendering of a service for a long period of time; but for many contracts,

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(3) The author wishes to thank the Registry for having granted access to the registered contracts for this research.

(4) See: Nadal, A. and M. González F. 1975. Engineering firms in Mexico. El Colegio de Mexico, mimeo. The study is part of the STPI Project in Mexico.

which must be registered, the service can be rendered for a period of time shorter than the 60 days, even in only one act. Such is the case for engineering services, for personnel training, and for certain types of technical assistance. Research on engineering firms has revealed that these enterprises do not register many of their contracts - some because of their short duration and others because their object is not considered subject to this procedure.

The RNTT procedure is quite simple: if the contract is not inscribed in the Registry, it shall be deprived of any legal effects and it shall not be recognized by any court. But in order to register a contract (that is, for it to be approved), it must be free of any restrictive or linking clauses that may be considered harmful. The Law establishes five basic reasons for denying registry to a contract: (a) when the relationship between price and purchased technology is unbalanced, or when the price constitutes an unwarranted or excessive burden on the national economy (Art. 7, section II); (b) when excessive lifespans are established, they can never surpass 10 years (Art. 7, section XII); (c) when the contract's object is the transfer of technology freely available in the country (as long as it is the same technology); (d) when any restriction or limitation is set to exports, production, usage of complementary technologies, research, administration, free purchase of equipment, spare parts, tools, raw materials, sale of manufactured goods, etc., or when there is an obligation to submit to the technology supplier patents, trademarks, innovations or improvements obtained by the recipient (Art. 7, various sections); and (e) when the acknowledgement of lawsuits, which could be originated by the interpretation or the breach of the contract, are submitted to foreign courts (Art. 7, section XIV).

Some exceptions are permitted, but not in the following cases: when the technology specified in the contract is available without reserve in the country; when there is an obligation to submit to the technology supplier any innovation developed by the purchaser; when limitations to the purchaser's research activities are set; when exports of the manufactured goods are restricted; when excessive lifespans are set; and when the acknowledgement of lawsuits or conflicts that might arise from the contract are submitted to foreign courts.

Transfer of Disembodied Technology by Industrial Branches

When the orientation of technical progress was examined, marked differences in the type of innovations introduced in each branch studied could be observed. It may be assumed that the ties with the foreign suppliers of technology vary in each industrial branch according to the nature of the products and processes, as well as to the particular structure of the industry. In some industries, the need to import machinery and equipment prevails (along with the technical assistance required for its installation or maintenance), and the disembodied technical know-how occupies a secondary place. The most explicit example is the dairy products industry, where the know-how is of public domain because it has been known for many decades, or that it is not patentable in some countries, but the machinery to process the raw material and to bottle it must be imported (5). An example of the opposite case is the chemical and petrochemical industry where the disembodied technology, protected by patents or industrial secret, is almost totally imported and much of the equipment

(5) The situation may be different in the case of particular processes of industrializing milk. The processing and packaging of fruits and vegetables is also achieved through traditional technology of public domain.

could be manufactured locally. However, imports of incorporated technology in intermediate inputs (catalyzers, additives, etc.) are relatively high. Capital goods production often requires the importation of both incorporated and disembodied technology.

The statements mentioned above are generalized and should be qualified since there are processes and products in each of the branches that do not require imported technology, for example, some resins or a certain type of machinery. But it is important to be aware of the fact that the Registry does not affect manufacturing enterprises of different types of goods in the same manner, since the channels through which technology is acquired vary in each case. Neither does it affect in the same way enterprises with a different capital structure. Evidently, the technology contracts between a subsidiary and its head office will include less restrictions than those between companies that have no financial ties. The head office has a more effective source of control (i.e., ownership) than a licensing agreement.

The analysis of the basic information contained in 1310 licensing agreements reveals that their contents vary in different branches. The list of these contracts includes the following information: (a) contracting parties; (b) foreign participation in the recipient's equity; (c) participation by the supplier in the recipient's equity; (d) date of initiation and termination of the contract; (e) services included in the contract; (f) four-digit classification of the recipient and of the goods or services included in the contract; and (g) payment scheme used in the contract.

The contracts were presented to the RNTT for information purposes only and reflect the situation before the Registry came into existence. However, this information does not tell us the type of technology that is being transferred. Here again, we can observe the formal treatment that this instrument gives to the transfer of technology. It is difficult to know which of the three levels (production, product, or material technology) is related to the transferred technology. However, the information included in the contracts is still valuable as an indicator.

The 1310 contracts represent 31.8 percent of the total number of contracts presented for information purposes up to 31 July 1975. The distribution according to industrial branches and the presence of the different elements in the contracts appear in Table 1. The branches that include the largest number of contracts are: chemical industry 31; electrical and electronic machinery, 37; non-electrical machinery, 36; and beverages, 21. Together, they hold 841 contracts, that is, 64 percent of the sample. Although the classification by industrial branches is a task that has not been finished, the data of this sample should be considered as an indicator of the significance of each branch in the total number of contracts presented to the RNTT.

All the consumer goods industries hold 257 contracts, that is, 19.6 percent of the sample contracts. In these branches (20 to 26) the significance of the trademarks is overwhelming (an average of 82 percent of the contracts involve trademarks) and it is logical to conclude that the trademark is a very important element in the industries that are strongly conditioned by the final market. But obviously, the inclusion of trademarks in a contract does not imply a transfer of technology. This element appears less frequently in the intermediate products and capital goods branches, where know-how and technical assistance prevail. It is also logical to assume that, in the branches where trademarks represent the most important element, technology will generally be associated to the incorporation of differentiating features in the final products. Finally, "consumption technology" is the most frequently

Table 1: The Contents of 1310 Contracts by Industrial Branch.

Industrial Sector	Number of Contracts	Patents		Trademarks		Know-how		Technical Assistance		Basic Engineering		Detail Engineering		Management Services		Other Services		Total Elements by Industrial Branch
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
20. Food Industries	65	(5)	7.6	(47)	72.3	(27)	41.5	(20)	30.7	(2)	3.0	(1)	1.5	(3)	4.6	(4)	6.1	109
21. Beverages	102	-	-	84	82.3	23	22.5	14	13.7	1	0.9	-	-	3	2.9	9	8.8	134
22. Tobacco	13	1	7.6	10	76.9	8	61.5	3	23.0	-	-	-	-	-	-	-	-	22
23. Textiles	25	5	20.0	17	68.0	12	48.0	9	36.0	-	-	-	-	-	-	-	-	43
24. Shoes and Garments	40	5	12.5	37	92.5	22	55.0	9	22.5	-	-	-	-	-	-	1	2.5	74
25. Wood	4	1	25.0	4	100.0	2	50.0	3	75.0	-	-	-	-	-	-	-	-	10
26. Furniture	8	2	25.0	7	87.5	3	37.5	1	12.5	-	-	-	-	1	12.5	-	-	14
27. Paper and Pulp	19	8	42.1	7	36.8	13	68.4	10	52.6	-	-	-	-	-	-	-	-	38
28. Printing	6	1	16.6	3	50.0	3	50.0	2	33.3	-	-	-	-	-	-	-	-	9
29. Leather	3	2	66.6	2	66.6	2	66.6	-	-	-	-	-	-	-	-	1	33.3	7
30. Rubber	24	8	33.3	8	33.3	16	66.6	14	58.3	1	4.1	-	-	1	4.1	-	-	48
31. Chemical Industries	440	112	25.4	271	61.5	248	56.3	161	36.5	17	3.8	7	1.5	10	2.2	13	2.9	839
32. Oil Products	14	2	14.2	7	50.0	11	78.5	7	50.0	3	21.4	-	-	-	-	-	-	30
33. Non Metal Products	28	12	42.8	5	17.8	21	75.0	19	67.8	4	14.2	2	7.1	2	7.1	-	-	65
34. Basic Metal	44	10	22.7	21	47.7	26	59.0	27	61.3	4	9.0	2	4.5	2	4.5	1	2.9	93
35. Metal Products	74	16	21.6	41	55.4	40	54.0	31	41.8	3	4.0	1	1.3	3	4.0	3	4.0	138
36. Machinery and Equipment (non-electrical)	136	42	30.8	69	50.7	83	61.0	72	52.9	9	6.6	3	2.2	5	3.6	4	2.9	287
37. Electrical Machinery and Equipment	163	44	26.9	89	54.6	91	55.8	75	46.0	2	1.2	2	1.2	3	1.8	10	6.1	316
38. Transport Equipment	51	16	31.3	27	52.9	38	74.5	30	58.8	4	7.8	2	3.9	-	-	-	-	117
39. Other Industries	51	23	45.0	23	45.0	34	66.6	24	47.0	1	1.9	-	-	1	1.9	2	3.9	108
	1310	315	24.0	779	59.5	723	55.0	531	40.5	51	3.9	20	1.5	34	2.6	47	3.5	2501

Source: Based on a list with the basic information of 1310 contracts, regarding the manufacturing industry, presented to the RNTT for information purposes only.

found element in the contracts (6).

Other interesting aspects are the following: the frequency of the patents varies in each sector (the implications of this fact have already been analyzed in the previous section); and engineering services appear in contracts of intermediate products and capital goods industries, with the exception of three contracts in the food industry, and one in the beverages. However, the supplier was not an engineering firm in any of these contracts. Therefore, engineering services were linked to other elements included in the contract. In these cases, it may be considered that the so-called "technological package" had not been opened.

A more detailed picture on the contents of the contracts is presented in Table 2, with three-digit information on the six sectors that have the greater number of contracts. It was in these six sectors that 70 percent of the contracts included in the sample were concentrated. It is important to break down the analysis, even up to a four-digit level if possible, since there are notorious differences within each branch. The significance of the patents is almost nil in the majority of the branches, except in those cases where the number of contracts is very small, as occurs in branch No. 384, where it is very difficult to make any comparison. Trademarks appear less frequently in almost all the branches of the chemical industry, except pharmaceutical products, and cosmetics and soaps. In these two branches, the frequency of trademarks is much higher than the average of the whole sample (59.5 percent). In 1971, 1250 million pesos were spent on royalties and technical assistance, which was probably linked with the maintenance of "adequate quality levels" of the products that carried those trademarks. The contracts in the branches of the food industries also have the trademark as its most frequent subject and together they exceed the average for the 1310 contracts.

It is interesting to compare the present information with the contract data whenever the licensor participates in the licensee's equity. The list contains this information for 132 contracts (7) out of which 111 are capital goods and intermediate product industries. Although 84 percent of these contracts belong to this type of industry, trademarks are quite important, since they appear in 47 contracts (42 percent). On the whole, the most frequent elements are the following:

	Percent	Number of Contracts
Know-how	49.2	65
Technical assistance	42.4	56
Trademarks	40.9	54
Patents	28.7	38
Engineering (basic and detail)	9.8	13
Other services	1.5	2

It seems that the relative significance of each of the elements in the contracts is similar, even when an important variable such as the financial relationship between the contracting parties (with tie-in or restrictive clauses) is introduced.

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(6) Lancaster, K. 1966. Change and Innovation in the Technology of Consumption. American Economic Review, Vol. 56, No. 2, May, pp. 14-23.

(7) This does not mean that in the general sample there were only 132 contracts among the enterprises with financial ties.

Table 2: The Contents of the Contracts in the Six Most Important Branches.

Industrial Classification	Description	Number of Contracts	Percentage of the Contracts that Include: Patents	Trade-marks	Know-how	Technical Assistance	Basic Engineering	Detail Engineering	Management Services	Other Services	Elements in Contracts
311	Manuf. of basic industrial chemical substances	34	32	26	74	74	24	3	-	-	79
312	Manuf. of fertilizers and pesticides	18	17	61	50	33	11	-	-	-	31
313	Manuf. of resins and synthetic fibers	25	20	36	56	52	12	8	-	-	46
314	Manuf. of paints, varnishes and lacquers	8	-	38	100	88	-	-	-	-	18
315	Manuf. of pharmaceutical products and medicines	210	27	74	49	28	1	1	3	4	399
316	Manuf. of soaps, detergents, perfumes and cosmetics	52	12	77	50	23	-	-	4	6	89
317	Manuf. of oils and greases for industrial use	-	-	-	-	-	-	-	-	-	-
318	Plastic articles	47	43	38	64	34	2	4	2	2	89
319	Manuf. of various chemical products	46	22	50	67	50	-	-	2	-	88
31	Total Chemical Industry	440	25	62	56	37	4	2	2	3	839
371	Manuf. of machinery, industrial electrical appliances and accessories	51	33	49	78	55	-	4	-	2	113
372	Manuf. of radio and television appliances	68	18	60	29	29	3	-	3	13	106
373	Manuf. of electric appliances and spare parts	15	47	80	87	60	-	-	-	-	41
374	Manuf. of other appliances and electric accessories	29	28	38	62	62	-	-	3	-	56
37	Total Electrical Industry	163	27	55	56	46	1	1	2	6	316
361	Manuf. of agricultural machinery	15	33	53	47	53	7	-	7	-	30
362	Manuf. of machinery for wood and metals	10	30	60	80	50	10	-	-	-	23
363	Manuf. of special industrial machinery	26	19	62	62	62	8	-	-	4	56

Industrial Classification	Description	Number of Contracts	Percentage of the Contracts that Include: Patents	Trade-marks	Know-how	Technical Assistance	Basic Engineering	Detail Engineering	Management Services	Other Services	Elements in Contracts
364	Manuf. of office equipment	6	17	50	50	50	-	-	-	-	10
365	Manuf. of other machinery and equipment	79	35	46	62	51	6	4	5	4	168
36	Total Industrial Machinery and Equipment	136	31	51	61	53	7	2	4	3	287
351	Manuf. of cutlery, tools, hardware	32	19	53	50	44	3	3	9	6	60
352	Manuf. of metalic furniture	3	-	67	33	-	-	-	-	-	3
353	Manuf. of metalic structures	5	-	80	80	60	-	-	-	-	11
354	Manuf. of other metalic products	34	29	53	56	41	6	-	-	3	64
35	Total Metalic Products Industry	74	22	55	54	42	4	1	4	4	138
201	Meat processing	-	-	-	-	-	-	-	-	-	-
202	Dairy products	8	13	88	25	38	13	13	13	-	16
203	Preservation of fruits and vegetables	10	-	80	50	20	-	-	10	-	16
204	Fish and sea food	2	-	50	50	50	-	-	-	-	3
205	Milling industry	7	-	86	29	14	-	-	-	-	9
206	Wheat and flour products	3	-	66	33	67	-	-	-	-	5
207	Cane sugar, Ethanol	-	-	-	-	-	-	-	-	-	-
208	Cocoa, Chocolate, syrumps, molasses	20	10	75	40	15	-	-	5	15	32
209	Other food products	15	13	53	63	53	7	-	-	7	28
20	Total Food Industry	65	8	72	62	31	3	2	5	6	109
381	Shipbuilding	-	-	-	-	-	-	-	-	-	-
382	Railroad equipment construction	5	20	-	100	100	-	20	-	-	12
383	Manuf. of automobiles and parts	44	32	59	73	55	9	2	-	-	101
384	Manuf. of other transport equipment	2	50	50	50	50	-	-	-	-	4
38	Total Transport Industry	51	31	53	75	59	8	4	-	-	117

The origin of the technology is found in Table 3. The scarce diversification of the technology suppliers' sources is remarkable: in 66.9 percent of the contracts, the supplier is a U.S. enterprise. (The American industry with the lowest participation of suppliers is wood products, with 50 percent.) The four European countries that appear more frequently as suppliers only have 17.4 percent of the contracts. This fact reveals a situation where there are no technology search services, and generally the recipient has a passive attitude. (The party who sells the technology has the initiative.)

Finally, in Table 4 the payment schemes used in the contracts are presented. The system of royalties on sales is the most common formula (used in 56.8 percent of the contracts), followed by royalties on volume of production (9.5 percent of the contracts). These formulae imply that payments are made throughout the duration of the contract. Other forms of payment are present in 15.8 percent of the contracts. Although they represent different formulae, they have a common characteristic: the total sum of payments is defined ex ante, and the technology can be generally transferred at once. Although the system of sales royalties is the most common formula used, it does not mean that it is the most convenient one. From the macroeconomic point of view, this form may produce negative effects, if the percentage has repercussions on the final prices. Also, in a period of strong inflationary pressure, it may represent larger payments. This system also has serious defects from the microeconomic point of view. If the technology recipient wishes to increase its profitability, it would be logical to link the payments to its profits, which is different from its total sales. Generally, in the early years of a plant's operation, there will not be any profit; therefore, the supplier will not be interested in using this alternative system, but will look for other advantages (for example, capitalization of technology through equity participation), with the excuse that in such a case the recipient's management must fall under its responsibility. As we shall see later, each formula has its advantages and disadvantages, and, in each contract, all the circumstances that may affect the total payment should be analyzed: the licensor's participation in the licensee's capital, percentage of intermediate inputs, raw materials, and parts and components that are to be imported (by the licensor), duration of the contract, etc.

The different characteristics of the disembodied technology market in each industrial branch are evident when the different levels of royalty rates are examined. From the sample of 1310 contracts presented for information purposes only, we obtained the percentages of net sales that were paid to the technology supplier in the following industrial branches:

Industrial Classification and Terminology	Royalty rates on net sales (percent)	Number of contracts
202 Dairy products	3.5	2
203 Preservation of fruits and vegetables	4.0	4
311 Basic industrial chemical substances	4.5	19
313 Resins and synthetic fibres	2.6	11
316 Soaps, perfumes and cosmetics	6.5	19
35 Metal products	4.9	23
361 Agricultural machinery	4.0	9
362 Machinery for wood and metals	1.5	2
363 Machinery for specific industries	4.0	21
37 Electric and electronic machinery equipment	6.0	19
38 Transport equipment	2.8	24
General average	4.0	152

Table 3: Origin of Technology by Industrial Sectors (Percentages).

No. of Sector	Sector	United States		Mexico		Switzerland		France		Great Britain		Germany		Others		Total
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
20.	Food Industries	46	70.8	5	7.7	9	13.8	-	-	1	1.5	-	-	4	6.2	65
21.	Beverages	59	57.8	24	23.5	2	2.0	3	2.9	6	5.9	1	1.0	7	6.9	102
22.	Tobacco	8	61.5	2	15.4	-	-	-	-	3	23.1	-	-	-	-	13
23.	Textiles	18	72.0	4	10.0	3	12.0	-	-	-	-	-	-	-	-	25
24.	Shoes and Garments	24	60.0	4	10.0	-	-	4	10.0	-	-	-	-	8	20.0	40
25.	Wood	2	50.0	-	-	2	50.0	-	-	-	-	-	-	-	-	4
26.	Furniture	7	87.5	-	-	-	-	-	-	1	12.5	-	-	-	-	8
27.	Paper and Pulp	15	78.9	1	5.3	2	10.5	-	-	-	-	1	5.3	-	-	19
28.	Printing	5	83.3	1	16.7	-	-	-	-	-	-	-	-	-	-	6
29.	Leather	2	66.7	-	-	-	-	-	-	-	-	-	-	1	33.3	3
30.	Rubber	17	70.8	1	4.2	-	-	-	-	2	8.3	4	16.7	-	-	24
31.	Chemical Industries	248	56.4	16	3.6	21	4.8	54	12.3	18	4.1	28	6.4	55	12.5	440
32.	Oil Products	11	78.6	-	-	-	-	1	7.1	-	-	-	-	2	14.3	14
33.	Non Metal Products	18	64.3	-	-	1	3.6	-	-	2	7.1	3	10.7	4	14.3	28
34.	Basic Metal	30	68.2	2	4.5	2	4.5	-	-	1	2.3	-	-	9	20.5	44
35.	Metal Products	52	70.3	5	6.8	3	4.1	-	-	5	6.8	3	4.1	6	8.1	74
36.	Machinery and Equipment (non electrical)	115	84.6	4	2.9	3	2.2	2	1.5	-	-	3	2.2	9	6.6	136
37.	Electrical Machinery and Equipment	131	80.4	3	1.8	5	3.1	1	0.6	3	1.8	2	1.2	18	11.0	163
38.	Transport Equipment	34	66.7	1	2.0	2	3.9	5	9.8	-	-	8	15.7	1	2.0	51
39.	Other Industries	35	68.6	1	2.0	3	5.9	1	2.0	-	-	4	7.8	7	13.7	51
	Total	877	66.9	74	5.6	58	4.4	71	5.4	42	3.2	57	4.4	131	10.0	1310

Table 4: Percentages of Forms of Payment in Each Sector
Form of Payment (Percentages)

	Percentage on Sales	Fixed annual Payment	Single Global Payment	Percentage of Volume of Production	Free	Payment on Services	Others	No Information	Total Number of Contracts
20. Food Industries	46.2	9.2	1.5	12.3	9.2	1.5	4.6	15.4	65
21. Beverages	12.7	1.0	-	10.8	12.7	-	38.2	24.5	102
22. Tobacco	7.7	7.7	-	69.2	7.7	-	-	7.7	13
23. Textiles	32.0	32.0	8.0	20.0	-	-	4.0	4.0	25
24. Shoes and Garments	65.0	2.5	-	10.0	7.5	-	-	15.0	40
25. Wood	50.0	-	-	25.0	25.0	-	-	-	4
26. Furniture	25.0	25.0	-	12.5	25.0	-	-	12.5	8
27. Paper and Pulp	68.4	-	-	15.8	-	-	5.3	10.5	19
28. Printing	50.0	16.7	-	16.7	-	-	16.7	-	6
29. Leather	33.3	-	-	-	-	-	66.7	-	3
30. Rubber	62.5	4.2	-	12.5	-	4.2	-	16.7	24
31. Chemical Industries	61.1	4.8	2.0	8.6	8.6	2.3	3.2	9.3	440
32. Oil Products	50.0	14.3	-	7.1	-	-	14.3	14.3	14
33. Non Metal Products	67.9	7.1	-	7.1	3.6	3.6	10.7	-	28
34. Basic Metal	45.5	20.5	4.5	13.6	4.5	2.3	-	9.1	44
35. Metal Products	52.7	9.5	-	13.5	8.1	-	4.1	12.2	74
36. Machinery and Equipment (non electrical)	67.6	8.8	1.5	1.5	6.6	1.5	3.7	8.8	136
37. Electrical Machinery and Equipment	69.3	4.3	1.2	6.1	5.5	1.8	1.2	10.4	163
38. Transport Equipment	72.5	5.9	-	9.8	2.0	2.0	2.0	5.9	51
39. Other Industries	66.7	5.9	2.0	7.8	7.8	3.9	3.9	2.0	51
Total	56.8	6.6	1.5	9.5	7.3	1.7	6.0	10.6	1310

With possible exceptions, the average level was higher than the 3 percent required previously, in order to obtain fiscal incentives under the Law of New and Necessary Industries. That limit was surpassed by the food industry contracts, but unfortunately the number of agreements is too small to allow for any conclusions. The payments for resins and synthetic fibres do not seem to be very high, especially when they are compared with other branches of the chemical industry. Although the technology market of the capital goods industry is considered to be defective (8), the payment levels do not seem to be excessive.

Finally, the high average in cosmetics is revealing. The Ninth Industrial Census of 1970 includes the following information on patent, trademark, and "other royalties" (9) expenditures.

Official Statistical Classification for Industrial Census	Payments on Royalties
2021 Milk pasteurization	116,000
2022 Manufacture of cream, butter and cheese	1,060,000
2023 Evaporated and powdered milk	31,640,000
2032 Fruits and vegetable processing	1,646,000
2055 Soluble coffee and tea	25,264,000
3121 Fertilizers	2,342,000
3131 Synthetic resins	27,746,000
3132 Artificial and synthetic fibres	15,743,000
3151 Pharmaceutical products	140,825,000
3161 Cosmetics and perfumes	68,969,000
3611 Agricultural machinery and implements	6,078,000
3621 Machinery for wood and metals	568,000
3632 Machinery for specific industries	7,257,000
3652 Transport machinery	3,184,000
3659 Repair workshops	3,290,000
(Subtotal of 5 classes of branch 36)	20,377,000

The pharmaceutical and the cosmetic industries have the highest royalty payments. The machinery branches had, in that year, a third of the total payments made by the cosmetic census classification. Hence, the high level of royalty rates found in the contracts of branch 316 is not surprising.

The data presented illustrate the differences existing in each branch, and emphasize the fact that an instrument such as the RNTT must carry out detailed studies at an industrial branch level with the purpose of forming the criteria that will give an adequate treatment to each case. These studies should analyze not only the basic information of each contract, but all its characteristics.

Internal Criteria for the Application of the Law

The five causes for the rejection of a contract (contained in the XIV fractions of Article 7) are very difficult to manage because their interpretation may vary in different cases. Since the Registry decides on the merits or deficiencies of each individual contract, it has been necessary to approve

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(8) See: Programming the Development of the Capital Goods Sector in Mexico, ONUDI-NAFINSA, April, 1973, mimeo, p. 282.

(9) The "other royalties" concept probably refers to technical assistance.

internally the criteria that must rule the application of this article. However, the particular circumstances of each contract are always taken into account. It is important to examine briefly the Registry's principal internal criteria: (10)

(a) When the price is not related to the acquired technology or constitutes an unjustified or excessive burden on the national economy (Art. 7, section II). As stated before, the preoccupation concerning payments to foreign countries exists in the Registry's origins. It is estimated that the total sum paid by Mexico to foreign countries for royalties and technical assistance was approximately 2500 million pesos (11). This amount represents 15 percent of the export value of that year and the same study predicts that those payments would increase to a rate higher than 20 percent annually. Consequently, the RNTT has paid special attention to this problem.

Nevertheless, it is extremely difficult to give a precise evaluation of the cost of technical know-how. The price of technology is fixed by the influence of the different parties involved in the negotiation, and that influence is conditioned by two factors: (i) In order for the buyer to make a correct evaluation of the technology that he wishes to acquire, he must have information on the technology's characteristics. The market is imperfect and information does not circulate freely. Experience has shown that, if the buyer has this information, he probably would not need to acquire additional information (12). (ii) The buyer's marginal cost to develop the technology is generally very high, but the marginal cost for the seller to commercialize technology is very low (frequently reaching zero) (13). This has a very important effect on the position of both parties involved in the negotiation.

Consequently, the RNTT is faced with the very difficult task of evaluating the price. The general principle is that the total price must be clearly stipulated in the contract. From the sample of 47 contracts examined for this study (14), six had not clearly established the sum that was to be paid (one did

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(10) RNTT's internal document General criteria resume on the application of the Law on National Registry of Transfer of Technology and the Use and Exploitation of Patents and Trademarks.

(11) UNCTAD. 1971. Transmission of Technology. Third period of sessions, Santiago de Chile. Report TD/106, November 10, 1971. This information must be used carefully, since the statistics are incomplete.

(12) Arrow, K.J. 1962. Economic welfare and the allocation of resources for invention. In The Rate and Direction of Inventive Activity, National Bureau of Economic Research, Princeton University Press, pp. 609 to 626. Besides, the acquirer very seldom has information on alternative sources of technology.

(13) Vaitsos, C. 1970. Alternative strategies in the commercialization of technology: the underdeveloped countries' point of view. Cartagena's Agreement Meeting, Lima, October 1970. It is important to take into account that the technical know-how does not wear out with use.

(14) It is important to remember that those 47 contracts belong to engineering firms.

not even mention the form of payment); although they broke the "golden rule," the RNTT approved and registered them. The second guideline establishes that the taxes related to such payments shall be covered by the enterprise that receives the income (the licensor). But once again, inconsistencies are detected, since in eight contracts the recipient was responsible for paying the taxes for the earnings of the enterprise who sold the technology, and in six cases it was a public sector enterprise. Seven of the eight contracts had already been approved.

The criteria indicate that the payment formula stipulated in the contract shall be taken into account. However, preferences are not established among the various forms of payment. These may be of different types: one cash payment; royalties while a contract is in force, up to a fixed amount or during a specific period of time (calculated on sales, production, volume or income-yield capacity rates); payment in shares from the recipient (capitalization of technology); periodical payments (not linked to sales or profitability); separate payments for specific technical services; and combinations of the mentioned formulae. Evidently, it is more convenient to link royalty payments to profits than to payments in equity from the recipient. In fact, this is an essential point and should have been included in the text of the Law. Capitalization of technology is not only a form of payment, which is very costly if the profits to be paid to the holder of the shares are taken into account, but it also represents a way of controlling the technology recipient. Such practice should, therefore, be forbidden or at least severely limited (15). The use of different forms of payment should be generally conditioned by the contract's objective. (A service rendered in only one act should be paid in cash and should not require continuous payments.) The evaluation is very difficult in the case of a complex contract that uses several formulae, because payments cannot be related on a one-to-one basis to the different services included in the contract.

The payment issue is obviously linked to the duration of the agreements. No contract may last more than 10 years, an excessively long period for some industrial branches. However, the RNTT should define, whenever possible, the criteria to reduce the period during which royalties are paid. Another important aspect, which has been neglected by the law and the internal criteria, is the amount of inputs (raw materials, intermediate goods and components) that the acquirer shall receive from the licensor. The value of these imports (CIF cost + import taxes + management costs) must be subtracted from the total sum that serves as a basis for the calculation of royalties, whenever these are calculated on sales, so that these are paid on the basis of value added to the recipient's plant. Besides, the internal criteria deal in a very superficial way with the problem of licensor participation in the licensee's equity. The only references on this issue indicate that, as a general rule, royalty payments shall not be allowed in licensing agreements regarding trademarks and patents whenever the licensor is a major participant in the licensee's capital. Besides admitting exceptions to the "general rule," this criterion excludes any enterprise with a 20 to 30 percent licensor's participation. Nothing justifies not fixing lower royalty rates in all cases where the participation is higher

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(15) The survey revealed that this practice is not unknown in Mexico; one of the enterprises that had technology contracts declared having paid in equity. This does not mean that this formula is the most commonly used.

than 20 percent (16). Finally, the criteria indicate that royalty payments on duties regarding patent use shall be maintained at the same levels as those for trademarks. Although the problem of the contracts' content shall be examined later on, it may be stated that, as a "general rule," it is very defective. Trademarks do not constitute technical know-how and their treatment cannot be equaled to the one given to technology, although it is true that in some cases their commercial value is much higher.

The RNTT has not established maximum limits on royalty payments by industrial branches. The belief that the Registry only authorizes payments of up to 4 percent on net sales is unfounded. This originated in the requirement established by the Office of Industrial Promotion in order to have access to the advantages of the recently repealed Law of New and Necessary Industries or the Decree on Decentralization and Industrial Development (17). Perhaps it is not convenient to fix a limit because it is true that "each contract is different," but more precise criteria must be designed to emphasize the advantages and disadvantages of the various formulae within the particular economic context of Mexico. The real problem in the payments' issue refers to the type of goods that shall be produced, and that shall be reviewed later. The RNTT indicates that section II of Article 7 must be interpreted in the sense of evaluating the payments, both in private and social terms. Although the methodologies for project evaluation in terms of their social-cost benefits have severe deficiencies (a fundamental one being that a project is not valued as a function of other alternative projects), the RNTT has not had, up to the present time, the technical capacity to accomplish such an analysis of the payments. Unfortunately, there is no legal basis to limit technology royalty payments to produce cosmetics or apply trademarks for luxury garments.

(b) When excessive terms of duration are established, which under no circumstances may exceed 10 years (Article 7, section XIII). The duration of an agreement must generally be determined according to the type of technology that is being transferred, but a period of less than 10 years is considered to be more than sufficient for an adequate assimilation (or even adaptation) of the acquired technology. The RNTT establishes that, in those cases where technology can be assimilated in a shorter period of time, the 10-year duration shall not be authorized. It also establishes that contracts that can be extended automatically for specific periods of time shall be approved only when the licensee has the option to conclude the contract in any of those periods, and when the initial term does not exceed 10 years. When this possibility is admitted, the initial resolution, which clearly states that no exception shall be allowed, is contradicted. A contract's extension is admissible only when it will lead to improvements or to new know-how, developed by the licensor during the period when the initial contract is in force. As was stated earlier, the Registry does not mention that the term must be evaluated according to the payments and technology included in the contract. When the technology is found

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(16) India constitutes a good example of how these aspects should be regulated. Capitalization of technology is limited to 10 percent of the equity, but generally they try to avoid it; royalty payments are often limited to 5 years; finally, the imported inputs are discounted when the licensor's participation in the equity is higher than 20 percent.

(17) These instruments with an implicit technology policy shall be analyzed later.

in a sector of rapid technical change, the licensee who accepts a 10-year term shall be paying royalties during the last 2 or 3 years for a technology whose life cycle has concluded. For a more conventional technology in a branch of limited dynamism, the licensee will generally be able to absorb it in a period of 5 years.

According to the Registry's criteria, a contract will be admitted when a term to protect the confidential information furnished by the licensee is established, provided that such a term does not exceed 10 years from the date the information is received. It is not clear whether the term must begin from the last receiving date (in the hypothetical case where the information could be divided, and therefore periodically delivered) or from the initiation of the contract. But since the RNTT approves contracts where the licensee still has obligations after the termination of the agreement, provided that it does not last longer than the term stated by the law (18), one must interpret that the obligation to respect the confidentiality is valid, even after the date on which the contract ends. To sum up, the interpretation of this section is very unfortunate, since the law does not authorize the establishment of any obligations after the contract ceases to be in effect. Instead, when section XIII prohibits excessively long terms, it clearly rejects the obligations that prolong the life of a contract beyond its conclusion. The proverb that "whatever is not forbidden is permitted" does not apply in this case. Finally, the internal criteria do not make any reference to the problem of the clauses on the termination of the contracts. There are many types of clauses; however, the use of clauses that allow the licensor to end a contract in an unilateral way without a justifiable cause must be rejected. The "involuntary" breach of contract is not a justifiable cause. The clauses on "unforeseen circumstances" must be clear and must be carefully stated to prevent abuses. In any case, the licensee should be able to use the information included in the contract, even after its conclusion.

(c) When the object of the contract is the transfer of technology freely available in the country (Article 7, section I). Apparently, this section does not present any major problems in its interpretation and application. Its purpose is to avoid the celebration of contracts that include licenses on patents that have become public domain, either because they have expired or have become void, or on unpatented information of public domain. Another guideline is that the contract shall not be accepted when it involves know-how that the recipient is able to "carry out by itself, without any additional cost." In those cases where a Mexican research centre is willing to furnish free technology and the same conditions offered by a foreign supplier, the contract shall not be approved; the acquirer shall be forced to obtain the technology from the R&D centre. In all these cases, the Registry stipulates that this fraction shall be applied if the free technology available in the country is substantially similar to the one they wish to import; that is, if its characteristics, yields and specifications are fundamentally the same.

In practice, this fraction has no value. The text of the Law itself nullifies the potential of this regulation to substitute the import of technologies, since the word "free" places the possible national suppliers in a disadvantageous position; in fact, they must be able to provide the know-how for free. The literature emphasizes the fact that research and experimental

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(18) According to the Registry's internal criteria.

development need to be compensated through "adequate" payments of royalties, duration of patents, etc. Therefore, it is not clear why, in the case of a national supplier, these considerations have no application. It would have been better to leave the possibility open for a technical advisory committee, with sufficient information on national suppliers of technology in the various industrial branches, to be in charge of deciding whether the technology was "substantially similar" and with the power of determining under which conditions (cost, duration of the contract, etc.) the transference should be carried out (19).

The RNTT states that a contract shall not be authorized when the recipient is able to acquire the knowledge included in the contract without an additional cost. This guideline is undoubtedly lost in practice, since it supposes that an evaluation of the recipient's technical capacity should be carried out in order to determine whether the company has access to that information. Nevertheless, section I must be applied in those cases where the transferred technology has not become public domain, but is easy to copy without the risks of invading previously acquired industrial property rights. Copying is a useful method of acquiring technology and perhaps it is the least costly. The criticism of patent lawyers that copying is illegal and equivalent to piracy lacks legal bases, and it implies turning away from a very useful instrument for autonomous technological development strategy. A technological copy often implies substantial modifications and adaptations that alter the characteristics of the copied technology in such a way that its impugnment is legally untenable. This is why the patent system has lost so much importance, in spite of the patent lawyers, its principal beneficiaries (20). The Mexican State must abandon the narrow legalistic positions that discourage copying, and establish instruments that promote it in a responsible and selective way. Copying evidently implies costs, and that is precisely why it could be supported with technical and legal assistance.

(d) When various restrictions for the purchaser are established (various sections of Article 7). The abuses and restrictions that the RNTT seeks to eliminate are classified under two categories: those which can never be permitted, and those where exceptions are allowed (21). Among the first we find the obligation to submit, in an onerous or gratuitous way, to the technology supplier all innovations or improvements obtained by the purchaser (section IV, Article 7o); when limitations to the purchaser's research or technological developments are set up (section V, Article 7o); and when exportation of goods and services produced by the purchaser is forbidden or restricted in a way contrary to the country's interests (section VII, Article 7o). Besides, no

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(19) Such a committee could use INFOTEC's information on national suppliers of technology.

(20) This can be the only explanation to their violent criticisms concerning the RNTT's law and the attempts to update the legislation on industrial property. The irrationality of their positions is clearly seen if we consider that they are criticizing legislation on transfer of technology and patents which originated in the Sherman Anti-Trust Act, the Treaty of Rome which gave birth to the European Economic Community, Brazil's Code of Industrial Property, and several instruments of Japan's industrial policy.

(21) See: Article 8 of the RNTT Law.

exceptions are allowed when the technology is freely available in the country (section I); when the lifespan of the contract is excessively long (section XIII); and when acknowledgement of lawsuits, arising from the contract's interpretation or execution, is submitted to foreign courts (section XIV).

However, the Registry admits contracts in which there exists a reciprocal obligation of interchanging information developed by any of the two parties: this criterion goes against the Law, since in this point no exceptions are admitted (22). The way the Registry interprets section V is still more serious. This fraction forbids restrictions on R&D carried out by the purchaser. The RNTT accepts contracts in which incorporation of improvements is justifiably limited or conditioned, especially when trademarks in contracts are involved. In the first place, the Law clearly establishes that no exceptions will be accepted for this fraction (there can be no "justifiable causes"). In the second place, this criterion is opposed to the objective of adapting foreign technology to local conditions. Finally, it is precisely when trademarks are involved in the contract that the State considers that bases have been found to introduce this type of limitation which strengthens the purchaser's dependency vis-a-vis the supplier. This interpretation is in conflict with section VIII of the same article that rejects any prohibitions in using complementary technologies. But again, the Registry accepts contracts with this limitation when the usage of trademarks (property of the licensor) is included. This interpretation is incorrect, because it weakens once more the purchaser's position. In any case, a difference between limitations in using complementary technology at product's level and production technologies should be established. In the latter ones, no limitation would be justifiable. It seems that the RNTT grants a special treatment to those contracts involving trademarks, thus recognizing the strong dependency, which increases every day, towards the supplier whenever this element is involved. It would be better to put aside so many exceptions and to stipulate that the use of foreign trademarks for exportation should be linked to national trademarks so that, when the contract expires, the purchaser would be able to have access to the market cultivated by him during the contract's lifespan. The use of new foreign trademarks for products destined to a national market must be discontinued.

The RNTT accepts limitations that might result from national legislations of the technology supplier with regard to restrictions on exportation. This refers, in particular, to those cases in which a foreign enterprise, for example, a North American one, is limited by legal or regulatory dispositions pertaining to that country and that have to do with exporting to certain countries such as Cuba. Before setting up a general rule, the Registry must first analyze, in collaboration with specialized organisms in foreign trade, whether the possibility of exporting to those countries exists. Other Latin American countries have operated in this way, and have forced the U.S. Department of Commerce to authorize these exports.

Finally, it has been said that section III, which prohibits intervention from the licensor in licensee administration, constitutes an incentive to transfer technology linked to capital, mainly through joint ventures. This way of transferring seems to be preferred by technology suppliers for it ensures a greater price and also a greater control, particularly when the technology can be rapidly assimilated, ending thus with the receiver's dependency towards the

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(22) In any case, it must be pointed out that in practice it might be very difficult to distinguish between improvements developed after signing the contract and development of new technologies.

supplier. It is difficult to speculate on these effects of section III; however, the RNTT makes for some exceptions, when the contract involves trademarks and when assistance is oriented towards maintaining quality levels. A recent analysis on the Registry's criteria has shown that even if the contracting parties would consider this possibility to evade the application of the law, it would still be necessary for the National Commission on Foreign Investments to authorize the establishment of this type of enterprise (23). This statement, however, is incorrect, for according to the Commission's interpretation of the Law to promote Mexican investment and regulate foreign investment, such authorization is not required when a new enterprise is set up with a maximum foreign participation of 49 percent (or with the specific limits established for certain industrial branches).

Effects of the Instrument

This section examines the effects of the Registry in the light of two basic sources of information: (a) the report on the activities of the General Office on the Transfer of Technology and (b) the results of the survey.

(a) When the RNTT Law was approved, there existed no precise notion of the number of contracts which had been signed previously. A special treatment was granted to these acts, requiring them to be presented before the Registry, first to "take note" of their existence and, again, within a space of 2 years from the time the Law came into effect, to adjust them to the provisions of the new Law. In the first 3 months the Law was in effect, 5625 contracts were presented to the Registry; of these, 4112 (73 percent) were presented for information purposes, and 1513 were presented to be registered with the RNTT (24). This mass of contracts indicated a far greater dependence on foreign disembodied technology than was expected. For July 1975, 3 years and 6 months after the Law came into force, the total number of contracts rose to 6497, and were distributed as follows (25): contracts submitted for information purposes, pending application for registration, 1937; contracts submitted for information purposes, and declared void, 81; and contracts with registration applied for, 4479.

Decisions have been made on 3081 of the contracts whose registration had been applied for: 72.3 percent affirmative (2225 contracts); and 27.7 percent negative (856 contracts). Many contracts whose registration was at first denied have been subsequently modified and presented again to the RNTT; thus, a total of 1292 negative determinations was reduced to 856, after 222 contracts were altered and approved on a second application and after the Registry itself reconsidered 214 decisions. Table 5 presents the violations of the Law for the 856 negative judgements.

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(23) Soberanis, J. Alvarez. 1975. Comentarios acerca de los criterios de aplicación de la Ley, expedidos por el Registro Nacional de Transferencia de Tecnología de México (Comments on different criteria on application of the Law, issued by the National Registry of Transfer of Technology of Mexico). La Propiedad Intelectual, No. 3, p. 168.

(24) De Maria y Campos, M. 1974. La política mexicana sobre transferencia de tecnología: una evaluación preliminar. Comercio Exterior, May, p. 472.

(25) Resumen de Actividades de la Dirección General del Registro Nacional de Transferencia de Tecnología: 1o. de febrero de 1973 a 31 julio 1975. Unpublished internal document of the RNTT.

As would be expected, excessive or unjustified payments are the cause for rejection which appears most frequently in the negative decisions. If 80.4 percent of the negative judgements mention this violation, it is because the emphasis in the RNTT internal rules falls upon the amounts of these payments. Moreover, there is no reason why "unjustified burden" should be restricted to cases in which an explicit financial flow exists (for example, when the royalties are very high). When excessive obligations are imposed upon the recipient, even when they are not expressly mentioned in the other sections of the 7th Article (for example, the obligation to make expenditures for commercial publicity), the second section can justifiably be invoked. Section XIII, which is closely tied to these payments, is the section with the second greatest number of violations: it was mentioned in 338 negative resolutions.

The exceptionally low number of violations of section I is not really surprising, since the interpretation of the RNTT is quite restricted. This instrument lacks the information necessary for an adequate application of this provision. The search for patents can be a problem, for the archives of the General Office of Industrial Property are handled with difficulty (26). Nor does a stock of information exist to supply facts about the technologies that Mexican firms or research centres could supply in alternative forms.

The violations of the sections on restrictive clauses (III to XII) total 939. In this group, the most frequent infractions involve the limitations imposed by the licensor on volumes of production or the imposition of sales prices (section XI). The RNTT Report makes clear that in the majority of cases these originate in clauses that oblige the recipient not to use the technical knowledge transmitted once the contract has expired. However, the internal criteria of the Registry indicate that this type of clause is in fact a violation of section XIII, which forbids agreements of excessively long duration (and by extension, obligations which extend beyond the termination of a contract).

It proves difficult, with this information on the number and type of violations, to evaluate the effects of the application of the Law. But even though a precise calculation has not been made, it is evident that there has been considerable success in reducing the sum of payments. In a recent lecture, it was asserted that, between January 1973 and August 1974, a saving of as much as 900 million pesos was achieved, and between September 1974 and August 1975, the saving was about 1800 million pesos (27). (Paradoxically, the same news source gave a declaration of the General Director of CONACYT to the effect that, in the first 10 months of 1975, the subsidiaries of transnational corporations had paid 4500 million pesos abroad.) (28) Furthermore, the study by Fajnzylber and Martínez Tarragó, based on figures from the

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(26) In fact no routine interchange of information exists at present between the RNTT and the Office of Industrial Property.

(27) Consult the article on the lecture by Ing. Carlos Rojas M., President of the Industrial Development Committee of the American Chamber of Commerce. Excelsior, October 2, 1975, p. 25A.

(28) Excelsior, October 2, 1975, p. 25A.

Table 5: Violations of Article 7 of the Law on the RNTT which have Occasioned 856 Negative Decisions.

Sections of Article 7	Number of Decisions Mentioning Each Violation	
	Number	Percentage of Total Negatives
1. Part or all the technology involved was found freely available in the country.	5	0.58
2. The price did not show a relation to the technology acquired or constituted an excessive and unjustified burden for the national economy.	684	80.4
3. Undue intervention in the administration of the licensee.	99	11.6
4. Obligation to yield to the supplier for free or onerously the improvements, patents, or trademarks of the licensee.	168	19.7
5. Restrictions on the technological development of the recipient.	109	12.8
6. Obligation to acquire raw materials, intermediate products, machinery, or equipment from the supplier of the technology.	75	8.82
7. Export restrictions contrary to the interests of the country.	164	19.29
8. Prohibitions against use of complementary technology.	21	2.47
9. Obligation to sell exclusively to supplier of the technology goods produced by the recipient.	14	1.64
10. Obligation to use permanently personnel appointed by the licensee.	4	0.47
11. Limitation on production volume or imposition of sales prices.	278	22.70
12. Obligation to sign exclusive sales or representation contracts for the national territory with the licenser.	7	0.82
13. Establishment of agreements of excessively long duration.	338	39.76
14. Subjection to foreign laws or obligation to submit to foreign courts the fact or resolution of trials which might be occasioned by interpretation or compliance with the contracts.	168	19.76
Negative determinations exclusively for section II.	249	29.29
Total violations in 856 negative determinations.	2134	

Source: Based on "Resumen de Actividades de la Dirección General de RNTT en materia de evaluación e inscripción de contratos" (February 1, 1973-July 31, 1975) Unpublished document.

Ministry of Finance and Public Credit, calculated the payments made in 1971 for technical assistance and royalties as 2082.5 million pesos (29). This last figure is the most reliable one, and if we accept a yearly rate of growth for these payments of 20 percent (the UNCTAD estimate for this decade), the payments would have been 3598.5 million and 4318 million pesos in 1974 and 1975, respectively. This means that savings of 2700 million pesos would represent 26.4 percent of the payment which, according to these calculations, would have been made between January 1973 and August 1975. The savings seem high, especially in the light of the statements by the General Director of CONACYT. But it is not clear whether these savings concern future payments reduced to their present value (in the case of royalties payable during the term of recently signed contracts) or whether they are net savings for the period mentioned. In conclusion, a more precise evaluation is needed from the officials of the RNTT. Without any doubt, these savings are quite superior to the budget of the RNTT, but it is necessary to examine the quantitative data broken down by industrial branch, above all with the goal of defining new policy criteria (30).

Concerning the effects of the Registry on the Transnational corporations operating in Mexico, it has been said that these units "are much more adaptable to official criteria on the transfer of technology," even though the levels of payments for royalties are greater in the case of the subsidiaries (31). As already indicated, the transnational firm does not need to resort to tie-in clauses to compel subsidiaries to follow its instructions. The main firm can limit exports, oblige a subsidiary to acquire inputs only from other firms in the group, overbill or underbill these transactions, restrict use of complementary technologies, etc., without the least indication of such restrictions appearing in their contracts. This fact acquires a greater importance when one considers that in Mexico the greatest part of payments for royalties and technical assistance is made by the affiliates of these corporations: around 80 percent in 1971 (32). Hence, the largest portion of the imports of disembodied technology is carried out through captive transactions, that is, within the transnational corporations. Advantages exist in channelling the remission of profitability through payments of royalties, since the fiscal charge is less than that levied on remitted profits.

Finally, the Registry has been of great assistance to national entrepreneurs in increasing their leverage in negotiations. This is due to the fact that the simple establishment of the instrument has made many entrepreneurs aware of undesirable contractual practices. Furthermore, in many

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(29) Op. cit., p. 591

(30) It would also be necessary to examine the information of the exports that have been generated with the aim of eliminating clauses that limit the possibilities for export.

(31) Aguilar, E. 1975. The transfer of technology in Mexico and the multinational corporation. A study presented in the Symposium on the Economic Impact of Transnational Corporations on the Receiving Countries, organized by the Centro de Investigación y Docencia Económica (CIDE), March, 1975, p. 13.

(32) Fajnzylber and Martínez Tarragó, op. cit., p . 593. The figure concerns payments of the manufacturing industry for these purposes.

cases the potential license simply presents the supplier with an accomplished fact (the Law on the RNTT), which is beyond his capacity to modify. In others, the entrepreneur has chosen to conduct his negotiations with the participation of officials of the RNTT.

(b) Of the 67 firms visited in the course of the survey, 36 responded that they were recipient parties in one or more licensing agreements. The contents of these agreements have been examined in the section on patent system. The agreements were distributed in the three branches in the following manner: capital goods, 16 firms; petrochemicals, 11 firms; and foods, 9 firms.

The forms of payment utilized in these agreements are presented in Table 6. The data were obtained for the 36 companies, and, as was to be expected, the greatest portion of the cases employed the formula of royalties on net sales during the time the contract was in effect (27 cases). No company indicated that it paid royalties on profits, and the royalties were paid up to a fixed sum ("sign-off royalties") in only three cases. In one case, the technology had been paid with 20 percent of the equity (which exceeded 250 million pesos), and neither machinery and equipment nor engineering services were included in the payment (33). In most of the firms visited, a marked indifference (and in some cases, total ignorance) was found towards the various modalities of payment.

Table 6: Forms of Payment Used in the Contracts of 36 Firms.

Forms of Payment	Capital Goods	Petro-chemicals	Foods	Total	Percent
Royalties on net sales	14	6	7	27	75
Royalties on profits	-	-	-	-	-
Payment of a lump sum	1	1	-	2	5.5
Royalties up to a fixed sum	-	2	-	3	3.3
Payment with stock in the firm	-	1	-	1	2.7
Other forms of payment	1	1	1	2	8.3
Total	17	11	8	36	100.0

Note: The other forms of payment were installment payments up to a fixed sum in one case and indirect expenditures (trips, travel allowances, etc.) in the other two cases.

All these firms presented their contracts to the Registry and the effects on the various clauses of the contracts were examined. Five firms explained that their contracts were in process, and 16 firms replied that

(33) The contract for this company was in process, for it had been presented for information purposes. It is obvious that the RNTT will not be able to modify this accomplished fact because the plant is already functioning.

their contracts had not undergone any alteration (that is, they had not presented any violations of the Law on the RNTT). Of these 16 companies, 13 were subsidiaries of transnational corporations. This confirms the conclusion that clauses in violation of the Law on the RNTT are not necessary for restraining the behaviour of subsidiaries.

In ten other cases, the registration of the contracts had involved modifications in the clauses of these agreements. The question presented to the interviewed subjects contained the following effects on the contracts: (i) The sum of payments for the technology acquired was reduced; (ii) restrictive clauses on exports were eliminated; (iii) the formula for payment used in the contract was altered; (iv) restrictive clauses on adaptations of the technology acquired were eliminated; (v) greater guarantees for your firm were included; (vi) restrictive clauses on the use of trademarks, which are the subject of the contract or contracts, were eliminated; (vii) a clause that permits your firm to sublicense the technology, which is the subject of the contract, was included; (viii) your firm was linked to national research centres; (ix) the duration of the contract or agreement was reduced; and (x) other effects (specify).

Three of these possible effects were never mentioned: elimination of restrictive clauses on trademarks, inclusion of a sublicensing clause, and links with national R&D centres. Table 7 contains the responses of the ten companies where effects were produced. It is interesting to point out that, in the capital goods branch, restrictions on exports and on adaptation of technology were eliminated for the same affiliate of a transnational corporation (100 percent of its capital is controlled by the head firm). In turn, for two national firms producing machine tools, the effect was the inclusion of greater guarantees for the recipient firm. Under the heading "other effects," two cases stand out: the change of a clause on foreign courts and laws; and the elimination of a restriction against a subsidiary's continuing to manufacture certain models of machinery for the construction industry if the main firm discontinued this line of machinery.

In the petrochemical industry, it is appropriate to clarify that most of the responses were from one firm, which has had foreign participation of 39 percent since 4 years ago. The contracts, which are alluded to in the responses, were in effect when the Registry was established, and in the interview it was indicated that the general effect on this firm involved making an inventory of all its agreements, revising them, and adapting them to the new Law before submitting them to the RNTT. These ex ante effects are positive and are not reflected in the Registry report on violations of Article 7 of the Law. It is likely that many firms conducted an examination and evaluation of existing contracts. In the case of this firm, contracts were even rescinded.

For the food industry, the only effect detected was modification of the formula for payment in a contract. From the responses gathered, it is difficult to determine the particular effects of this instrument on each industrial branch, but it seems that a special treatment of contracts involving trademarks will have greater implications on the branches where these factors are more common (as in foods).

Conclusions

The need to establish instruments that will regulate the commercialization of disembodied technology arises from the concern about the amounts of payments abroad for technology and about restrictions imposed on exports. Subsequently, as the analysis of the characteristics of contracts has become more

Table 7: Effects of the RNTT on Contracts for Technology

Effects	Sectors			
	Capital Goods	Petro-chemicals	Foods	Totals
Amount of payments for technology acquired was reduced	1	2	-	3
Restrictive clauses on exports were eliminated	1	1	-	2
The formula used for payments was altered	-	-	1	1
Restrictive clauses on adaptations of technology acquired were eliminated	1	1	-	2
Greater guarantees for the firm were included	2	1	-	3
The duration of the contract or agreement was reduced	-	1	-	1
Other effects	3	1	-	4
Without effects	7	5	4	16
In process	-	2	3	5

complete, the elimination of other types of restrictions related to the technological behaviour of the recipient has been desired.

The greatest part of the technology (embodied and disembodied) that is used in industry is of foreign origin. The dependence of the industrial plant upon external sources of technology (and trademarks) is a real fact which has instigated a State policy to make it less onerous. The instrument which was established seeks to examine and control the formal conditions under which commercialization of disembodied technology is conducted, and attempts to eliminate the abuses and restrictions frequently included in these contracts. However, it is imperative to point out that structural character of technological dependence is merely reflected by these contractual conditions; elimination of these does not necessarily involve elimination of the problem. In the final analysis, the terms through which dependence is revealed are being renegotiated, without facing the objective of elimination or diminishing dependence itself. Even within this framework, the Registry is an instrument of limited scope, because of its aims and because of the defects of the Law. The central purpose of the Registry is to eliminate abuses and restrictions, but these conditions are a consequence of a situation of technological dependence. In cases where dependence is quite marked (for example, when the recipient has used trademarks which are the property of the supplier during a set period), the RNTT cannot eliminate the abuses. In these cases, the negotiating position of the supplier is so strong that it can threaten not to sign the contract, which would seriously affect the recipient and could even force the closure of the plant. Taking this into account, the RNTT has found itself obliged to approve contracts that otherwise would have been rejected under the terms of the Law. Another of the fundamental aims of the RNTT is to diminish payments made for disembodied technology. In Mexico this measure has not been accompanied with a limitation on the levels of profits that direct foreign investment can remit abroad. Therefore, while the taxation through this channel is higher, foreign direct investment can be used for remission of profitability. Besides, the effects of the RNTT on transnational enterprises are neutral, since it is not necessary to introduce any restrictive clause into the contracts for them. Thus, the use of transfer prices in these captive transactions cannot be regulated by this instrument.

It is a fact that RNTT has strengthened the negotiating position of the purchasers of technology. The consciousness of national entrepreneurs has been sensitized to the implications of the various clauses that can be included in a contract. Moreover, in numerous cases RNTT officials have participated in the renegotiation of contracts and have obtained considerable advantages for the recipients.

The Registry is, then, an instrument that basically protects and benefits the national firm that acquires foreign technology. While it is clearly difficult to determine accurately the savings on payments for royalties, it has obviously been much larger than the Registry's budget (34). Establishment of this instrument was criticized for various reasons in a variety of circles: it was alleged that the number of contracts for technology was very low and did not warrant establishing this control; it was also argued that national firms knew perfectly well how to seek, identify, and negotiate for the technology they acquired; and it was even asserted that "it is incomprehensible

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(34) The Fifth Government Report of the current administration mentioned that the savings reached the figure of 2800 million pesos. The budget for the RNTT is only 7 million pesos.

why the State took over the power to protect the interested parties even beyond what they themselves desire." (35) These arguments should be interpreted more as a desire to strengthen negotiating positions before the Registry than as reasons grounded in reality.

As a regulatory instrument, the RNTT has the inconvenience of encountering the contracts only after the industrial projects have been conceived and negotiated. The terms of financing have already been established; the sources of inputs, the supplier of technology, the location of the plant, etc., are parameters which have already been established when the contract is made known to the Registry. Therefore, the fundamental technological decisions have already been taken (including the decision on what goods will be produced), and only ex post facto some of their formal conditions. This is important because regulations should not only be a means for reducing payments or restrictions, but also a means for altering the dependent situation of the recipient enterprises. The omissions from the Law, and the lack of criteria of interpretation, aggravate the defects of the Registry.

General Recommendations

It has been insistently repeated that the functions of the RNTT should not go beyond the scope of examining the formal conditions of the transfer of technology. However, if the Registry is to become an organism that will contribute more to the reduction of technological dependence, it will have to intervene in the evaluation of substantive or material conditions of the transfer of technology. The following presents various recommendations on this function of the Registry.

Like the majority of mechanisms of industrial and technological policy in our country, the Law on the Transfer of Technology does not establish sectorial criteria that will permit the direction of industrial development. Thus, an entrepreneur can acquire technology for a new process or product in the area of fruit packing or of toilet articles without any restriction. This licensee can be given the same treatment as the businessman interested in obtaining technology to produce an automatic lathe, a large capacity press, or to install a continuous rolling mill. It would be desirable to establish criteria to be able to discriminate against those contracts that concern technology related to products (or their processes) and that in some manner could be considered superfluous, or that would require a universally known technology. For example, all the items comprising the branch of toilet articles, cosmetics, and many pharmaceutical products could be considered harmful for the development process. The technology for the manufacture of beverages is not necessary, and the most important aspect in this branch is the license for the trademark. A general criterion would be not to permit this type of contract when no actual transfer of new technical knowledge of interest to the country occurs. In the industry for processing fruit and vegetables, royalties are frequently paid abroad for technology for canning, labelling, etc., and in the dairy industry, royalties are paid for the use of disposable containers which have a considerable cost and are a pollution factor. In many of these cases,

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(35) F. Vázquez Pando. 1973. Notas para el estudio de la nueva Ley sobre el registro de la transferencia de tecnología y el uso y explotación de patentes y marcas. Jurídica, (5), p. 735. Reducing this argument to the absurd, the social security system and compulsory public education would be unacceptable State interference.

the technology is known and has been assimilated for quite a long time. In other cases, the technology of the processes is known, but the machinery and equipment that permit very large scale production are not made locally. (This is the case with the processing and bottling of milk.) The importation of disembodied technology ought to be limited in these industries. The regulation and control of imports of capital goods, intermediate inputs, and raw materials involves another type of instrument, which will be considered later.

Selectivity must be introduced as a basic criterion in the operation of the RNTT, not only because there are strategic industrial branches that ought to receive adequate support, but also because the technological link with foreign sources is different in various industries. Doubtless, the RNTT will have a greater impact in the case of industries whose technological link to other countries is through licensing agreements (disembodied technology) than on industries whose ties are brought about through the acquisition of machinery and equipment or intermediate inputs (embodied technology). Moreover, licensing agreements contain different elements according to the different industries involved (for instance, trademarks play a basic part in the pharmaceutical industry). The RNTT will have to set differential criteria for the control of conditions for transference of technical knowledge in each sector. It is absolutely imperative that a group or committee be formed to advise the RNTT on the technical content of the contracts. Only in this way can the acquisition of unnecessary technology be avoided in our country.

In dealing with this aspect of the problem, one must recall that marked differences exist among the various types of industries. For example, chemical industries, considered in the "continuous flow" group, can also be subclassified in various groups according to their adaptability, transfer mechanisms, protection or availability of the technology, and the nature of the technology itself (technology embodied in equipment, product and process technology) (36). Other industries such as the mechanical or the electrical and electronic ones have particular characteristics which a mechanism like the RNTT must consider if it wants to influence the material conditions of the transfer of technology.

Selectivity will have to be established in terms of the type of firm. The RNTT already relies upon certain criteria for differential treatment in contracts between head firms and their subsidiaries. (However, these criteria will have to be applied in conjunction with those mentioned above, or they will remain incomplete.) But no definite criteria exist for firms with State participation, decentralized organisms, research centres (like the Mexican Petroleum Institute), mixed enterprises, and joint investments.

A highly important factor not considered by the Law on the Transfer of Technology is the discretionary power of the Registry. It has been said that this mechanism has discretionary power, and in fact it analyses contracts on the basis that "each case is different." Yet, no criteria for examination and approval of contracts have been established on the basis of the following elements: contribution to exports, generation of employment, training of personnel, support of or ties with the national scientific and technological system (including the use of national engineering firms), realization of research activities, regional development and decentralization, use of national raw materials, satisfaction of vital necessities of segments of the population not currently benefitting from the development process. The

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(36) José Giral B. 1974. Manual para desarrollo, transferencia y adaptación de tecnologia química apropiada. Technology Development Group, Chemistry Section, UNAM, Mexico.

levels of royalty payments, duration of contracts, and other similar elements would have to be examined in the light of such considerations.

Another aspect of vital importance is the timing of the moment when the RNTT intervenes. When contracts are presented to the Registry, they have already been signed (and in many cases their execution has already commenced), so that the intervention of this mechanism is ex post to the negotiation process. It is important to point out that the role of the RNTT (supervision and control of the formal conditions of the transfer of technology) is completely in accord with this ex post intervention in these transactions for acquiring technology. Once the Registry is converted into a mechanism for regulating the substantive aspects of these operations, its intervention will have to occur before the conclusion of agreements and not after. This ex ante intervention would have to be subjected to various modalities since it would be practically impossible to intervene in every type of contract made by any company. (The number of contracts presented to the RNTT annually can be estimated at 350-500.) In principle, the ex ante intervention by the Registry could be considered obligatory for all agreements entered into by organisms of the public sector. Through this participation in the negotiation process, the Registry would seek to counteract some negative aspects of the "technological behaviour" of public enterprises and decentralized organisms. One such aspect is that these organisms often find themselves subject to political pressures, and so their risk propensity diminishes (37). Consequently, if they need to acquire a technology, normally they look for something which is "tried and true." This leads to selection of foreign technology without any consideration of the possible intervention of local technical capacity. When process engineering is acquired, it could be compulsory for the supplier to accept the participation of Mexican technicians in the preparation of basic engineering.

In the public sector, the ex ante intervention would seek to implement a policy of acquisition of technology oriented towards centralized contracting for foreign technology. Such technology could later be sublicensed to various firms with the following advantages: (i) A government agency would "buy" the technology and could thus use ample discretionary powers in the choice of the sublicensee and in the negotiation of the sublicense involved; (ii) the presence of various companies all using the same technology would serve to encourage a more competitive structure; and (iii) the outflow of foreign exchange would be reduced. Obviously, this policy would imply very close coordination with several organisms in order to program investment adequately for the branches of industry where technology would be acquired in a centralized fashion, since the operation of plants on inefficient scales would have to be avoided. Hence, the RNTT would have to cooperate with the Ministries of National Property and of the Presidency, with the Committee on Imports of the Public

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(37) More common is the case where the role assigned to those public firms is that of assisting the rest of the economy in the process of accumulation. Thus, the public enterprise finds itself subject to financial restrictions (occasioned by the transfer of the surplus generated in it to the enterprises of the private sector through low prices) and must continue offering a "public service" which necessarily implies having available the most modern and trustworthy technology.

Sector, etc. (38) Moreover, it could begin to work in accord with these outlines through the large State enterprises: PEMEX, the Federal Commission, Altos Hornos de Mexico, etc.

Finally, two recommendations so that RNTT might cease playing a passive role and decidedly enter the area of promoting and encouragement activities are given. Section I of Article 7 sets the bases for directing part of the demand for foreign technologies towards internal sources. But the interpretation of the law is erroneous, for national institutions which have developed technologies are placed in a disadvantageous situation vis-a-vis foreign suppliers. The adequate interpretation ought to be the following: the RNTT will not register the contract when a national supplier offers the same technology under similar conditions to those of the foreign supplier. Here, the "same technology" would be understood to mean a technology equal in its "results," for this section is quite difficult to apply. In other words, this technology offering equal results must be as freely available in Mexico as it would be abroad.

The possibilities for copying technology are quite extensive in various branches of industry (39). Copying implies developing technology on the basis of already existing knowledge. It has multiple advantages: low cost, adaptability to local conditions, etc. However, avoiding the infringement of industrial property rights requires that copying be carried out in a responsible manner; and, as the capacity for copying is a scarce resource, it needs to be directed and completed in a selective way. Consequently, a committee for legal and technical assistance should be formed to take charge of promoting (and if necessary, helping to finance) this activity. Such a committee would be formed by CONACYT, INFOTEC, the Nacional Financiera, the RNTT, and the Office of Industrial Property, and could invite certain research and experimental development centres to participate in its efforts.

Specific Recommendations

The first recommendation concerns the term of 60 days within which contracts must be presented to the RNTT. The rationale for this length of time is not clear, for if a contract has been signed, it should be presented as soon as possible to the Registry. But in the case of contracts for engineering services, the term is too long, for the construction and mounting of a plant can have begun by the time the contract is presented to the Registry. The same can be asserted for contracts for technical assistance, which can have a duration limited to a few months, so that a high percentage of the payments would have been made even before the intervention of the RNTT. In these cases (engineering services and technical assistance), the time limit for the presentation

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(38) There would be an effort to keep from happening what has occurred repeatedly in the past between the RNTT and the Petrochemical Commission of SEPANAL: the Commission grants permits to industries in secondary petrochemicals without consulting the opinion of the Registry on the terms of the contracts involved. An excellent opportunity to put the strategy noted above into practice has been lost in this sector.

(39) In the branches considered in this study, the production of resins and various types of machine tools falls in this category.

of the contracts should be one week (40).

The substantive evaluation, which was alluded to in the general recommendations, should be conducted ipso facto on the type of services offered. The technical consulting committee whose creation was recommended should carefully examine whether the purpose of the contracts corresponds to that declared by the firms when they carry the procedure before the RNTT. To this end, precise definitions must be made to explain exactly what is meant by basic or detail engineering, by supply of technical know-how or technical assistance, administrative services, etc.

The legislator could not foresee all the abuses which might appear, and, consequently, some restrictive clauses are forgotten. The following list offers clauses that the Law should include in Article 7, as well as some criteria that should be used:

(1) Prohibition against capitalizing technology. Payment for the technology that will be used with stocks from the firm is rather more than an onerous form of payment (the payments continue while the firm operates with a profit), for it is a form of transmitting control of the company, and should not be permitted.

(2) Frequently, the recipient of the technology does not demand (or cannot obtain) that guarantees be included for the operation or technical characteristics of the technology. Despite arguments to the contrary, it is perfectly feasible to offer guarantees to a licensee for volumes of production, product specifications, critical consumption of raw materials and inputs, use and wear of equipment, levels of contamination of wastes, etc. The RNTT could demand that these and other guarantees be included in all contracts. In particular, it should emphasize inclusion of the obligation on the part of the licenser to correct the defective operation of the technology which is the subject of the contract. On the other hand, there are certain guarantees against infringements of patents which are quite difficult to fulfill; here, what might be demanded is that the licenser be obliged to cover the expenditures that the licensee might have to make in legal defense of the patents which are the subject of the contract.

(3) In many cases, guarantees are tied to the form of payment, and this should be carefully examined. If the principal element of the contract appears as "free," in the case of conflict the licenser can be excused of all responsibility, by asserting that it has no financial obligation for this element of the contract.

(4) Another important aspect which should be prohibited is the obligation to make expenditures for publicity and commercialization. (At present, there is an effort to cover this point through section II of Article 7 of the Law.)

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(40) In principle, this should not represent any problem, for the payments derived from unregistered contracts are not deductible for the purpose of calculating income tax. However, these expenditures can be presented as expenses for professional services (for which contracts are not subject to registration). The Ministry of Finance lacks the capacity to distinguish them from payments for engineering services or for technical assistance.

(5) Numerous contracts include trademarks (in fact, this is the element which appears most frequently in the contracts currently registered with the RNTT) (41) and the Law on Industrial Property is quite deficient on this heading. The effects of a very pronounced dependence upon the owners of trademarks can be reduced if the use of national trademarks combined with those of foreign possession is made obligatory.

(6) A mechanism should be established through which the licensee has some knowledge of the technology it is going to acquire before the signing of the contract. The famous "prior disclosure" is a suitable mechanism for correctly evaluating the technology to be acquired. Inclusion of a "the most favoured licensee" clause should also be promoted.

(7) Access to improvements in the technology, which is the subject of the contract, is very important for the licensee. As far as possible, the inclusion of a clause which would enable the recipient to have access to these improvements (and of course, to be acquainted with the research programs of the supplier of the technology) should be encouraged.

(8) The analysis of the total cost of the technology should cover both the explicit cost (royalties, payments for specific services) and the implicit cost (in particular, prices of transference in captive operations). In this area, a mechanism should allow close coordination with Finance authorities and the National Commission on Foreign Investments. Moreover, the RNTT should determine criteria of alternative forms of payment, their advantages and disadvantages.

(9) The Registry should conduct a more intensive campaign to inform national firms about all aspects related to transactions for transference of technology. This campaign ought to be based on the circulation of a "model contract" previously prepared by the RNTT and of outlines that should be followed in the different phases of negotiations (42).

(10) Finally, the RNTT has in its archives an extremely rich source of information on the modalities of the commercialization of technology and trademarks. This organism should complete a series of studies directed towards the drafting of criteria for implementing the recommendations offered above.

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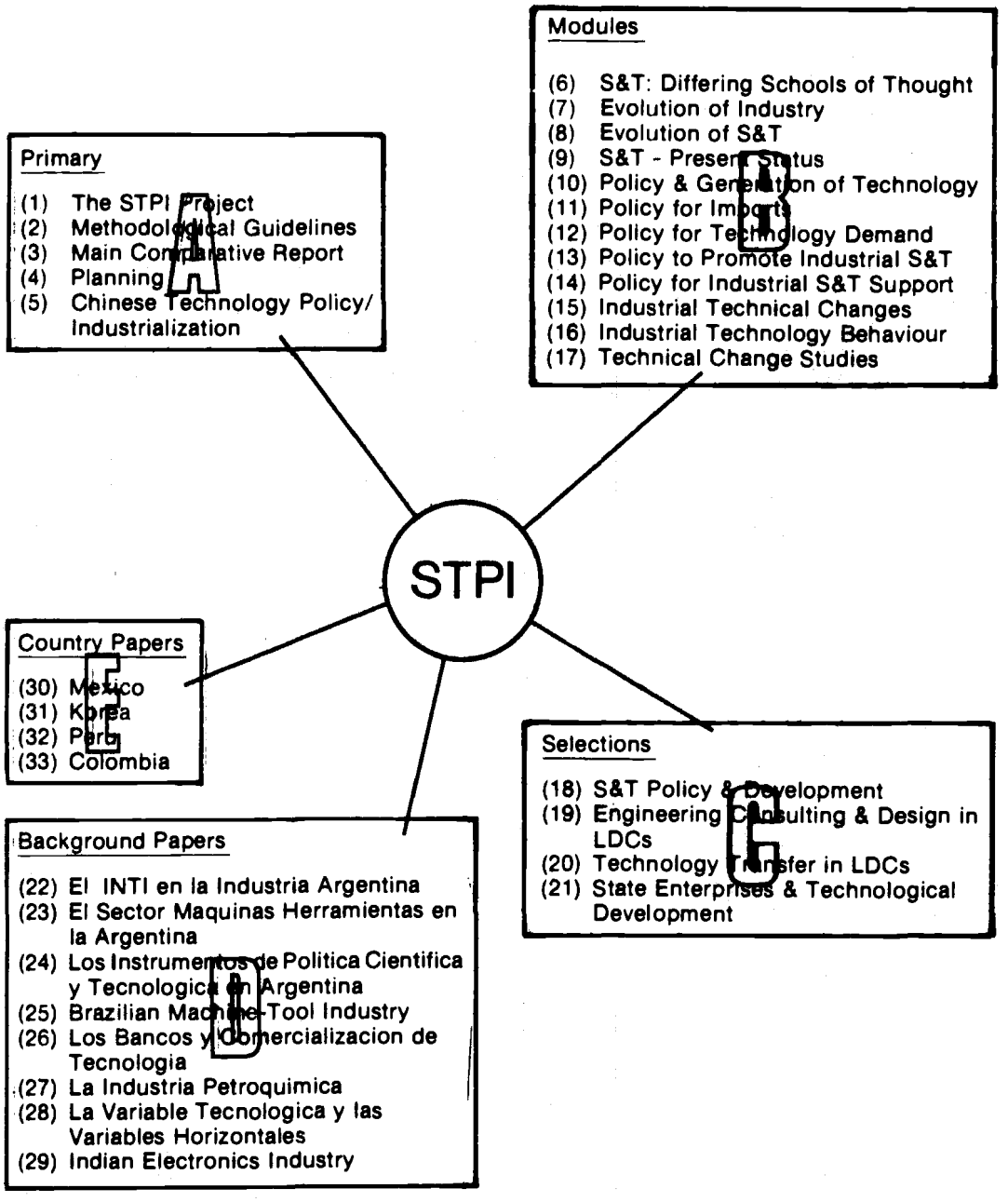
(41) This fact is intimately linked with the strategy of development followed to date - with its pattern of accumulation and the structure of added demand.

(42) The following documents might serve in putting this recommendation into practice: Singh, K.D.N. 1973. Guidelines for the acquisition of foreign technology. UNIDO, Vienna. Moreno, Felix. 1975. Cartilla sobre la adquisición de tecnología. COLCIENCIAS, Colombia; and the Codes of Conduct on Transference of Technology from UNCTAD and the Pugwash Conferences.

Key to STPI Publications



A GUIDE TO THE SCIENCE AND TECHNOLOGY POLICY INSTRUMENTS (STPI) PUBLICATIONS

A. Primary Publications

(1) The Science and Technology Policy Instruments (STPI) Project (IDRC-050e) (out of print)

(2) Science and Technology Policy Implementation in Less-Developed Countries: Methodological Guidelines for the STPI Project (IDRC-067e) (out of print)

(3) Science and Technology for Development: Main Comparative Report of the STPI Project (IDRC-109e). (Also available in French (IDRC-109f) and Spanish (IDRC-109s).)

(4) Science and Technology for Development: Planning in STPI Countries (IDRC-133e)

(5) Science and Technology for Development: Technology Policy and Industrialization in the People's Republic of China (IDRC-130e)

B. Modules

These constitute the third part of (3) above and provide supporting material for the findings described and the assertions made in (3).

(6) STPI Module 1: A Review of Schools of Thought on Science, Technology, Development, and Technical Change (IDRC-TS18e)

(7) STPI Module 2: The Evolution of Industry in STPI Countries (IDRC-TS19e)

(8) STPI Module 3: The Evolution of Science and Technology in STPI Countries (IDRC-TS20e)

(9) STPI Module 4: The Present Situation of Science and Technology in the STPI Countries (IDRC-TS22e)

(10) STPI Module 5: Policy Instruments to Build up an Infrastructure for the Generation of Technology (IDRC-TS26e)

(11) STPI Module 6: Policy Instruments for the Regulation of Technology Imports (IDRC-TS33e)

(12) STPI Module 7: Policy Instruments to Define the Pattern of Demand for Technology (IDRC-TS27e)

(13) STPI Module 8: Policy Instruments to Promote the Performance of S and T Activities in Industrial Enterprises (IDRC-TS28e)

(14) STPI Module 9: Policy Instruments for the Support of Industrial Science and Technology Activities (IDRC-TS29e)

(15) STPI Module 10: Technical Changes in Industrial Branches (IDRC-TS31e)

(16) STPI Module 11: Technology Behaviour of Industrial Enterprises (IDRC-TS32e)

(17) STPI Module 12: Case Studies on Technical Change (IDRC-TS34e)

C. Selections

These are a selection of the numerous reports prepared for the STPI Project chosen as a representative sample of the various topics covered by the STPI Project in the course of the main research effort on policy design and implementation.

Science and Technology for Development: A Selection of Background Papers for the Main Comparative Report.

(18) Part A: Science and Technology Policy and Development (IDRC-MR21)

(19) Part B: Consulting and Design Engineering Capabilities in Developing Countries (IDRC-MR22)

(20) Part C: Technology Transfer in Developing Countries (IDRC-MR23)

(21) Part D: State Enterprises and Technological Development (IDRC-MR24)

D. Background Papers

(22) El INTI y el Desarrollo Tecnologico en la Industria Argentina (In press)

(23) El Sector Maquinas Herramientas en la Argentina (In press)

(24) Los Instrumentos de Politica Cientifica y Tecnologica en Argentina (In press)

(25) The Brazilian Machine-Tool Industry: Patterns of Technological Transfer and the Role of the Government (In press)

(26) Rol de los Bancos en la Comercializacion de Tecnologia (In press)

(27) Comportamiento Tecnologico de las Empresas Mixtas en la Industria Petroquimica (In press)

(28) Interrelacion Entre la Variable Tecnologica y las Variables Horizontales: Comercio Exterior, Financiamiento e Inversion (In press)

(29) A Planned Approach for the Growth of the Electronics Industry — A Case Study for India (In press)

E. Country Reports

(30) Instruments of Science and Technology Policy in Mexico (In press)

(31) Technology and Industrial Development in Korea (In press)

(32) Los Instrumentos de Politica Cientifica y Tecnologica en el Peru: Sintesis Final (In press)

(33) STPI Country Report for Colombia (In press)