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**INTERNATIONAL TECHNOLOGY TRANSFER:
IMPACT OF REGULATORY FUNCTIONS AND
METHODOLOGY FOR THE ANALYSIS OF TECHNOLOGY FLOWS**

Vitor Corado-Simões

68.

PART I

**IMPACT OF REGULATORY FUNCTIONS RELATED
TO THE TRANSFER OF TECHNOLOGY:
THE CASE OF PORTUGAL**

IMPACT OF REGULATORY FUNCTIONS RELATED TO THE TRANSFER OF TECHNOLOGY: THE CASE OF PORTUGAL

I. INTRODUCTION

Technology transfer agreements have increasingly become a matter of concern in both developed and developing countries.

In the former, those agreements have been approached under three main perspectives. First, to prevent that they might lead to an unwished outflow of sophisticated or military - related technologies towards specific countries. Second, to avoid that technology transfer contracts, namely those between affiliated firms, might be used as tax-evasion devices. Third, to fight the adverse effects that some clauses (the so-called restrictive clauses) might have on competition. The influence of the Sherman and Clayton Acts on the behaviour of American firms is widely known. In the European Economic Community, regulations were enacted on patent licensing and on franchising agreements defining the kinds of provisions that are allowed and those which are forbidden, due to their anti-competitive effects; another regulation on know-how licensing agreements is about to be published.

In developing countries, laws were more directly addressed to technology imports, as such. The main reasons behind the enactment of specific legislation and the setting up of regulatory agencies in charge of the evaluation and registration of technology transfer agreements were, by and large, the following:

(i) To reduce the direct and indirect costs stemming from contractual technology imports, either on an arm's length basis or between affiliated firms;

(ii) To strengthen domestic firm's bargaining power vis-à-vis their foreign suppliers, taking into account that the transfer of technology is often an unbalanced operation where recipients are in a relatively unfavourable situation, due to their lack of information and knowledge; and

(iii) To improve the conditions for a more effective absorption and assimilation of imported technology and for promoting the development of domestic scientific and technological capability.

Since various developing countries already have a relatively long experience in regulating technology inflow, it seems advisable to assess such experience. This may be of interest for two main reasons. First, for the countries concerned, to evaluate the results obtained so far and to identify areas where policy changes might be required. Second, for those developing countries that are now envisaging the formulation of specific policies aimed at regulating technology inflow, or are just launching them, to learn from other's successes and failures.

The purpose of the present document is to review of the Portuguese experience in regulating technology imports between 1978 and 1985. The fact that the legislative framework for analysis and registration of technology transfer agreements with the Foreign Investment Institute was discontinued since 1986 makes our task easier and probably less pervaded by prejudices. Indeed, Legislative changes

were much more the consequence of exogenous determinants - Portugal's accession to the European Economic Community - than the result of a failure of the regulation of technology inflow itself. The case of Portugal is also interesting inasmuch it refers to a "middle-of-the-road" country, with similarities with both the more industrialized countries and the developing ones.

2. PORTUGUESE LEGISLATION ON TECHNOLOGY TRANSFER

2.1 Historical perspective

The regulation of technology transfer agreements by Portuguese authorities is a recent phenomenon. Only in 1973 the drawing up of contracts between residents and non-residents was subject to prior authorization by the Bank of Portugal (Decree-Law 158/73 and Ministerial Order of the Minister of Finance dated 10 April 1973). This legislation, however, was mainly addressed to the control of foreign exchange outflows and was not concerned with the overall conditions under which foreign technology was acquired. Therefore, the analysis undertaken by the Bank of Portugal was almost exclusively focussed on the financial and foreign exchange implications of the agreements, leaving aside the economic and technological aspects.

It was only after the change of political régime in April 1974 that conditions were created for a more specific and technology oriented approach. Several efforts were undertaken towards a more effective control of the negative impact often generated by badly negotiated and unbalanced technology transfer contracts, through the working up of a more suited legal framework.

The first version of the so-called Foreign Investment Code was enacted in April 1976 (Decree-Law 239/76, of 6 April). It was aimed at regulating both foreign investment and technology inflow. The conclusion of technology transfer contracts was subject to prior authorization and registration with the Foreign Investment Institute and various restrictive practices were formally prohibited. However, this law left much to be desired, technology transfer issues being approached in a poor and uncoherent manner. The envisaged enabling legislation was never enacted. The real effects of this law over technology inflow were, as a matter of fact, not very relevant.

A new, more liberal (especially on what foreign investment was concerned), Foreign Investment Code was published in 1977 (Decree-Law 348/77, of 24 August). Like its predecessor, it encompassed both foreign investment and technology transfer. A regulatory decree specifically aimed at governing technology imports was enacted (Regulatory Decree 53/77). This body of legislation, with slight changes introduced in 1982, remained into force during about 8 years and provided the framework for the activity of the Foreign Investment Institute in evaluating, authorizing and registering technology transfer agreements. Due to its relevance for our purposes, this Legislation will deserve a separate analysis.

Portugal's accession to the European Economic Community was the main factor behind the strong change introduced in 1985 in the regulation of technology transfer (Decree-Law 351-c/85, of 26 August). Broadly speaking, it amounted to a return to the situation existing between 1973 and 1976 technology transfer agreements are treated in a way similar to any other contract generating current invisible operations. Financial and foreign exchange considerations prevail over economic and technological aspects.

As a rule, the drawing up of contracts for either the import or the export of technology between residents and non residents in Portugal, as well as their alteration or renewal, depends on prior registration with the Bank of Portugal(^y). Each contract must include a detailed description of the content of the transfer and of the envisaged payments as well as a reference to the contract duration. If no objection is raised by the Bank of Portugal in a 30-day period after the submission, the contract is considered as automatically registered (see Decree-Law 351-c/85 and Normative Orders 98/85 and 95/86, dated 17 October and 20 October respectively).

^y - Only those contracts that correspond to foreign investment operations (i.e. generate stable and long-lasting economic links, from which effective decision-making power is obtained or strengthened) are to be submitted to the Foreign Investment Institute.

Besides the above legislation, technology transfer contracts have to comply with the rules laid down in the Competition Law (Decree-Law 422/83, of 3 December), whereby some restrictive clauses are forbidden. Also relevant are EEC Regulations on patent licensing agreements and franchising^(Y).

2.2 The legislative framework between 1977 and 1985

As indicated above, Decree-Law 348/77 and Regulatory Decree 53/77 laid down the basis for the screening of technology transfer agreements undertaken by the Foreign Investment Institute - whose experience is reviewed in the present document.

The most relevant aspects of the legislation on the field of technology transfer were the following:

(i) Setting up of a mechanism of prior evaluation, authorization and registration of contracts - The drawing up of technology transfer agreements between residents and non residents in Portugal - as well as their alteration and/or renewal - was subject to evaluation, authorization and registration with the Foreign Investment Institute, even in those cases when renewal was already provided for in the initial agreement. "Old contracts", signed before 1973, were also to be submitted to the Institute for analysis of compliance with the new legal rules and registration.

(ii) Scope - The legislation referred to above concerned technology imports only; the registration of technology export contracts remained with the Bank of Portugal. The definition of technology transfer agreements was very wide,

^Y - As pointed out above, a new EEC Regulation on know-how licensing is expected to be published soon.

encompassing not only the license or sale of industrial property rights or know-how, but franchising contracts, training, the provision of engineering services and various forms of technological assistance(7).

Such a broad definition, although implying a significant work load with contracts of minor relevance (especially for equipment repair and maintenance services), proved to be very useful to exert control over some types of contracts that may have a technological content and whose importance has strongly increased in recent years (franchising and software are cases in point).

(iii) Mandatory provisions - With an aim to protect technology recipients in drafting their contracts, the law explicitly identified some clauses - corresponding to "guarantess" for the licensee - that must be included in all contracts. The most noticeable were the following:

- detailed description of the object of the transfer and of the type, method and amount of payments;
- indication of the duration of the agreement;
- guarantee that the recipient will be informed about all the improvements introduced in the technology, except when these were patentable or correspond to an invention;
- guarantee of supply of inputs under agreed conditions (prices should not exceed international standards); and
- provision, whenever feasible, of adequate training programmes.

7 - According to the law, technology transfer agreements "are deemed to cover all acts and transactions in connexion with:

a) The sale of or the granting of rights for the use of patents, trade names, models, drawings or inventions as well as the transfer of other non-patented know-how;

b) The rendering of technical assistance in the field of company management the production or marketing of any goods or services which entail expenditure arising from consultations with or the movement of experts, the drawing up of plans, the supervision of production, market research or personnel training.

c) Agreements with specialized companies for the construction or maintenance of industrial units, roads, bridges and ports;

d) Any other form of technical assistance".

(iv) Restrictive clauses - To avoid undue limitations to the activity of technology recipients and to strengthen their bargaining power vis-à-vis suppliers, it was laid down in the law that some restrictive provisions were, as a rule, not permitted. This prohibition concerned:

- tie in clauses,
- unbalanced conditions on the communication of improvements, limitations on the volume and structure of recipient's production,
- export and marketing restrictions,
- definition of sale or re-sale prices by the licensor,
- limitations on the post-contractual activities of the licensee, unless stemming from industrial property rights held by the supplier(γ).

Some of the above mentioned clauses might however be accepted, "in case where the transfer of technology assumes special interest for national economy". As a matter of fact, the Institute adopted a flexible attitude on this matter, taking into account the restrictive potential of the clauses in each specific agreement and the relevance of the technology for the recipient and for the Portuguese industrial fabric.

(v) Intra-group contracts - Unlike other countries, where payments for licensing agreements between affiliated firms were forbidden, there was not in Portugal a different legal approach between arm's length technology transactions and intra-group contracts. Portuguese law concerned all contracts between residents and non residents, irrespectively of their relationship.

γ - This prohibition was introduced only by the 1982 revision.

The law explicitly stated that even when connected with direct foreign investment or with investment in branches of foreign companies, transfers of technology are deemed to be covered by the general provisions on this matter.

The treatment of intra-group transaction is very relevant, since - as it will be seen below - a large share of contracts and payments take place between affiliated companies and the reasons for entering technology transfer contracts may be, in this case, different from those between independent firms.

(vi) Effects over domestic scientific and technological capacity

It was explicitly stated in the law that the evaluation of technology transfer contracts should take into account the compatibility of the envisaged technology imports with:

- economic and industrial development priorities,
- actions aimed at the assimilation, absorption and adaptation of the transferred technology; and
- the strengthening of domestic scientific and technological capacity, namely the availability of research institutions and consulting and engineering firms.

The National Board for Scientific and Technological Research would keep the Foreign Investment Institute informed about the centres engaged in technological research in Portugal. In practice, however, such an exchange of information was very weak and the Institute lacked a more in depth knowledge about research centres and laboratories and about their ongoing activities.

3. THE INSTITUTIONAL FRAMEWORK: THE FOREIGN INVESTMENT INSTITUTE

3.1 Function of the Institute

Technology transfer is a complex phenomenon. It is connected with very different subjects, namely industrial development, industrial property, competition policy, and foreign investment, technology transfer issues may therefore be approached through different, though complementary, perspectives. The Locus and characteristics of regulatory agencies may also differ, according to the main areas of concern and the relationships considered to be more relevant.

In Portugal the choice was to privilege the links between foreign investment and technology transfer, ascribing their regulation to a single body: the Foreign Investment Institute. According to the law, the functions of the Institute were

- "- to coordinate, guide and supervise direct foreign investment,
- to control the drawing up and implementation of all or any deeds or agreements concerning the transfer of technology, and
- to ensure the proper implementation of governmental policy regarding direct foreign investment and the transfer of technology".

There are various reasons in favour of a common approach to foreign investment and contractual technology transfer.

First, they are both channels for technology inflow. A technology transfer policy exclusively centered on contractual technology imports is clearly shortsided. The importance of foreign investment for technology acquisition cannot be disregarded.

Second, the knowledge about the characteristics and strategies of foreign-owned affiliates enables a better evaluation of the technology agreements where they are involved.

This is especially remarkable for a country as Portugal where a large part of technology payments (above 70% in the case of licensing) is undertaken by foreign-owned firms, mostly on an intra-group basis.

Third, the synergies between the two fields are also relevant in the evaluation of new foreign investments, with a real or alleged technological content, involving the drawing up of technology transfer contracts. The presence of technology experts is very helpful for the definition of the fair terms under which investment is to take place. The same happens in the negotiation of investment contracts granting specific incentives to foreign firms; the characteristics and the relevance of the envisaged technology transfers need to be assessed for setting up the terms and conditions of the corresponding contracts; this may be an essential aspect of project evaluation and negotiation.

Foreign Investment Institute's experience has shown that there are, in fact, advantages in putting together foreign investment and technology transfer under a single roof. But it has also shown that the balance between both is not an easy one. Foreign investment tends to be much more appealing, "visible" and praised, especially when a strong emphasis is put on the attraction of new foreign investments. Regulatory functions may, then, suffer - insofar as they are perceived as hurdles for foreign investors.

All in all, foreign investment matters may concentrate most of the attention and interest of management, while technology transfer regulation may be seen as a grey, bureaucratic area. This is a very sensitive issue. The lack of a proper balance may to some extent efface the advantages of a common approach to technology transfer and foreign investment.

3.2 Technology transfer : organization and staffing

The organizational structure of the Foreign Investment Institute between 1978 and 1984 included two Directorates dealing with the evaluation and registration of technology transfer contracts. One was charged of chemicals, food, textile and similar industries; the other was concerned with metallurgy, machinery and transportation equipment industries.

Directors were both engineers and technical staff consisted of about 10 economists and engineers, many of them with prior experience in industry. This appeared to be an important pre-requisite for a more correct evaluation of contracts and for a successful dialogue with firms. As a matter of fact, evaluation has to take into account national industrial fabric and the requirements and specific conditions of recipient firms. Visits to industrial premises were also a relevant feature. Technology transfer staff can not stay in an "ivory tower"; they need instead to be aware of the strengths and weaknesses of domestic firms and to generate a relation of dialogue and mutual trust.

Co-operation between engineers and economists in evaluation procedures was very frequent and helpful. To profit from the complementarity of knowledge and experience, teams were set up for the study and assessment of more complex or sensitive cases. The basic legal evaluation was undertaken within Technology Directorates themselves. However, whenever specific questions arised they were referred to the Legal Department, that provided advice to all the Institute.

Portuguese experience also pointed out the need for a good administrative back office, with competent clerical staff. Evaluation and registration of contracts entails a significant clerical workload, for processing application and registration, for handling contacts and correspondence with firms, and for supplying evaluation staff with data and references on previous decisions. Of course, the existence of computing and word-processing equipment helps a lot - but a reliable back office organization is of paramount importance for the success of technology transfer regulation.

4. THE POLICY

4.1. Objectives

Portugal is a "middle-of-the-road" country with a well developed industrial fabric in some areas, but showing significant weaknesses in many others. Portuguese industrial growth has been largely based on imported technology. Compared with highly industrialized countries, Portugal has a fragile scientific and technological system, with a low capability of endogenous generation of new technologies.

Such a background, in a country then member of the European Free Trade Association and wishing to join the European Economic Community, was not compatible with a strong control over technology imports. A hard-lined approach risked to have adverse effects over the characteristics and volume of technology inflow and, thereby, on economic growth. The Foreign Investment Institute therefore followed a "soft" approach, the dialogue with contracting firms - and especially with the Portuguese, recipient partners - prevailing over a strict enforcement of legal rules. Contracts were subject various changes and amendments, but sharp rejections of applications were very few - only in exceptional cases, for instance when the contract had no technological content or when it concerned widely diffused knowledge. According to the Foreign Investment Institute, this "soft" attitude was aimed at achieving "a good balance between the stipulation of adequate contractual conditions and the necessity to increase the inflow of foreign technologies"(1).

The main objectives pursued by the Foreign Investment Institute in regulating technology transfer were the following:

(i) to increase the transparency of the technology market, by providing support and information to acquiring firms;

(ii) to get better contractual terms and conditions for the import of technology, including inter alia "the reduction of royalties' levels to values in accordance with the importance of the transferred elements and with the levels achieved in other countries"(1).

(iii) to promote the development of the Portuguese scientific and technological capacity, by creating conditions for the absorption, assimilation and diffusion of imported technologies.

(1) Foreign Investment Institute, "Annual Report - 1981", Lisbon, 1982

4.2. Evaluation, authorization and registration procedures

The procedure followed by the Foreign Investment Institute in regulating technology transfer contracts is schematically presented on Flowchart I. The main steps will be briefly reviewed below.

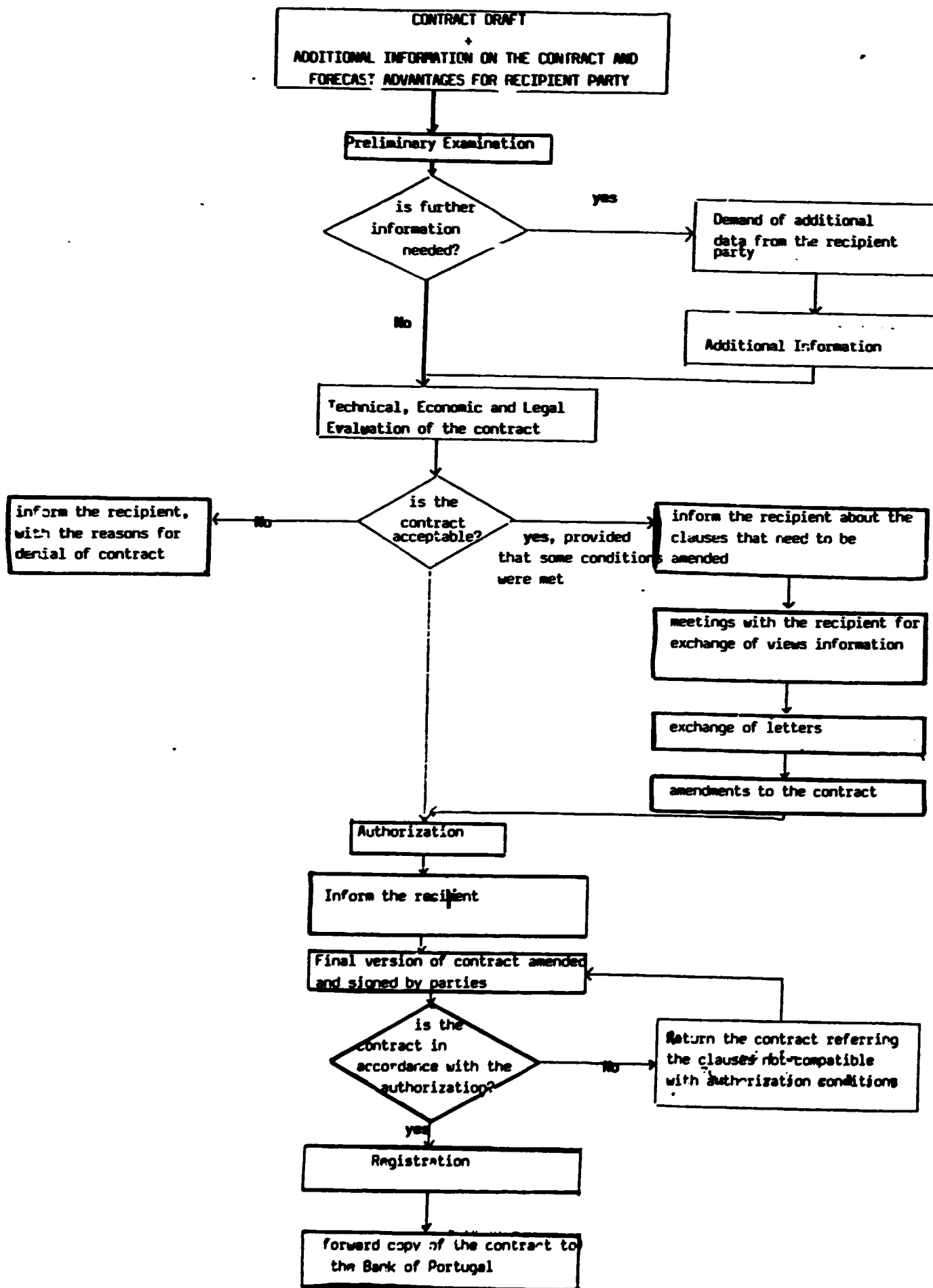
According to the law, applications were made through the submission of draft agreements, in triplicate, to the Institute. This was entitled to request "any clarification necessary for the appraisal" of the contracts. As a matter of fact, to proceed to a more thorough and correct evaluation, the Institute often required the filling up of an application form with data on the parties involved and on the contract - particularly for licensing agreements and for less known recipient firms; additional specific information might be also demanded for more complex or unclear contracts.

The application form referred to above included information on the following: prior experience and characteristics of the recipient firm (size, industrial specialization, employment, technological capability, export orientation ...); reasons for entering the contract and for choosing that particular supplier; envisaged impact of the contract for the recipient characteristics of the technology; industrial property rights involved; main features of the contractual products; sales and export forecasts; import substitution effects; and sources and value of equipment and inputs to be purchased in connection with the project.

Evaluation of contracts was aimed at assessing the advantages stemming from the technology transfer operation for the recipient firm and for Portuguese industrial fabric as well as identifying its (possible) negative aspects, with a view to modifying it in a way more favourable to the Portuguese interests. Evaluation was a key step in the process of regulating technology inflow.

A three-fold perspective was taken for evaluating contracts - economic, technical and legal. The Foreign Investment Institute adopted a pragmatic stance, more concerned with the overall effects of each contract than with specific clauses. It was recognized that the contractual relationship is a lot more than a set of individual provisions, so that evaluation has to take into account the goals pursued, by domestic firms and by national economic and technological policies: for instance, it may happen that contracts with various "not-so-good" or even bad clauses have to be accepted insofar as they may be essential for keeping firms alive and maintaining employment.

FLOWCHART I
 AUTHORIZATION AND REGISTRATION OF
 TECHNOLOGY TRANSFER AGREEMENTS



Evaluation of contracts might lead to one of three possible outcomes: denial of authorization, immediate authorization or suggestion of changes. The first was rare and occurred only in exceptional circumstances, linked with the characteristics and rationale of the operation (absence of technological content, lack of secrecy of the know-how, lack of validity of the claimed industrial property rights) or with the suitability or capability of the contracting parties; the text of the contract itself did not usually lead to an outright denial of authorization, but to the introduction of amendments and changes instead. The second decision - immediate authorization - was very frequent in minor service agreements (short-term technical assistance, equipment maintenance and repair) but less common in licensing, especially in the case of new contracts. The third was the most usual in both licensing and significant service contracts (engineering services, routine technical assistance).

When several contractual clauses were to be changed, the Foreign Investment Institute informed the Portuguese contracting party about the matters that needed to be amended for the contract to be approved. In many instances, an informal approach was followed: a meeting was convened with representatives of the Portuguese firm, where the Institute's staff explained the rationale behind its decision and even showed the advantages that the suggested amendments might entail for the recipient; on the other hand, staff was informed about the concerns and strategy of the Portuguese party. This might lead to a, sometimes too long, process of dialogue and negotiation, through which the most harmful contractual clauses were often dropped or redrafted.

After getting notice of authorization, parties should send to the Institute the contract, duly signed and amended to comply with the authorization conditions, for registration. Registration was undertaken only after checking whether all the authorization conditions were met. If so, a letter was then forwarded to the Portuguese firm, giving notice of the registration of the contract and the corresponding number assigned to it.

Copies of registered agreements were forwarded to the Bank of Portugal by the Institute, so that authorizations for the transfer of payments stemming from the contract were readily granted. A very close cooperation and exchange of information between those institutions was instrumental for ensuring that payment authorizations were granted to registered contracts only - and not to those that failed to comply with authorization conditions and that were deemed not legal and entitled to generate payments abroad.

4.3. Evaluation: the main concerns

Due to its key role in the process of regulating technology transfer, evaluation deserves a closer analysis.

It was said above that the Foreign Investment Institute adopted a flexible, pragmatic approach. It endeavoured at enhancing the terms and conditions of technology acquisition, without reducing the level of inflow. A global perspective - the effects of the contract for the recipient firm and for the industrial sector concerned - often prevailed over a strict appraisal of unlawful clauses.

To get better contracts and to reduce the direct and indirect costs was one of the main concerns of the Institute. This was mainly associated with three aspects: level of payments, restrictive clauses and duration of contracts.

Contract payments were viewed as an important issue, but not always as the essential feature of contracts. In fact, the conditions of use and assimilation of the technology are often far more important, at both micro (firm) and macro (industry, national economy) levels, than the amount of payments.

The Institute attempted to define acceptable royalty levels, taking into account the innovativeness of the technology concerned, the advantages to be gained from the contract (sales increases, cost reduction, technical improvements, higher quality, higher productivity, opening of new markets) and the comparability with international standards. In this regard, exchange of information with other registries, both on a bilateral and on a multilateral basis (through TIES) was very helpful to assess the reasonableness of requested royalties. Use was also made of the UNIDO profit-sharing method, namely for more complex or relevant cases. This method was very useful not only to define acceptable royalty ranges (taking into account that acceptable licensor's share may be between 1/3 and 1/4 of total profit), but especially insofar as it provided an additional bargaining argument to get lower royalty rates; it was also important to make Portuguese firms aware of the need to evaluate technology payments against the net contribution of the contractual technology towards the achievement of their profit goals(1). In general, the Institute discouraged the use of front-end payments and minimum royalties in licensing contracts, since they increase the burden on the licensee and reduce licensor's risk and thereby its commitment.

(1) For an application and appraisal of the UNIDO method to licensing contracts, see Manuela C. Pires and Vitor Corado Simões, "Pagamentos de Tecnologia e Repartição de Lucros: Um Exercício sobre o Método UNIDO", Investimento e Tecnologia, 1/1983, pg. 19/27.

With regard to service contracts, attention was paid to the fees and honoraries charged, in order to ensure that they were in line with the standard remuneration for each level of qualification in licensor's country. Formulae for increase in fees to cope with inflation were also subject to scrutiny⁽¹⁾.

Portuguese law did not established an absolute ban on restrictive clauses. Again the Institute preferred a "soft" to an hard-lined approach, taking into account the innovativeness of the technology, its relevance for the recipient firm and for the Portuguese economy, the expected practical restrictive effect of each clause and its relevance in the context of the whole agreement. The concern was that contracts would not unduly restrict the capacity of recipients to use, assimilate and develop imported technologies to the maximum extent possible.

Although the assessment of the restrictive potential of each clause depended on each particular case, it may be said that emphasis was put on some clauses, deemed to be generally more harmful (export restrictions, unbalanced access to improvements, post-expiry restrictions, tie-in clauses and price-fixing by licensors), while others were regarded on a lenient manner. Experience proved that it was very difficult to delete all restrictive clauses from draft agreements without seriously hampering the technology transfer operation or provoking a reaction to evade control.

Concerning contract duration, the purpose was to define periods enough to enable technology assimilation, but not so long that might become, in the medium or long term, an undesirable burden. The "rule-of-thumb" followed was to allow a 5-year period, that might be renewed by an equal term. Larger periods were, however, accepted for specific types of contracts or activities, e.g., 10 to 15 years for management contracts in the hotel industry.

The effects of the contract over domestic scientific and technological capacity were another important issue for evaluation. The Institute attempted to increase the awareness of Portuguese firms about the advantages of a real assimilation of imported technologies and their further development, both in-house or in co-operation with domestic research centers. The participation of Portuguese consulting and engineering firms in engineering projects and studies was actively encouraged, since they are a powerful instrument for ensuring a real endogeneization and diffusion of foreign technologies, since the raison d'être of engineering firms is to devise new manufacturing facilities incorporating their technological know-how; unlike manufacturing firms that endeavour to keep their technological assets secret, engineering enterprises derive their profits from the spread of new facilities both domestically and abroad.

(1) For a broader analysis of this topic, see J.M. Caldas Lima, Pagamentos por Tecnologia, mimeo.

The activity of the Institute in this field was hurt, however, by some opposition of suppliers and recipients together. In fact, while in other issues there was a coincidence of domestic firms' and national interests, here that was not often the case, recipients resisting Institute's attempts to increase Portuguese engineering firms participation in the projects. The behaviour of suppliers is easily understandable: the provision of large packages of technology, services and (often) equipment enable higher profit margins and keeps purchasers more dependent and unable to effectively absorb the technology. For recipients the main motive is risk-aversion; by purchasing a package, they deal with one single counterpart and feel that project implementation and the assignment of responsibilities will become easier - although the experience shown that this is not always the case.

A reference should be made to the existence of specific guidelines for some sectors. The law already provided for a mechanism to define evaluation criteria for particular sectors. Such a mechanism involved however some bureaucratic workload. The Institute adopted instead a more flexible approach, by defining - whenever appropriate in consultation with the relevant sectoral authorities - guidelines for the evaluation of contracts in several industries. However, this procedure did not lead to the working out of "model contracts", since these were seen as an inadequate straitening of the reality that might be dangerous for domestic firms.

The first guidelines were defined for the pharmaceutical industry, by far the one with the largest number of contracts. Evaluation criteria concerned issues such as: duration, purchase of raw materials and other inputs, draw-back clauses, export restrictions and royalty rates (as a rule, not above 5% of net sales). Following the experience with pharmaceuticals, other guidelines were defined for industries where contracts were easily standardized and their number was high or the amounts involved were significant: cosmetics, textiles and the automotive industry.

5. ASSESSMENT OF THE RESULTS

5.1. Preliminary remarks

To assess the results of regulating technology inflow is not an easy task. Only a part of those results may be subject to a quantitative approach. The impact of regulation on the behaviour of contracting parties, on the assimilation and mastering of imported technologies throughout domestic industrial fabric are largely of qualitative nature.

Intervention of registries on the contractual process may generate unforeseen reactions from the parties that may seriously undermine the achievement of policy objectives. As Daniel Chudnovski remarked in a very interesting paper, the hypotheses that recipients and suppliers' goals are contradictory and that recipients interests usually coincide with national interests may not hold(1).

Concerted action between licensors and licensees to by-pass regulation may take place. If registries adopt a very strict and unflexible attitude, the gap between firms' perceived interests and national objectives may increase and illegal behaviour (through gentlemen's agreements, for instance) becomes more common. In such circumstances the assessment of results is difficult, since official statistics do not accurately translate the reality.

Effectiveness of regulation also depends on the overall economic system. In economies where the State holds a substantial share in the economy (and especially in manufacturing) or where most investments are undertaken by public entities regulation may achieve better results than in pure market economies. In the former, the ground for divergence between recipient's and national interests appears to be smaller and registries intervention may take place at an earlier stage - thereby being probably more effective(2).

The questions raised do not preclude, however, a general assessment of the impact of regulatory activities by the Foreign Investment Institute of Portugal. Such an assessment will take into account both available statistical data and qualitative informations about the institute's behaviour got from personal experience and from contacts with economic agents that dealt with the Institute on technology transfer matters.

Four main issues will be examined: level of technology flows, terms and conditions of contracts, establishment of linkages for technology mastering and diffusion, and recipient firms awareness of contractual technology transfer business.

(1) See Daniel Chudnovski, Transfer of Technology: Regulating Technology Imports in Some Developing Countries, Trade and Development, 1982.

(2) In central planning systems, however, other factors may interfere with registries activities (bureaucratic decisions, power clashes, politically-based choices, etc.).

The first topic concerns the influence of regulation on the magnitude of technology inflow: did Institute's intervention reduced the inflow of foreign technologies? The second refers to the analysis of the main contractual provisions (duration, payments, restrictive clauses): was the Institute able to get significant improvements of the formal terms and conditions of technology acquisition? Technology mastering and diffusion section will endeavour at appraising to which extent regulation was successful in promoting the endogeneisation of imported technologies. Finally, the last issue reviews the impact of advisory and support services provided by the Institute on domestic firms capacity to make a better use of technology transfer agreements.

5.2. Level of technology inflow

One of the main criticisms raised to technology transfer regulation is that it reduces technology inflow, since suppliers will be less prone to sell their technologies under government imposed terms and conditions. This attitude, some authors argue, would be particularly strong for more advanced technologies.

Did this happened in Portugal following the setting up of the 1978 legislation on technology transfer?

As it was remarked above, the Foreign Investment Institute appeared to be aware of such danger, endeavouring at regulating contracts without seriously affecting the level of technology inflow. The "soft" approach towards contract evaluation and authorization was, to some extent, dictated by this concern. There is, however, scanty evidence of cases where regulation discouraged potential suppliers of entering licensing agreements with Portuguese firms. In other instances, the envisaged contracts were abandoned as a reaction to an evaluation process judged as excessively long and boring.

Nonetheless, an overall assessment of the issue clearly indicates that, in general terms, regulation did not seriously hindered technology inflow. Such a conclusion is supported by the analysis of available statistical evidence.

The average number of registered agreements per annum was 647 for the period 1978-1985, as against 215 only for the period 1973-1977. Although the first figure has a broader coverage - it includes some additional types of services contracts as well as the registration of old, pre-1973, agreements - it is undoubtful that there was a strong increase in the number of contracts. Looking at the trend during the period 1978-1985, it is convenient to stress two features (see Table 1). First, the low number of registrations in 1978 was due to lack

of experience and to some under-staffing of the Institute, and not to an adverse reaction to legislation. Second, the fact that the number of contracts reached a maximum in 1982: it is interesting to remark that the slowing-down of the number of contracts registered occurred exactly in a period when the Institute adopted a more liberal stance(1).

Similarly, data on technology payments does not lend support to the hypothesis of a decline in technology inflow following the regulation of technology transfer.

The amount of payments under the heading "Rights for Patents, Trademarks, Models, etc." of the Balance of Payments exhibits a marked growth trend throughout the period 1970-1985 (Table VI). It is true that payments in 1978, the year of beginning of regulatory activities, were only slightly above the value recorded in 1977. This is not the result of a decrease in technology inflow. It rather translates a "freezing" of payments due to the overloading of the then infant Foreign Investment Institute with the evaluation of old, pre-1973, agreements and the lack of experience of its staff. From 1978 onwards, payments increased sharply, average annual growth rate for the period 1978-1985 reaching 32%.

Data on payments stemming from technology transfer contracts were also published by the Foreign Investment Institute, being available for 1979-1985 (Table VII). They increased almost 6-fold throughout the period, confirming that regulation did not curbed technology inflow. It is interesting to remark that payments due to license agreement show a steady growth, while those for service contracts reached a maximum in 1983 and slightly decreased since then; this fact doesn't correspond to a reaction of foreign technology suppliers, but rather to a slowing down of payments associated with services in petroleum and gas prospection and construction agreements in connection with the building up of new highways.

5.3. Terms and conditions of contracts

This is most probably the area where a quantitative evaluation of the results of regulatory activity appears to be easier. In fact, by comparing the main features of agreements ex-ante and ex-post (that is, as submitted to the Foreign Investment Institute and as registered) it is possible to identify the changes introduced as a consequence of the evaluation process.

(1) Tables II through V provide additional information about the types of contracts, industrial breakdown and countries of domicile of technology suppliers.

Statistical data on this subject have, however, to be interpreted with some caution due to several factors. First, the text of the contract - although important - is only a framework for the development of future relationships between partners. It does not determine the outcome of the contract and its consequences for the recipient party: apparently "good" agreements, without any restrictive clauses and providing for low royalty rates, may turn into awful experiences, while "not-so-good" contracts may evolve into mutually profitable relationships and extremely helpful devices for technology acquisition and mastering. Second, the setting up of legislation and regulatory agencies may generate new forms of firm behaviour that undermine the relevance of statistical approaches. Such behaviour may have positive aspects - wish to comply with the law, increased awareness of the restrictive potential of some clauses - and thereby lead to the submission of better contracts. But it may also take a negative facet: gentlemen's agreements, reduced involvement of suppliers in the technology transfer process. Third, a part of the changes introduced by regulatory agencies is difficult to quantify and is therefore not captured by statistics: softening of restrictive clauses, modifications of wording establishment of linkages with domestic R&D institutions, etc.

Notwithstanding these comments statistical approaches of the changes resulting from regulatory activity remain very relevant, since they provide information about the "visible" success of registries in achieving better terms and conditions for technology inflow.

The analysis that follows is based on a sample of 691 licensing agreements registered with the Foreign Investment Institute between 1978 and 1983. Three main issues will be examined: contract duration, payments and restrictive clauses.

5.3.1. Contract duration

Duration is one of the main matters of concern for technology registries. It may influence both the level of expenditures (longer durations will as a rule generate higher foreign exchange outflows⁽¹⁾ and the capacity of technology assimilation and mastering (short-term agreements may be inadequate for an effective technology assimilation, while long ones may create a dependency towards the licensor).

(1) Assuming that payment obligation will have the same duration of the whole contract and that royalty rates are independent of contract duration.

Duration is especially relevant for those contracts that are entered into for a specific period of time (license and routine technical assistance agreements). For most service contracts duration is not so relevant, insofar as it does not affect the amount of payments or recipient firm's opportunity costs.

Table VIII shows the duration of almost 700 license contracts as submitted to and as registered by the Foreign Investment Institute.

The comparison of initial (as submitted) and final (as registered) versions of contracts reveals that regulatory activity had two main consequences:

(i) A significant decline in the number of contracts whose duration was left open or was not defined: from 8.5% of all agreements submitted to less than 2% of those registered. This is consistent with the legal provision that technology transfer agreements shall contain an indicator of the period for which the agreement is to remain in force;

(ii) A reduction of the average duration of contracts, from above 5 years to 4.65 years. In the initial contract drafts submitted to the Institute period of 5 years or less occurred in about two thirds of total, while for registration such share reaches almost 80%. Institute's intervention led to a stronger concentration of contracts in the range between 2 and 5 years.

With regard to renewals the Institute was flexible. A further 5 year renewal was generally allowed. This was, however, used to renegotiate some contract clauses aiming at improving recipient's position: elimination of restrictions, increase in local value added, reduced royalty rates...

Service agreements were not subject to a similar scrutiny, since duration is far less important. Nevertheless, in some contracts a period was established for the provision of the envisaged services, in order to protect recipient against undue delays by suppliers.

5.3.2. Payments

Ideally the best way of assessing the results of regulation would be to compute total savings by comparing payments really undertaken with those that would be incurred if payment conditions had not been subject to change. In some countries (the Philippines, for instance) registries provide an estimate of future savings over a given time-period, by comparing foreign exchange outflow entailed by royalty rates as requested and as allowed by the registry. However, data collected by the Foreign Investment Institute does not allow such an estimate for the majority of contracts, reason why savings forecasts will not be considered in the present paper.

Again one should be cautious when analysing the results. Firms may by-pass regulations through gentlemen's agreements; licensors may countervail reduced royalty rates by marking-up the prices of goods and services supplied to their licensees or by reducing their commitment to a successful technology transfer.

Data available from the Foreign Investment Institute concerns two main issues: royalty basis and royalty rates.

With regard to the first it appears that in the large majority of cases royalty bases were not subject to change. Nevertheless it is possible to identify a clear preference for a more widespread use of net sales less purchases from the licensor as a basis for computing royalties. The purpose was to reduce total payments and to avoid double counting: when inputs are acquired from the licensor, the use of net sales as a royalty basis provides a further stimulus to over-pricing those inputs. Other result of intervention - not fully translated in the statistics - was a proper definition of the concept of net sales in many agreements. Although not imposing net profits as a royalty basis, profit-sharing was sometimes used as an useful evaluation criterion.

Unlike other countries, Portugal did not establish a priori ceilings to royalty rates. Although some guidelines existed, taking into account international references and in-house experience, the Institute usually evaluated royalty rates on the basis of the merits of each agreement. Furthermore, payments were not necessarily the main concern of contract evaluation.

This background may, to some extent, explain the relatively modest decrease in average royalty rates: from 4,8% to 4,4% of net sales (see Table IX). It has to be remarked, however, that if a weighted average were computed, those percentages - especially the last one - would decline. As a matter of fact, a large share of the 17 contracts with royalty rates of 10% or above were old agreements in specific sectors (namely cosmetics), generating very low amounts of payments.

As the main guidelines followed by the Institute became known by firms it was found that contract applications were more in line with the Institute's requirements, thereby requiring less intervention. This was particularly relevant in the pharmaceutical industry where a 5% royalty on net sales was defined, in principle, as the maximum acceptable royalty.

An important consequence of the Institute's experience on this issue was the revision of the maximum royalty rates, in the various industries, acceptable as costs by the Tax Authorities. The co-operation between the Institute and Tax Authorities was very important to reduce the propensity of firms, and

especially of foreign-owned firms, to enter parallel contracts with higher royalty rates, since the registration of contracts with the Foreign Investment Institute was always requested by Tax Authorities for allowing as cost deductible royalty payments whose rates exceeded the industrial maxima defined.

5.3.3. Restrictive clauses

Data on the occurrence of the so-called restrictive clauses are presented on Table X. These clauses, however, do not have all the same nature: some mainly concern the current or future economic activities of recipient (export restrictions, tie-in clauses, limitations to technology development), others are addressed to legal matters (applicable law), while still others refer to both aspects (transmissibility of rights, restrictions to industrial property rights). Even inside each type of clauses, different levels of "restrictiveness" may be found. Statistics only indicate the existence in the licensing contracts surveyed of the various kinds of provisions, irrespectively of the restrictive character of each particular clause; these range, therefore, from leonine clauses to provisions that may, taking into consideration the specific conditions of a given contract, be acceptable due to its minor restrictive effects.

A general assessment of Foreign Investment Institute's activity reveals that it led to the deletion of 14% of the restrictions laid down in contract applications. Statistics do not fully translate, however, the results of regulation. In fact, the above figure does not reflect, for instance, the significant softening of the restrictive nature of some provisions. Nor does it show the results achieved in contracts with several restrictions of a similar type, through the elimination of part of them. To put it in a nutshell, statistics underestimate the effectiveness of regulation in curbing restrictive clauses down.

A closer look at Table X shows that the Institute was much more concerned with provision affecting economic activities and technological strategies than with those having a stronger legal content. The level of elimination of restrictions dealing with transmissibility of rights or applicable law was very low. In contrast, success records for export restrictions, unbalanced grant-back clauses or price-fixing by suppliers were fairly good: in 40, 35 and 29%, respectively, of the contracts involving those kinds of restrictions in their initial version, regulatory activity led to their elimination.

Export restrictions were, most probably, those subject to closer scrutiny. Besides the cases where exports became totally free or free towards all countries, except those where exclusive licenses were already granted, some success was achieved in changing total export bans into authorization of exports to some countries (mostly to other European countries and/or to the former Colonies).

Two relevant areas where the results appear to be weak are tie-in clauses and post-expiry restrictions, whose indexes of elimination of restrictive clauses reached 12% only. This figure shows how difficult it is for a soft, dialogue-oriented approach to fully eliminate some types of sensitive clauses, to which licensors attach much importance and that may put at stake the technology transfer itself. In the case of post-expiry restrictions the problem was further compounded by the lack, until 1982, of a legal prohibition of such restrictions. Again, however, the above figure underestimates the outcome of regulation, since it does not reflect the softening of restrictions. With regard to tie-in, the main aim was to stipulate that recipients were free to purchase inputs, provided that a minimum standard of quality was met; when the contract stipulated that inputs were acquired from the licensor, it was required that prices should be in line with international standards. For post-expiry restrictions, the achievement of the main goal - licensee's right to continue production and sales of the contractual goods after contract's term - implied in some instances the acceptance of minor restrictions, such as post-expiry secrecy.

Provided the flexible approach followed by the Foreign Investment Institute the levels of change in restrictive clauses may be considered as relatively good and compatible with a continued inflow of foreign technology. The deletion of those provisions from contracts does not ensure, however, that the corresponding restrictive practices did not take place, especially in cases when the bargaining power of licensors increases over time. But this is another issue that can not be dealt with here due to the lack of information.

5.4. Establishment of linkages for technology mastering and diffusion

The Institute recognised that regulation of technology inflow was only one part of the effort needed towards the strengthening of Portugal's technological capacity. Action was also required to stimulate the mastering and the diffusion throughout industrial fabric of imported technologies.

Diffusion is however difficult for licensing contracts, since it is the very possession of secret know-how that provides an edge over competitors. It cannot be expected, therefore, a significant voluntary diffusion of technology in this case. It may happen only through indirect forms: demonstration effects, leave of skilled personnel, use of sub-contractors.

The case is different for engineering agreements, namely those connected with the setting up of new manufacturing plants. Here, domestic engineering firms may play an important role in assimilating the technologies and diffusing them, through the supply of manufacturing facilities to other firms - either in Portugal or abroad.

The Institute developed several forms of co-operation with the Association of Portuguese Engineering and Consulting Firms as well as with reputable domestic firms to promote an increased participation of such firms in important engineering projects - not only as sub-contracted for specific areas but desirably as main contractors. This effort enabled a significant presence of Portuguese engineering firms in some projects where such presence, if any, would otherwise have been marginal.

The success remained, however, confined to a limited number of projects. For most of them it was not possible to reach a significant increase of the participation of Portuguese engineering firms by two main reasons. First, as it was referred to above, the import of technology packages was often preferred by suppliers (because it increases the room for price mark-ups) and recipient (because it is perceived as a risk-minimising choice). Second, Institute's intervention took place at a late stage in the decision process, when the main decisions were already taken and the conditions of technology supply largely agreed. Institute's push towards an accrued recourse to Portuguese firms was therefore often seen as a deterrent of the technology transfer process and as a undesirable and untimely intervention. Even when State-owned enterprises were concerned, things were not easier.

In a few instances, the Institute was asked by Portuguese firms envisaging to launch significant investment projects to collaborate in the definition of the conditions of tender and in the definition of criteria for ranking and selection of proposals.

With regard to the strengthening of linkages between technology imports and the activity of domestic R&D centers several actions were taken. The most important concerned the association of public or University R&D centres to some contracts with a view to ensure the assimilation and endogeneization of technologies; one interesting example was in forestry; when an University research Centre was associated to the most suited trees for paper pulp and paper in a vast area in the center of Portugal. Other actions were related with the diffusion of information about imported technologies, safeguarding confidential data, to support the definition of new research projects.

contract aimed at
identifying

It has to be recognized, however, that achievements in this field were limited. The lack of adequate incentives for firms to develop projects of mastering and further development of imported technologies as well as the short-minded approach followed by the majority of firms in acquiring foreign technology severely reduced the room for developing University-industry linkages.

5.5. Awareness of the contractual technology transfer business

The pedagogic activity of the Foreign Investment Institute has probably been the most important and long-lasting outcome of 8 years of technology regulation.

By 1978, when the Institute took off, technology transfer in general, and licensing in particular, were matters of little concern for Portuguese firms, namely small and medium-sized ones. The contents of the contracts submitted to the Institute translated the lack of knowledge about the minimum elements needed to choose partners, to negotiate and draft agreements and to successfully implement them. Today, although serious problems still remain, there is an increased awareness about the technology transfer business.

It is our conviction that the Foreign Investment Institute played a role in such change. The dialogue-orientated approach, in spite of extending too much the evaluation period in many instances, enabled the exchange of views about the questions raised by the drawing up of technology transfer contracts and by the development of the transfer process itself. Such dialogue had a double effect: on the one hand, provided the Institute's staff with a better knowledge about the main reasons leading to acquire technology and about the constraints faced by recipient firms; on the other, increased the awareness of entrepreneurs about the opportunities and pitfalls of technology transfer agreements, about the hidden dangers of some clauses or about the methods for evaluating royalty rates.

A problem often found in evaluating contracts was the difficulty to change their "spirit" by a mere redrafting of the most negative or restrictive clauses. This led the Institute to advise firms about the advantages of negotiating on the basis of their own draft.

In several instances were the firms themselves that came to the Institute to demand support and guidance for the negotiation and drawing up of contracts. This earlier advice enabled some interesting results in the definition of contractual terms and conditions, but could not be extended too much, since it might conflict with the regulatory functions. Nevertheless, firms requests may be seen as the acknowledgment that Institute's technical capacity and expertise might be more relevant than the administrative power to authorize and register contracts. It was therefore regrettable that the accumulated knowledge and experience were not used, after the 1986 liberalization, to provide advisory services to domestic firms in the preparation and negotiation of technology transfer contracts.

While some Portuguese firms regarded technology regulation as an undesirable interference in their activities, others relied on the Institute and on legal provisions to strengthen their bargaining capacity vis-à-vis technology suppliers.

Another area where the Institute played an useful role was in the diffusion of non confidential information about registered agreements and of statistical data on the general terms and conditions of technology imports and on technology payments. Such information was helpful for both other Government bodies and entrepreneurs to be more aware of the trends and characteristics of foreign technology inflow.

6. CONCLUSIONS

Which is the overall assessment of the Portuguese experience in regulating technology inflow and which lesson may be drawn from it for the benefit of other countries?

From our point of view the final outcome was positive. Benefits were derived from both regulatory and pedagogic activities. It appears however that the pedagogic approach aimed at increasing domestic firms awareness of the intricacies of contractual technology imports generated more benefits than the regulation itself. But it should be reminded that most probably the pedagogic activity would not have been impossible without the support of the regulatory power.

It was shown in the last chapter that regulation did not significantly hindered the volume of technology inflow and enabled an amelioration of the contents of agreements. Some shortcomings may be identified, however; let us point out two of them. First, the sometimes unduly long evaluation period. This may have in some cases inhibited firms from launching new products on time and thereby discouraged innovation. Registries must pay particular attention to the time factor: firm's concern to successfully put the product in the market may be more important than marginal amelioration of the text of the contract. Successful marketing of licensed products is almost always an essential ingredient of a successful technology transfer. Second, the regulation of minor technical assistance contracts. Technical assistance like trouble-shooting or routine revisions of machinery and equipment are current acts of production management where Governmental interference through regulation may cause more harm (by delaying assistance) than help. They should not, therefore, be subject to registration. This was recognized within the Institute and a fast administrative procedure was followed in these cases, but they were never excluded from the legal definition of technology transfer agreements.

These examples show that regulation cannot disregard the needs and capacities of the main actors involved in technology transfer operations: the firms. An excessive commitment to legal provisions disregarding the specific conditions of each operation may widen the gap between firms interests and regulatory "goals", inhibiting technology inflow or giving rise to parallel gentlemen's agreements. That's why the flexible approach followed by the Foreign Investment Institute, without providing spectacular statistical results in terms of reduction of royalty rates or elimination of restrictive clauses, proved to be reasonably effective: the dialogue enabled a balancing of national interest and firms' objectives and constraints in the acquisition of technology.

The Portuguese experience also shows that a "dynamic" perspective of registries functions has to be adopted. Registries must not be confined to a "defensive" attitude of checking contractual terms and conditions. They must have a more important role in promoting the mastering and endogeneisation of imported technologies. Elimination of restrictive clauses does not guarantee that the recipient firm will be able, or willing, to export or to introduce adaptations in the technology concerned. That requires a strategic change in the purpose of technology acquisition: the use of imported technology as an in-house innovation promoting factor.

Registries can play an important role in fostering such a change. Through the dialogue with firms they may show the pitfalls and the opportunities of technology transfer contracts. They may help firms to identify suppliers for the technologies needed and to define the headlines of desirable licensing agreements. They may also serve as brokers between firms and local R&D centres to work out projects of assimilation and adaptation of imported technologies.

Evaluation and registration of contracts did not lose their importance. They still have their place in the context of national strategies of technological development. But they need to be complemented with promotional, "offensive" measures aimed at increasing the awareness of firms about technology transfer contracts and the opportunities that they may offer.

In a changing world where technology is becoming increasingly important, technology transfer registries have a pivotal role to play in creating conditions for developing countries to successfully integrate imported technologies in the process of technological development.

PART II

**METHODOLOGY FOR THE ANALYSIS OF
THE TRENDS IN TECHNOLOGY IMPORTS BY
TIES MEMBER COUNTRIES**

METHODODOGY FOR THE ANALYSIS OF
THE TRENDS IN TECHNOLOGY IMPORTS BY
TIES MEMBER COUNTRIES

1. INTRODUCTION

It was pointed out in the first part of the present paper how important information is for the success of technology transfer regulation. To perform their duties registries should be aware about the worldwide trends in the terms and condition of technology flows. Such awareness will provide them with further leverage to get more suitable technology contracts and to help domestic firms in the business of acquiring foreign technology.

Most technology suppliers are large firms with an international perspective, licensing technology worldwide, while technology recipients are usually small or medium sized firms, with limited, if any, international experience. This raises a bargaining gap. To strengthen the bargaining position of domestic firms, registries should not confine themselves to an a posteriori checking of contractual terms and conditions. They must inform local firms about what's going on in technology transfer field, about international royalty standards for the various products and industries.

International exchange of information is, therefore, of paramount importance for enhancing developing countries' stance when importing technology. Such exchange already exists under TIES (Technology Information Exchange System), handled by UNIDO.

The present paper aims at suggesting a methodology for a stronger use of TIES as an effective device for information exchange and for assessing the trends in technology transfer to developing countries. It will include 3 parts. First, a brief presentation of TIES. Second, a methodological outline for the analysis of technology transfer trends. Third, an illustration with recent data on several TIES member countries.

2. TIES INFORMATION EXCHANGE

Launched in 1979, TIES has proved to be a powerful tool in promoting the diffusion of information on technology transfer contracts. The importance of TIES was recognized inter alia by the meeting of Heads of Science and Technology Agencies of Developing Countries held at New Delhi in 1981.

This meeting recommended UNIDO to enlarge TIES membership and to enhance its activities. UNIDO has actively endeavoured at this and helped developing countries to establish compatible registry information systems under CORIS.

TIES information exchange can be sub-divided into four categories:

1. TIES I - Statistical information on license contracts;
2. TIES II (license) - Detailed information on individual license contracts;
3. TIES II (service) - Detailed information on individual service agreements;
4. Exchange of information on special requests.

It should be recognized, however, that systematic information exchange fell below expectations. Some countries have shown a remarkable commitment to the supply of information, while others had a very scarce, if any, contribution to the working of the system.

The development of CORIS (Computerized Registry Information System) and its implementation in several countries may provide a further impetus to TIES information exchange, since CORIS was designed to meet TIES requirements.

3. METHODOLOGICAL ISSUES

3.1. General aspects

TIES I data are suited to provide a framework for assessing the trends and characteristics of technology flows. In fact, TIES I tables are already standardized in a way that enables easy international comparisons and aggregations.

Yearly data need to be set against an historical background, in order to identify which changes are occurring. It would be desirable, for each country concerned, to have a revolving 5-years historical data. For several TIES members this does not raise problems. For others, however, this may not be possible, due to a late adhesion to TIES or to the lack of an appropriate data base. It may be expected that as the implementation of suited registry information systems - and namely CORIS - progresses, a wider historical coverage may be reached.

On the basis of TIES I tables information may be collected for each recipient country and industry on the following:

- (i) Collaboration types - the 17 collaboration types identified in TIES and CORIS user manuals will be adopted:

- . leasing/franchising
- . know-how
- . trademarks
- . patents
- . pre-investment consulting
- . turn-key
- . construction or set-up
- . basic engineering
- . detailed engineering
- . management of construction set-up
- . start-up supervision
- . production supervision
- . equipment repair and maintenance
- . administrative supervision
- . marketing
- . training
- . quality control

(ii) Supplier countries

(iii) Foreign holding in recipient enterprise

(iv) Duration of contracts

(v) Payments types, identifying 4 main groups:

- . royalties
- . lump-sum payment
- . reimbursement payment
- . others

(vi) Royalty rates, expressed as a percentage of net sales

3.2. Data by recipient country

Countries follow different approaches to technology transfer regulation, according to inter alia their level of economic development, industrial priorities size, legislative framework and foreign investment policies. To examine trends it would not be, therefore, advisable to rely solely on aggregate data. Country trends do matter as well, setting the characteristics of technology inflow for a given year against an historical framework.

This kind of analysis requires, of course, a previous explanation of the policies followed in each country, their objectives and evolution over time.

When enough information is collected for each country, and particularly for countries with a large number of contracts per annum, an industry-wise breakdown would be very helpful.

3.3. Data by industry

Terms and conditions of technology transfer agreements widely differ from industry to industry. For instance, the characteristics and remuneration of a contract in bulk chemicals are very dissimilar from those found in one for the construction of automotive engines.

An industry-wise approach is, therefore, needed to provide registries and companies in developing countries detailed information that might be useful when defining evaluation guidelines or when negotiating contracts.

This requires the use of an internationally accepted classification. In spite of its shortcomings (that are now leading to its revision) ISIC is undoubtedly the most appropriate to enable multi-country comparisons. Furthermore, ISIC is the classification already used in TIES I Tables.

The 6 groups of subjects referred to above in § 3.1. will be analysed here from a sectoral perspective. It would also be convenient to collect the information on supplier firms, as this may enable registries to identify the firms more active in each field.

3.4. Extension of information

At a later stage it might be envisaged to extend the scope of the information analysed. The implementation of CORIS in more registries would enable an easier information processing and the addition of new subjects, such as the size of the firms involved, licensed products, exclusivity provisions and restrictive clauses.

4. AN ILLUSTRATION

On this basis of 1986-88 TIES data for 4 countries (China, Peru, the Philippines and Poland) a brief illustration of the ideas presented above may be sketched.

The following aspects should be pinpointed:

- Sectoral patterns differ from country to country: in China, machinery, transportation equipment and industrial chemicals account for about three fourths of contracts, while in Philippines and Peru light chemicals and food and beverages are predominant.
- Know how and trademarks are by far the most common collaboration types, trademarks showing a stronger frequency than know-how in Peru.
- The pattern of supplier countries is leaded by the United States, the main origin of contracts for China, Peru and the Philippines. But geog:aphical and psychological proximity do matter as well: Japan is the second or third supplier for both China and the Philippines.
- Royalties are by far the main forma of payment for all countries; royalty-rates rarely exceed 5%.
- A common pattern of contract duration does not exist: a sharp contract appears, for instance, between Peru (where most contracts extend for less than 5 years) and China, where about two thirds of contracts are scheduled to remain in force for 5 years or more.

TABLE I

TECHNOLOGY TRANSFER CONTRACTS
 BREAKDOWN BY TYPE OF CONTRACT
 (1978 - 1985)

	LICENSE	SERVICE	TOTAL
1978	81	135	216
1979	189	318	507
1980	170	443	613
1981	235	576	811
1982	212	663	875
1983	175	552	727
1984	151	520	671
1985	165	580	755
1978/85	1 378	3 797	5 175
%	26.8	73.4	100.0

SOURCE: F.I.I.

TABLE II
TECHNOLOGY TRANSFER CONTRACTS
BREAKDOWN BY OF CONTRACT
AND INDUSTRY

(1978/1985)

	1978	1979	1980	1981	1982	1983	1984	1985	1978/1985
LICENSE (LATU SENSU)									
TOTAL	81	189	170	235	212	175	151	165	1 378
MANUFACTURING	74	169	166	227	202	167	138	162	1 305
% OF MANUFACTURING	91.4	89.4	97.7	96.6	95.3	95.4	91.4	98.2	94.7
SERVICE									
TOTAL	135	318	443	576	663	552	520	590	3 797
MANUFACTURING	85	242	311	358	415	360	344	421	2 536
% OF MANUFACTURING	63.0	76.1	70.2	62.2	62.6	65.2	66.2	71.4	66.8
TOTAL (LICENSE+SERVICE)									
TOTAL	216	507	613	811	875	727	671	755	5 175
MANUFACTURING	159	411	477	585	617	527	482	583	3 841
% OF MANUFACTURING	73.6	81.1	77.8	72.1	70.5	72.5	71.8	77.2	74.2

SOURCE: Foreign Investment Institute

TABLE III

**TECHNOLOGY TRANSFER CONTRACTS
BREAKDOWN BY INDUSTRY
(1978 - 1985)**

	1978	1979	1980	1981	1982	1983	1984	1985	1978/1985	%
Agriculture, forestry and fishing	5	10	8	3	4	-	3	5	38	0.7
Mining and quarrying	6	8	8	29	53	19	20	18	161	3.1
Manufacturing	159	411	477	585	617	527	482	583	3 841	74.2
Food, drink and tobacco	9	27	44	21	26	26	35	38	226	4.4
Textiles, clothing and footwear	21	30	61	93	81	79	73	103	541	10.5
Wood and cork	2	2	5	9	15	6	7	6	52	1.0
Paper, printing and publishing	24	61	62	83	89	89	84	127	619	12.0
Chemicals	44	115	148	188	199	133	117	120	1 064	20.6
Non metallic minerals	18	22	26	31	38	27	41	44	247	4.8
Metallurgy	9	19	41	46	41	33	23	16	226	4.4
Metal prod., machinery and transp. eqt.	31	132	82	106	123	125	96	123	618	15.8
Other manufacturing	1	3	8	8	5	9	6	6	46	0.9
Electrical power, gas and water	13	23	27	38	42	35	39	43	260	5.0
Construction	2	5	8	12	16	14	7	10	74	1.4
Trade, restaurants and hotels	6	12	21	24	21	10	25	17	136	2.6
Transports and communications	12	15	19	31	35	24	15	21	172	3.3
Banking, insurance and business services	10	22	36	66	54	66	40	39	335	6.5
Miscellaneous and social services	3	1	7	23	33	32	40	19	158	3.1
TOTAL	216	507	613	811	875	727	671	755	5 175	100.0

SOURCE: Foreign Investment Institute

TABLE IV
LICENSE CONTRACTS (LATU SENSU)
BREAKDOWN BY INDUSTRY
(1978 - 1985)

	1978	1979	1980	1981	1982	1983	1984	1985	1978/1985	%
Agriculture, forestry and fishing	1	8	2	1	1	-	1	-	14	1.0
Mining and quarrying	-	-	-	1	2	1	1	-	5	0.4
Manufacturing	74	189	166	227	202	167	138	162	1 305	94.7
Food, drink and tobacco	5	9	17	5	9	11	10	15	81	5.9
Textiles, clothing and footwear	9	14	23	33	28	21	23	41	190	13.8
Wood and cork	1	1	2	4	-	3	-	1	12	0.9
Paper, printing and publishing	5	2	3	2	-	3	4	2	21	1.6
Chemicals	23	62	57	108	98	59	46	54	507	36.8
Non metallic minerals	5	8	4	5	1	5	8	1	37	2.7
Metallurgg	4	3	5	3	2	4	2	-	23	1.7
Metal products, machinery and transp. eqt.	21	67	47	59	61	52	40	44	391	28.4
Other manufacturing	1	3	8	8	5	9	5	4	43	3.1
Electrical powers, gas and water	-	2	-	-	-	-	-	-	2	0.2
Construction	-	2	1	-	3	1	1	-	6	0.6
Trade, restaurants and hotels	2	2	1	2	2	2	5	3	19	1.4
Transports and communications	2	2	-	1	1	2	1	-	9	0.7
Banking, insurance and business serv.	2	4	-	3	-	1	4	-	14	1.0
Miscellaneous and social services	-	-	-	-	1	1	-	-	2	0.2
TOTAL	81	189	170	235	212	175	151	165	1 378	100.0

SOURCE: F.I.I.

TABLE V
TECHNOLOGY TRANSFER CONTRACTS
BREAKDOWN BY SUPPLIER COUNTRY
(1978-1985)

	1978	1979	1980	1981	1982	1983	1984	1985	1978/1985	%
E.E.C.	128	311 ^(a)	370	506	547	434	397	445	3 138	60.6
BELGIUM	14	17	33	34	31	33	22	22	206	4.0
DENMARK	3	7	9	8	9	8	5	5	54	1.0
FRANCE	34	78	108	171	175	131	101	136	934	18.1
FED.REP.GERMANY	27	73	97	115	147	107	124	127	817	15.8
GREECE	-	1 ^(a)	-	-	1	1	1	4	8	0.2
HOLLAND	4	17	12	28	20	17	21	21	138	2.7
ITALY	6	38	33	33	53	29	33	41	266	5.1
LUXEMBURG	-	-	1	2	2	1	2	1	9	0.2
REP. IRELAND	-	-	-	1	-	4	2	-	7	0.1
UNITED KINGDOM	40	83	81	120	109	105	86	88	712	13.8
E.F.T.A.	41	103	124	142	156	164	125	160	1 015	19.6
SWEDEN	13	35	29	25	46	46	42	56	292	5.6
SWITZERLAND	21	46	66	76	88	96	66	71	530	10.2
OTHERS	7	22	29	41	22	22	17	33	193	3.7
SPAIN	23	39	41	63	77	50	64	69	426	8.2
UNITED STATES	19	32	58	63	78	48	69	66	453	8.8
OTHERS	5	23	24	20	19	33	16	21	161	3.1
TOTAL	216	507	613	811	875	727	671	755	5 175	100.0

(a) Greece was not yet member of E.E.C.

NOTE: Total does not corresponds to the sum of country's figures, because there are contracts involving two or more suppliers, from different countries

SOURCE: F.I.I.

TABLE VI

PAYMENTS FOR "PATENTS, TRADEMARKS, MODELS"

YEAR	AMOUNT (MILLION ESCUDOS)	INDEX (1970 = 100)
1970	141	100
1971	187	133
1972	276	196
1973	357	253
1974	426	302
1975	194	138
1976	500	355
1977	764	542
1978	797	565
1979	1 101	781
1980	1 548	1 098
1981	2 141	1 518
1982	3 147	2 232
1983	4 174	2 960
1984	4 201	2 979
1985	5 682	4 030

Source: Bank of Portugal

NOTE: Data refers to the heading of the Balance of Payments entitled "Patents, Trademarks, Models" that includes 3 main types of operations: granting of licenses, authors' rights and registration of industrial property right. For additional information see OECD, Data on the Technological Balance of Payments of Portugal (Report by Vitor Corado Simões), doc. DSTI/IP/87.16/16, Nov. 1987.

TABLE VII

TECHNOLOGY PAYMENTS

YEAR	LICENSE	SERVICE	TOTAL
1979	1 731	1 051	2 782
1980	2 697	1 507	4 204
1981	2 913	2 883	5 796
1982	4 273	5 856	10 129
1983	5 269	8 500	13 769
1984	6 636	7 936	14 572
1985	8 551	7 614	16 165

Unit: million escudos

Source: Foreign Investment Institute

TABLE VIII
DURATION OF CONTRACTS

Duration (D) in years	Contracts as submitted to the F.I.I.	Contracts as registered by the F.I.I.
D ≤ 1	64	57
1 < D ≤ 3	121	142
3 < D ≤ 5	282	333
5 < D ≤ 10	60	72
10 < D < 15		
D ≥ 15	11	3
Validity of patent	4	3
Open or duration omitted	59	13
TOTAL	691	691

SOURCE: Foreign Investment Institute

TABLE IX**ROYALTIES ON NET SALES**

ROYALTY RATE (%)	Contract as submitted to the F.I.I.	Contract as registered by the F.I.I.
< 1	2	3
1-2	26	32
2-3	53	59
3-4	75	90
4-5	41	36
5-6	145	139
6-7	24	20
7-8	29	22
8-9	12	16
9-10	2	1
≥ 10	30	17
TOTAL	439	435
AVERAGE RATE	4.82	4.42

NOTE: Figures based on a sample of 691 agreements registered with the Foreign Investment Institute

SOURCE: Foreign Investment Institute

TABLE X
RESTRICTIVE CLAUSES IN LICENSING CONTRACTS

	Contracts as submitted to the Foreign Investment Institute		Contracts as approved by the Foreign Investment Institute		Index of elimination of restrictive clauses (5)
	Absolute(1) (1)	Relative(2) (2)	Absolute (1) (3)	Relative(2) (4)	
Export restrictions	273	39.5	164	23.7	39.9
Tie-in clauses	150	21.7	132	19.1	12.0
Distribution policy restrictions	144	20.8	132	19.1	8.3
Technology restrictions	107	15.5	101	14.6	5.6
Unbalanced grant-back clauses	60	8.7	39	5.6	35.0
Restrictions to productive activities	162	23.4	142	20.6	12.3
Restrictions to ind. property rights	84	12.2	81	11.7	3.6
Price-fixing by suppliers	28	4.1	20	2.9	28.6
Post-expiry restrictions	318	46.0	279	40.4	12.3
Restrictions of transmissibility of rights	216	31.3	214	31.0	0.9
Use of foreign law	242	35.0	232	33.6	4.1

(1) Number of contracts with restrictions

(2) Percentage of contracts with restrictions over number of contracts in the sample (691)

(3) $\frac{\text{Colum (1)} - \text{Colum (3)}}{\text{Colum (1)}} \times 100$

SOURCE: Based on data published by the Foreign Investment Institute