11-1-1973

Patents, the Paris Convention and Less Developed Countries

Jorge M. Katz

ECONOMIC GROWTH CENTER

YALE UNIVERSITY

Box 1987, Yale Station
New Haven, Connecticut

CENTER DISCUSSION PAPER NO. 190

PATENTS, THE PARIS CONVENTION AND LESS DEVELOPED COUNTRIES

Jorge M. Katz

November 1973

Table of Contents

Table of Contents (Cont.)

Patents, the Paris Convention and Less Developed Countries

Jorge M. Katz*

Introduction

Human beings live surrounded by institutions that they dimly understand, and that they control only in an imperfect manner. It should not, therefore, come as a surprise that, when one carefully examines the performance of a particular institution, one normally finds unfulfillment of objectives, inefficiency, and social costs that frequently exceed the sum of benefits involved.

The reasons why an institution fails to operate adequately are not, in general, easy to identify, and even less, to correct. In some instances trouble may arise from an inadequate definition of the objectives the institution should accomplish. In other instances, an increasing gap may develop between the initial goals, drawn in relation to a given set of conditions--and the changing socio-economic framework in which the institution has to operate through time. Obviously, the list of reasons can be extended, as any handbook on institutional psycho-sociology could teach us. In spite of malfunctions

---

*The author works for the Center for Economic Research (Centro de Investigaciones Económicas) of the DiTella Institute, Buenos Aires, Argentina. He is currently a visiting fellow in the Economic Growth Center of Yale University.

In this monograph statistical materials are used which were compiled with the aid of D. Chudnovsky and S. Glemboki, whose dedication is here acknowledged. The study has received financial support from the DiTella Institute and the S.S.R.C. of the United States. The translation from Spanish into English is the work of Cesar Cardozo.

The author also wishes to thank the stimulus and commentaries of M. Wionzcek, M.A. Laquis, A. Orol and A. Canitrot.

The present version incorporates ideas and materials that arose during seminars at Yale and Harvard. The collaboration of those who attended these seminars is acknowledged.

The opinions here expressed are the author's responsibility, and do not compromise any of the other persons and institutions named before.

and inefficiencies, however, every institution ends up benefiting certain groups in society (at the very least its own administrative bureaucracy), groups which, by definition, become vehement defenders of the prevailing practices and perennial opposers to the introduction of significant changes in the rules of the game.

A clear example of a situation of this sort is to be found in connection with the Patent System, and its juridical counterpart at the international level, the Paris Convention of 1883, with its host of additions and changes agreed at in Washington, Brussels, Lisbon, etc.

Both these institutions are part of the complex mechanism which regulates property rights on the output of inventive activity, the first at a national level, and the second in the international scene.

Both the Patent System and the 1883 Paris Agreement are long standing juridical institutions. Both had their origin in countries which now belong to the developed world, and they were eventually transplanted to less developed societies, on the assumption that what was good for the former necessarily had to be good for the latter.

Such an assumption will be critically examined in this paper. The balance of costs and benefits arising from both institutions has to be re-examined in the light of the economic and technological features of the so-called "developing" countries, before we can rightfully state that the transplant can be justified. The general case here examined is the one of a country that: (a) imports most of its technology from abroad; (b) utilizes technology that is normally lagged between five and twenty years when compared with "best-practice" designs currently used in developed countries, (c) is not particularly suited to contribute to the advancement of the international

technological frontier, and (d) is not specialized in the export of industrial goods. Such conditions strongly differ from the ones that prevail in the advanced countries. For this reason we strongly suspect the validity and usefulness of contemporary writings in this area, which are based on the conditions prevailing in the developed world and pretend to reach normative conclusions to be followed by less developed societies.

This paper explores the operation of the Patent System in a technologically dependent country, under the assumption that it constitutes an instrument of government policy. We shall try to answer the following questions, which seem crucial in this field: (1) should a technologically dependent country maintain a domestic Patent System? (2) If so, which characteristics should that System have in order to maximize that country's welfare position? (3) Is it convenient, or is it not, for that country to belong to the International Agreement on the Protection of Industrial Property Rights (Paris Convention)?

Even though this paper contains information regarding several Latin American countries, its central argument has been built around the experience of Argentina, a case which is herein examined in detail during the post-war period.

The paper is divided in three parts. The First Part (Sections One to Four) reviews the various arguments that have been historically used in order to justify the need of a Patent System at the level of an individual country. The Second Part (Sections Five to Seven) examines the empirical evidence related to the operation of the Patent System in Argentina over the last few decades. Finally, the Third Part (Section Eight) summarizes the various findings of this exploration, advances an answer to the various questions previously posed, and briefly mentions possible lines of future action.

1. Economic and Non-Economic Arguments used to Justify the Need of Patent Rights

Even though the Patent System dates back to early stages of history--it can be traced back, for example, in the early codes of the Fifteenth Century's Venetian Republique--there is agreement that the 1623 Statute of Monopolies of Great Britain is the piece of legislation that has served as a model for most of the laws currently prevailing in western countries.[1]

Five different arguments have been used to justify the need of a Patent System; three of them are arguments of an economic nature, whereas the other two are cast in terms of rights inherent to the human being.

1.1. Rights Inherent to the Human Being

While the first argument stresses the individual's property rights on his own ideas, the second argument emphasizes the right to an 'Adequate Retribution' for the services rendered to society.

(a) We shall not discuss here whether or not the property right is inherent to the human being, or whether it is a social arrangement that serves social purposes.[2] However, it is worth observing that, even if we conceded that the individual has natural property rights on his ideas before communicating them to other people, it is very different to argue that these rights can still be claimed after the individual's ideas are shared with others. In such case the ideas become common property.

---

[1] The spirit of the 1623 English Act can be found in the French Legislation of 1791. It is important to note that the 1864 Argentine Law on Patents follows the French model. The same is true of some other codes in Latin America.

[2] See the discussion by M. A. Laquis and others in "Sobre la Teoría del Derecho Sujetivo," "Juridica," Journal of the Law School of the "Universidad Iberoamericana," Bs.As. 1970.

(b) A second non-economic argument rests on the moral rights of the inventor to be compensated for the services rendered to society. It was stated by J. S. Mill in the following terms:

> "The idea that the inventor should be adequately compensated can not be rejected. It would be immoral that the law permitted someone to benefit from some other's work, without his approval and a fair compensation."[1]

Also this argument is far from being trouble-free. First, it supposes that whoever patents an invention is really the one who conceived the original idea. On the one hand, this is not always true, and often leads to injustices, as can be appreciated from the following case, commented by F. M. Scherer in a recent work:

> "An example--of the difficulty in identifying the original inventor--, can be found in the dispute about the Lasser rays. In this case, a graduate student, unaware of the complicated procedures that must be followed in order to obtain a patent, lost his priority against the Nobel Prize winner Charles H. Townes, and the Bell Telephone physicist Arthur Schawlow, even though the graduate student seems to have been the one who first perceived the correct solution to the problem."[2]

On the other hand, it often happens that it is not just one individual who happens to be exploring a certain territory and thus it is somewhat unfair that the one who first gets the adequate solution collects the lot of the benefits involved.

---

[1] J.S. Mill, "Principles of Political Economy," cited in E. Penrose and F. Machlup, "The Patent Controversy in the XIX Century," Journal of Economic History (May 1950).

[2] F.M. Scherer, Industrial Market Structure and Economic Performance, Rand McNally, Chicago, 1971, p. 394.

Section G of the American Patents Code mentions three different, and potentially conflicting forms in which priority conflicts can be resolved; these are: (a) date of conception; (b) date in which the solution was put into practice, and (c) readiness of the one who conceived the idea in putting it to practice.

Second, even admitting that the inventor must be compensated, the argument does not necessarily imply the needs of protection by means of a patent system. It has to be shown-by means of a cost-benefit analysis - that a patent system is the best possible policy instrument, as there are alternatives to it.[1]

We shall not deal any longer with the non-economic arguments for the granting of patents. It is the central theme of this paper that the Patent System should be considered as an instrument of economic policy. Thus, the economic arguments in favor of the granting of patents deserve careful examination.

1.2. Patents as an Instrument of Economic Policy

There are three different arguments in this respect: (a) patents as an incentive to inventive work; (b) as an incentive to technological innovation, and (c) as an incentive for inventors to disclosure their inventions. We shall now examine each of these arguments.

(a) Patents as an Incentive to Inventive Activity.

The production of technical and scientific knowledge is one among the very many productive activities carried up by human beings. Unlike other productive activities, however, this one is difficult to explore in terms of the analytical tools of received theory. Technological knowledge as a tradable good has some features that make it a very special commodity. On the one hand, it is a commodity whose production function presumably

---

[1] See S. Stepanov, "Increasing the Role of Innovators and Inventors in Socialist Production," in Problems of Economics, 1958.

exhibits both technological "indivisibilities" and scale economies. On the other hand, it belongs to the group of the so-called "public goods." This last attribute gives rise to "inappropriability" problems, i.e. the marginal cost of imitation is substantially lower than the cost of the original discovery.

Given both such features, we have to expect that, first: the expenditures on research and development will be concentrated in a few economic agents, of relatively large size, and, second: that the amount of expenditures in the production of technical knowledge will tend to be less than optimal.

It is this last difficulty that makes it necessary for the state to intervene in order to give additional incentives to the production of technological knowledge, this being the first of the arguments currently used in order to show the need for a patent system. The patent creates a monopoly, and it is this monopoly that allows the inventor to reap full benefits from his inventive activity.

(b) Patents as Incentive to Investment in Technological Innovation.

There is a large distance between invention and innovation, both in terms of resources and risks. Any invention that seems promising enough at the stage of its original conception must undergo a lengthy technical and economic manipulation in order to evolve into its experimental stage and finally into its actual utilization on an industrial scale.

Such process--which normally implies a variety of resources-consuming activities such as applied experimentation, prototype constructions, pilot plant design and operation, engineering plant design, and so forth--also involves substantial risks. The empirical evidence suggests that, both investment and risk, are much greater in the stages of development of an invention than they are in the initial stage of its discovery.[1]

[1] See E. Mansfield, Research and Innovation in the Modern Corporation, Norton and Co., New York, 1971, Ch. 4.

In the same way as before, also here the prospect of an early imitation works as a disincentive for private entrepreneurs to take the risk of innovation. The necessity arises, therefore, of an instrument of economic policy which could ensure the innovating firm that it will recoup its R&D expenses plus a premium for the risk which underlies the act of innovation.

(c) Patents as Incentive for Inventors to Disclose their Inventions

A third argument in defense of the Patent System stems from Rousseau's "Social Contract." In this case the patent is the expression of a contract between the inventor and society, contract through which the former gives public status to the fruits of his inventive work, whereas in exchange the latter grants monopoly rights on the output of such inventive activity for a given number of years. After this period has elapsed society can freely use the knowledge involved in the invention in question.

It can be seen from the previous paragraphs that the three economic arguments in favor of patents imply the creation of a monopoly right. In the first case, as an incentive for the production of the right amount of technological knowledge; in the second one, as stimulus for the new knowledge to be developed up to the stage in which it can be effectively used in production, and finally, in the third case, as an incentive for the inventor not to keep secret the fruits of his inventive work.

It must be recognized, however, that the granting of monopoly rights to a given firm or individual has definite social costs, so that the optimal policy becomes a matter of evaluating social benefits against social costs in each particular situation. There is no reason to expect such balance to be the same among countries very different in their economic structure, or to

be the same in different industries within a country or, finally, to remain the same during different historical periods in the evolution of any given society. This argues against: (a) patent laws which are straightforward reproductions of the ones conceived for other countries; (b) legislation that pretends to cover with an homogeneous rule the various industries of a given economic structure, or, finally (c) patent systems which have been kept unchanged through the economic history of any given society.

The balance of social benefits and costs is not, however, easy to calculate in empirical terms. This is so, for various different reasons: first, a correct evaluation would have to isolate those inventions and innovations that would not have occurred had we lacked patent protection, from those other inventions which would have occurred anyway. From the net social benefit of the former (assuming it to be positive) we would have to substract the social costs of the latter. (Note that the social benefits of these last ones does not have to be included, as it would have been present even in the absence of patent protection.)

Second, the social benefits arising from inventions and innovations that can be attributed to the patent system must be measured in terms of additional "consumer surplus." The following cases could be distinguished:

(1) Launching a new product to the market: The consumer surplus will be somewhat positive, unless the monopolist can perfectly discriminate among buyers, and claim from each consumer the maximum demand price that he is willing to pay.[1]

---

[1]This case has been examined by D. Usher in "The Welfare Economics of Invention," Economica, (August 1964).

(2) Introduction of a new process in a monopolistic industry: the marginal cost curve of the monopolist will move down, and the intersection with the marginal income schedule will take place to the right of the initial equilibrium point, thus implying an increase in production, a reduction of price, and a subsequent increase in consumers' surpluses.

(3) Introduction of a new process in a competitive industry: the innovator could gradually displace other producers, and this would give rise to a monopoly situation. The consumers' surplus would be positive, except in the case in which the new monopolist could perfectly discriminate among buyers.

The foregoing examples show some of the difficulties that have to be taken into account when measuring social benefits and costs: Summarizing, the following information seems to be needed: (1) Whether the innovation consists of a new product or of a new production process; (2) the degree of competitiveness prevailing in the industry before and after the innovation; (3) if the innovation would have happened even if patent protection were lacking; (4) the magnitude of the cost reduction that results from an innovation in the production process; (5) the price elasticity of demand; (6) the proportion of the cost reduction which is actually passed to the consumer, etc.

Third, the picture does not look any better when we examine the other side of the equation, that is, the side of the social costs of the patent system. By creating monopoly situations the patent system has collateral effects upon the pattern of resources-allocation, upon income distribution, etc. Such collateral effects arise even if the monopolist does not indulge himself in what is called "abuse" of rights. It is said that the monopolist "abuses" of his rights when he attains a degree of monopoly which is larger

than the one the law originally choose to grant. Obviously, when there is abuse, it has to be computed among the social costs of the patent system.

F. Machlup has quite clearly perceived the various difficulties involved in the cost-benefit evaluation of the American Patent System. It is on account of that that he writes:

> "If one is not in a position to judge if a whole system (not specific pieces of it) is good or bad, the best thing to do is to recommend living on with it if that has been the way for some time during the past, or alternatively, to recommend its rejection if it has not been still tried. If we did not have a patent system, it would be irresponsible, on the basis of our actual knowledge, to recommend the institution of one now. But, given that we have had a patent system for so many years, it would be irresponsible, on basis of our actual knowledge, to recommend its abolition. This conclusion is referred to the U.S., and it certainly makes no sense for a small country or for a less industrialized country, in which the arguments will have different weight and can, consequently, suggest a different solution."[1]

Machlup's last sentence certainly applies to the case of a country whose domestic "Inventive Activity" does not significantly contribute to the expansion of the world's technological frontier, and that does not qualify as a significant exporter of industrial goods.

We will see later on that there are strong reasons to believe "a priori" that the benefits associated to the patent system will tend to be lower, and the costs higher, in less industrialized economies, than in the complex industrialized societies of the developed world. Before entering into such argument, it may be important to observe that the balance of benefits and costs in each individual country greatly depends on the international set of rules agreed upon by the Treaty of Paris, signed in 1883. Let us briefly look into the international set of rules before we consider in more detail the subject of costs and benefits for any given less developed society.

---

[1] F. Machlup, "An Economic Review of the Patent System," Government Printing Office, Washington, 1958, p. 79.

2. The Paris Convention and the Extension of Patent Rights to the International Scene

There are four aspects which, from the point of view of the argument hereby developed, should be noted in the Paris Convention. They are:

2.1 Equality of Treatment for Nationals and Foreigners

Article 2 of the Treaty establishes that "The nationals of each one of the countries of the Union will enjoy, in the other countries members all of the advantages that the respective laws grant to their own nationals."

It is to be observed that this provision rejects the idea of reciprocity of treatment to foreigners. In other words, it forces each of the countries members of the Union to give all foreigners the same treatment given to nationals, and not identical treatment to the one its nationals get in each other's countries.

2.2 Priority Rights

Any person that has rightfully fulfilled the requirements for a patent, utility model, etc., in one of the Union's countries, will enjoy priority rights during the following twelve months (only six for brand names and models of industrial designs) in order to register the patent, utility model, etc. in any one of the other countries of the Union.

The purpose of this article is to allow the owner of a patent to benefit from it on a world scale, if he wants to do so. For this to be possible, the eventuality had to be avoided that the first disclosure of the invention would destroy its novelty, thus blockading its patentability in other countries. By granting one year's priority to the inventor to revalidate his patent in any one of the other countries of the union, this posibility is being discarded.

2.3 Cancellation of the Patent Because the Product is being Imported

Article 5 of the Convention establishes that "The introduction, by the patent's titular, in the country where the patent was issued, of the respective product manufactured in another of the Union's countries, will not imply the forfeiture of the patent." The foregoing is restated in the following way: "When one product is introduced in one of the Union's countries where a patent exists that protects a process to manufacture a certain product, the patent's titular will have, respect to that particular product, all the rights that the country's legislation grants him on the basis of the patent given for the production of the article in that country." This article was conceived so as to grant the maximum possible flexibility to the patent's owner, as to where to manufacture the article in question. It is to be observed that at this point the International Agreement clashes against what is being ruled in individual countries' legislations when they penalize the lack of domestic exploitation of the patent. (Such is, for example, the case of Argentina, which in article 47 of its patent law penalizes the non-exploitation of the patent with its straightforward cancellation after two years of granted.)

2.4 Compulsory Licenses, "Legitimate Excuses," and the Forfeiture of Patents

According to the Paris Convention the forfeiture of the patent is possible two years after the first compulsory license has been issued (art. 5); however, no compulsory license is to be granted before four years have elapsed since the deposit of the patent's application. And adds, in relation with the "legitimate excuses" argument, that a request for a compulsory license can be rejected if the owner of the patent justifies the non-exploitation of the patent with "legitimate excuses."

So much for the Paris Convention. We are now equipped with the tools necessary to review the problem of the costs and benefits of the patent system from the viewpoint of a less developed country, and to evaluate: (1) whether the arguments in favor of the granting of patents maintain their rationality, and (2) if the specific terms in which the International Convention has been conceived have positive or negative consequences from the point of view of a technologically dependent country.

3. Patents and Less Developed Countries

We shall now re-examine the foregoing arguments in relation to specific features of economic life usually found in less developed countries. Let us assume that the country we are looking at:

(a) Operates with certain technological "lag," that ranges between five years and two decades, depending upon the industrial field which is being considered.

(b) That the country imports from outside most of the productive technology that is put into operation.

(c) It is expected that, for a good number of years, the country will not contribute to the expansion of the international technological frontier, having most of its local "inventive activity" addressed to the "adaptation" to the local circumstances, of technology which has been designed in the developed world.

(d) The country is not specialized in industrial exports. Rather on the contrary, the bulk of its export trade is primary produce or simple manufactures (foodstuffs, etc.).

As most of the Latin American countries display features such as the aforementioned ones, our arguments are specifically addressed to such countries.

3.1. The "Patents-as-an-Incentive-to-Inventive-Activity" Argument

The available empirical evidence shows that, in technology-generating countries, the number of patents can be taken as one of the possible indexes of "Inventive Activity." Not very long ago J. Schmookler has shown that the statistical series of patents granted within the American economy is positively correlated both with the number of "technological workers," and with R&D expenditure.[1]

At the light of such evidence Schmookler concludes that: "Given that more than 80% of the inter-industry differences in patenting activity in 1953 are 'explained' by corresponding inter-industry differences in R. and D. expenditure... there is reason enough for us to use patents statistics as an indicator of inter-industry differences in inventive activity."

A similar statement, however, would not make sense in the context of a less developed country. In such context patents granted to foreigners (multinational firms in its great majority) constitute a large and growing proportion of the total number of patents yearly issued. Table I below illustrates this point.

---

[1] The correlation coefficient between patents and number of technological workers (scientists, engineers and qualified workers) was r = 0.83 when working with 1950 data. The correlation coefficient between number of patents and R. and D. expenditures was r = 0.84 when using inter-industry data for 1953. See Schmookler, Invention and Economic Growth (Harvard University Press, 1966), Ch. 2.

1.	India	(a)		89.38%
2.	Turkey	(a)		91.73%
3.	Ireland	(a)		96.51%
4.	Peru	(b)	In 1960	95.20%
			In 1970	97.45%
5.	Chile	(c)	In 1947	90.00%
			In 1967	94.50%
6.	Argentina	(d)	In 1950	49.50%
			In 1967	76.54%

Sources:

(a) The role of patents in the transfer of technology to the developing countries. United Nations, New York 1964.

(b) Pedro Leon Diaz: Analisis comparativo de los contratos de licencia en el grupo Andino. Mimeo, Lima 1971.

(c) Patentes de invencion. Estudio estadistico preliminar. CONYCIT, Sgo.de Chile 1971.

(d) Jorge Katz: Patentes, corporaciones multinacionales y tecnologia Revista de Desarrollo Economico, Bs.As. April 1972.

It is obvious that in countries such as those with which we are concerned, the revalidation of foreign patents can not be taken as an indicator of domestic inventive activity.

The argument of patents acting as an incentive to domestic inventive activity can not be put forward in defense of maintaining a Patent System in countries in which anything between three-fourth and 95% of the total number of patents yearly granted does not bear any relation whatsoever with the flow of domestic inventive activity.

3.2 The 'Incentive-to-the-diffusion-of-information' argument.

Definitionally a less developed country operates with a certain time lag respect to world's technological trends, the majority of its products and/or production processes being close replica of similar products and/or

processes used long before by developed nations. Empirical evidence gathered in a recent study reveals that the time lag--measured as the number of years that elapse between first world wide commercial usage of a product and/or process and its domestic utilization in the industrial sector of Argentina--goes from five to twenty years, the actual amplitude of the lag depending crucially on: a) Whether we are looking at a mechanical-engineering or a processing industry (electronics vs. chemicals, for example), b) On the absolute size of the domestic market as compared with the minimum economically feasible scale of plant, etc.[1]

It follows that, at the moment of its local utilization by a LDC, most 'new' products and/or production processes have already been publicly known on the international scenery for quite some time, being it possible to obtain the same amount of information as contained in the text of the patent at an almost insignificant cost (subscribing, for example, to the Gazette published by the US Bureau of Patents). It does not, therefore, seem to be correct to argue that LDC's have to grant patents to foreign firms in order to encourage and benefit from technological disclosure.

Like in the previous case, this argument can not be used in defense of maintaining a Patent System in relatively less developed societies.

---

[1]The data referring to the time lag with which Argentine industries operate has been obtained by the presen t author in two samples, one corresponding to the chemical industry and the other to the electronic industry. The data was obtained from questionnaires answered both by local firms and by independent technologists. The results thus obtained are partially reported in: Jorge Katz: Importacion de technologia, aprendizaje local e industrializacion CIE, Instituto DiTella, 1971.

P. Stubb, in a study concerning technological aspects of manufacturing production in Australia, reports comparable information. See: Peter Stubb: Innovation and Growth. Australia National University, 1970.

Discarded the two aforementioned arguments, we are left with the argument of the patent system as an incentive to technological innovation. Given the high degree of complementarity that normally prevails between technological innovation and investment--in physical equipment, in product development, etc.--this last one really constitutes an argument for the granting of patents as an incentive to investment. In particular, as an incentive for the attraction of foreign capital.

3.3 The 'Incentive-to-Investment-and-innovation" argument.

Strictly speaking, we should begin by differentiating here between cases of investment and innovation that are due to the patent system and those other cases in which the sequence investment-innovation would have taken place even without the incentive of a patent(s).

Only cases of the first sort should be counted as part of the social benefits that any given society derives from maintaining a patent system. From a theoretical point of view, and in the framework of a perfect competitive situation in which governments abstain from using policy instruments to induce the flow of new investment, protection by means of patents might prove to be a significant stimulus. This is so because in such analitical framework perfect diffusion of information is assumed, as well as no barriers to new entry. Imitative competition can thus rapidly erode such monopolistic quasi-rents as might develop as a consequence of a given time-lead in investment and innovation. In such a case, a system of patent protection could proof to be a strong policy instrument, operative in retarding competitive imitation and thus inducing the risk taking behaviour implied in the act of innovation.

The actual world, however, is a far cry from such an extreme text-book image. On the one hand, markets are never perfectly competitive. Natural lags and leads arise in the difussion of information, and various economic

and extra-economic circumstances act blockading the fluid entrance of new producers to the market. On the other hand, governments normally interfere, strongly subsidizing investment and innovation in various different ways--sheltering new producers under tariff protection, granting tax-exemptions, admitting duty-free imports of parts and new equipment, and so forth.

Policies of this sort insure high profitability to new investment, almost independently of entreprenurial performance.

Both such reasons--government protection and natural lags and leads in the diffusion of information coupled with the existence of barriers to new entry--explain why the incremental degree of protection granted by a patent might constitute only a very marginal incentive to new investment. It is obvious that the effect of patents is not completely null, but its incidence is of second order significance relatively to the previously mentioned variables.[1]

It follows from the above reasoning that the social gains of having a patent system in a relatively less developed society, if positive at all, will probably be quite minute, as only in exceptional cases will the decision to invest and innovate depend on the incremental degree of monopoly power which results from holding an invention patent.

Let us now take a look at the social costs that arise from maintaining a patent system in a less developed country. As we shall now show, these tend to be rather high and depend to a crucial extent upon previously mentioned provisions of the Treaty of Paris.

---

[1] It is to be expected that industries where the 'imitation lag' is small, and the number of potential imitators large, will tend to consider relatively more important the marginal increment in the degree of protection that can be obtained from holding a patent. About 60% of foreign patenting in Argentina corresponds to the pharmaceutical industry, which clearly meets such conditions. See: J. Katz La industria farmaceutica argentina. Mimeo, New Haven 1972.

3.4 The Treaty of Paris and the social costs of the patent system

For reasons of symetry with the argument of the preceeding paragraphs we can not blame on the patent system all the social costs that arise from the high degree of oligopoly that frequently prevails in the manufacturing sector of LDCs.

Small markets usually catered for by few large firms sheltered from external competition, are responsible for most of such costs, being it improper to blame the patent system for them.

There are, however, specific circumstances in which the social costs of monopoly have to be entirely attributed to the Patent System. Such circumstances are related to what is normally called 'abuse of rights' from the part of the patent-holder, subject which we shall now examine. It is said that we are facing 'abuse of rights' from the part of the patent holder when he manages to achieve a higher degree of monopoly power than the one originally intended by the law. This happens both if he extends his monopoly power beyond the expected time-span of the patent, or if his monopolistic position covers a field of activity broader than the one specifically affected by his inventive activity.

Several routes are feasible in order to attain either a larger time-span of monopoly control than the one envisaged in the original patent, or to cover a field of activity broader than the one which effectively corresponds. Among other routes, the following should be mentioned: a. Incomplete disclosure of information in the text of the patent. b. Celebration of licensing agreements that go beyond the life of the patent. c. Making the text of the patent illegitimately ambiguous and broad. d. Signing cross-licensing agreements, or 'patent-pooling' agreements. e. By 'supression' or non-exploitation of granted patents, etc.

Even though various of these forms of 'abuse' are frequent in practice, the last one--patent 'supression' or lack of local exploitation--is the most relevant from the point of view of our present argument.

The subject of patent 'supression' is a complex one and has to be examined in at least three different levels. First, from the point of view of each country's own national legislation. Second, from the point of view of the Treaty of Paris, to which only some countries belong,and third and final, from the point of view of the jurisprudence and judicial practices of each particular nation.

Let us now examine the subject of patent supression in these three different levels in the case of Argentina. The Argentine Patent Law does not define in a precise way what the domestic exploitation of a patent actually means. It does, however, say that "A patent will lose its validity if after two years of its expedition it has not been exploited" (art. 47 of Law 111).

In spite of the above, the Argentine jurisprudence has adopted in this area what we shall here consider as a <u>weak</u> approach to the problem of patent exploitation. From the proceedings of the court case filed by 'Quimica Estrella' (a local firm) against Ciba (a multinational drug company), we have extracted the following paragraph which clearly shows the views held by the main strands of national jurisprudence in this matters: "Breuer Moreno--[one of the main national authorities in this respect]--when referring to the concept of patent exploitation, notices that it has not been defined by the law, and further adds that public consensus accepts the following interpretation which he considers to be reasonable: exploitation is not the same thing as local production, neither is it the same as local utilization. Therefore, in his views, it is neither just, nor is it reasonable to cancel a locally granted patent if theinventor is giving the necessary steps towards its

utilization, even though the actual industrial use of the patent has not yet materialized. Thereafter he deems as reasonable the procedure usually followed, i.e.: the inventor advertizes in a professional newspaper, offering to grant a license on a specific patent".[1]

Such doctrinnaire views are in complete agreement with the text and spirit of the Paris Convention, according to which the forfeiture of a patent because of its non-exploitation can not be deduced until after two years from the date in which the first compulsory license has been granted on that patent. It should be remembered--as noted before--that according to the Paris Convention the first compulsory licensing can not be requested until four years have elapsed since the original patent application, and this only in the case in which no legitimate excuses can be advanced by the patent-holder in order to justify his action.

It is interesting to compare the above with the new legislative ideas contained in the Brazilian Law of 1969 and in the Peruvian one of 1971. Both these pieces of legislation present what we shall consider as a strong view with regards to the subject of patent exploitation. In so doing they introduced rules different from the ones agreed upon by the countries that join the Paris Agreement.

The first of these two legal codes establishes that: "The patent holder must demonstrate the effective exploitation of the patent before three months following the third year of validity of the patent, and thereafter, before the third month of each successive year" (art. 59). It also establishes that: "The deathline for the exploitation of the patent, to the effect of

---

[1]Poder Judicial de la Nacion, October 5th. 1970. Notes from the files of the case" Quimica Estrella vs. Ciba." (Unpublished).

granting compulsory licenses, will be two years after the date of concesion and one year afterwards, for the whole life of the patent" (Art. 42)

The Peruvian Law goes even further in several aspects which we shall not deal with in this paper. As regarding theconcept of patent exploitation it establishes that:

a. He who applies for a patent must submit a formal statement agreeing to initiate its local exploitation in no more than two years.

b. He is to inform the relevant Government Office the date in which the patent exploitation has actually began, requesting to be registered in the Record of Inventions under exploitation.

It should be noted that both these laws reduce the time period fixed by the Paris Agreement for the concesion of compulsory licenses. Moreover, they introduce a new and important juridical figure, absent from the Argentine legislation. We refer to the 'reverse of the burden of proof' arrangement which implies that it is the patent-holder, and not a hypothetical domestic entrepreneur (which might not even exist at all), the one that has periodically to give evidence of the fact that the patent is being locally exploited.

The Peruvian and Brazilian codes exhibit a much stronger legislative will of control than the one to be found in the Argentine legislation. In this case the legal path is in fact open for the owner of a patent to 'surpress' it from local utilization, covering instead the mere importation of the patented product.

---

[1] See, E. Aracama Zorroaquin: Tendencias actuales de la propiedad industrial en America Latina. Revista del colegio de Abogados, Bs. As. 1972.

We shall now argue that there are at least two circumstances in which patent 'supression' generates social costs that have to be imputed to the patent system. Both of them become fairly significant in the socioeconomic structures with which this paper is centrally concerned.

The first of these two cases arises in those situations in which a product is being imported not because of its local production being not feasible either on technical or economic grounds, but because a legal obstacle--represented by a patent--blockades local undertakings. Such case entails a distortion in resource allocation, whose social costs are to be charged on the patent system.

A second case in which the social costs of patent supression have to be imputed to the patent system arises when local subsidieries of multionational groups trade with associated companies--or with their respective mother companies--manipulating the 'accounting prices' at which such transactions take place. Price manipulation permits the generation and transfer of a flow of monopolistic rents which, from the point of view of the patent-granting country, has to be imputed to the patent system.

Recent studies made in Colombia, Peru, Argentina, Mexico, etc. show that both such cases--price manipulation and distortion in resource allocation--are frequent events across Latin America. For example, after examining a sample of intermediate drugs presently imported by the Argentine pharmaceutical industry, approximately two thirds of which were protected by locally granted patents, we concluded that: "Even under conservative assumptions, the evidence just submitted supports the idea that from an overal import budget of around 17 million US dollars, no less than 5 millions correspond to transfers which derive from straight price manipulations. Thus, 'overpricing' of imported

drugs accounts for approximately 4% of the yearly value of sales".[1]

Recent studies by C. Vaitsos suggest a similar pattern to prevail in some of the Andean Pact countries. He writes

"The sample of pharmaceutical products hereby examined shows an over-invoicing of about 3 million US dollars. Approximately 50% of this figure should have actually gone to the government as taxes if it had been declared as net benefits by the Colombian subsidieries. Most of the remaining amount--probably up to 70% of it--would also have remained in the country because the local firms would have reached the maximum profit-remittance rates permitted by the law.[2]

And he further adds:

"Another industry that we have examined outside Colombia was the electronic industry of Ecuador. After examining 29 intermediate products imported by Ecuador, we find that 16 of them were imported at prices comparable with those in Colombia, 7 exhibited over-invoicing of up to 75%, and the other six show rates of over-invoicing around 200%. Thus, the rate of over-pricing prevailing in Colombia has to be re-adjusted upwards when we consider the case of Ecuador.[3]

M. Wionzcek et. al. concluded, after studying the same topic in Mexico:

"In Mexico, like in other countries, royalty payments represent just a small fraction of the total cost of the received technology. Most of the actual cost comes from the rate of over-pricing that the Mexican subsidieries pay for

---

[1]J. Katz: La industria farmaceutica Argentina. Estructura y comportamiento. Mimeo, Yale University, 1972. (To be published by Instituto T. DiTella, Bs.As. Argentina.)

[2]C. Vaitsos: The Use of economic power by transnational corporations. Doctoral Dissertation, Harvard University 1972. To be published by Oxford University Press, 1973.

[3]Ibidem, C. Vaitsos, op. cit.

imported intermediate parts and products bought from their headquarters abroad. When the international prices are compared with the prices Mexico is paying for importing such inputs, differences are found similar to those reported by C. Vaitsos in Colombia. From 13 individual products we looked into, only one is imported at a price comparable to the international average. In three cases the rate of overinvoicing was found to be less that 100%, whereas in five other cases the rate was somewhere between 100% and 1000%, exceeding the 1000% mark in yet three other commodities. It is obvious that by this means large amounts are being transferred abroad, adding to the observed cost of the new technology.[1]

The foregoing paragraphs reflect the nature of one of the cases in which the patent system generates significant social costs for a LDC willing to comply with the internationally accepted rules concerning industrial property rights.

The other case in which the patent system generates important social costs can be found in situations in which the complete substitution of imports is both, technically and economically feasible, but is actually blockaded by foreign-owned patents. Examples of this sort can be found, in the case of Argentina, by looking into the files of court cases such as: a) "Hoffman La Roche and Co. vs. Roemmers SA"[2], or b) "American Cyanamid vs. Unifa SA"[3], or others of more recent vintage. Some of these cases combine both, blockage of domestic production and over-invoicing of the imported good, thus adding up two sources of social sub-optimization.

---

[1] M. Wionzcek, G. Bueno and E.Navarrete: La transferencia internacional de tecnologia a nivel de empresas. Mimeo, Mexico, 1972.

[2] See: Poder Ejecutivo Nacional, 18th June 1971.

[3] See: J.R. Vanosi: La proteccion constitucional y legal de patentes de productos farmaceuticos. La ley, February 16th. 1971. Also: M.A. Laquis, Indispensable reconsideracion de la ley 17.011. La Ley, August 1972.

We conclude here our examination of the social costs LDC's frequently have to face from maintaining relatively weak domestic patent systems and, concomitantly, adhering to the Paris Convention.

The following section closes the first part of this paper with three brief conclusions. The second part of this monograph examines the empirical evidence corresponding to the Argentine case during the Post-war period. Many of the arguments presented here in an a priori fashion, receive statistical support from the survey data to be examined.

4. Conclusion of Part One: The balance of social costs and benefits of the patent system in a LDC.

First, independently of what the balance of social costs and benefits of the patent system may appear to be in the context of a developed society, the previous discussion indicates that such balance willnecessarily figure out worse off in countries where not only the legislation, but also the local jurisprudence, have adopted a weak conception of what the meaning and purpose should be of locally exploiting domestic patents. This is so on account of the fact that the International Agreement facilitates the transfer of monopoly rents from LDC towards those countries that generate and export scientific and technological knowledge.

Second, there are reasons to believe that more than sound economic considerations--based on the careful examination of social costs and gains--it is because of political reasons that LDC chose to maintain both, a weak domestic patent law, and their membership to the Paris Convention. The foundation of the presidential decision of October 1966, through which the Argentine executive signed the formal incorporation of Argentina to the International Treaty, constitutes enough evidence in support of this believe. It says there: "The Treaty of Paris offers the Argentine innovator and entrepreneur undeniable possibilities for the promotion of exports and for the transfer

of Argentine technology. It should be kept in mind that some of our exports --notably wine--have been facing difficulties in some foreign countries, because such countries did not recognized our national brands for our lack of membership to the Paris Agreement".[1]

In other words, recognizing that the Paris Agreement constitutes part of the legal framework which regulates the international trade of industrial goods and technology, the Argentine Government decided to put this country on a equal footing with more developed societies, assuming that in so doing the country was to derive net benefits. Not consideration was given to the clear inequality which characterizes the country's import and export flows of industrial goods and technology, inequality which clearly generates a concomitant imbalance in the international distribution of the benefits resulting from joining the Treaty.

Contrasting the lack of economic analysis stands the political significance of the Argentine adhesion to the Treaty, late in 1966. A new military government had just taken over the running of the country's affaires, and is at that point trying to re-establish a strong international image of economic stability and thorough respect for the accepted rules of the game regarding property rights. The obvious counterpart is the concomitant appeal to foreign businesses to invest in Argentina.

Third, a strong legislative code--as for example the recent laws in Brazil, Colombia, Peru, etc. constitutes a necessary but not a sufficient condition to stop the patent system from producing adverse effects of the sort previously described. A fair operation of the system depends not only upon a major change in the written text of the law, but also, and basically, upon a change in the spirit of the courts of justice which are responsible for the application of the law.

---

[1] Boletin Oficial de la Nacion, 10 de Octubre 1966.

Undoubtedly this last change is most difficult to attain, as it involves obvious clashes with vested economic interests, value judgments and preconceptions regarding the type of society that is desired (both at the national level and in the international scenery), and other such aspects deeply rooted in the class structure of any given society.

The next part of this paper explores in some detail the operation of the Argentine Patent System along the Post-War period. Some of the arguments previously advanced receive empirical verification in the following sections of the monograph.

Empirical evidence regarding the operation of the patent system in a less developed society: the case of Argentina 1946-1970.

5. Total number of patents granted and applied for during the post-war period.

The performance of the Argentine Patent System has not been thoroughly examined up to the present. On account of this any empirical inquiry in the field necessarily had to start from basics, assembling a preliminary body of statistical information upon which to base subsequent analysis.

In the context of the present study such task was undertaken by, first, examining the available primary data from the National Bureau of Patents and, second, by carrying up two separate pieces of field work, one covering a sample of independent inventors which have been granted patents within the local framework, and the other one concerning a subset of multinational corporations with systematic patenting activity in Argentina.

Let us first look at the aggregate information coming up from the Bureau of Patents, leaving for further sections of this paper the discussion of the various different result which emerged from the two separate surveys mentioned before.

5.1 Aggregate information concerning the application and granting of patents

The National Bureau of Industrial Property (DNPI) publishes on a fornightly basis a Bulletin containing some basic information for each one of the patents that have just been granted. The following features of each patent are consigned: a) Name and nationality of the patent holder, b) Number of the patent, c) Name of the invention, d) Number of years for which the patent has been granted and date from which its validity begins, e) Number of 'class' to which the patent belongs within the

classificatory records of the DNPI.[1]

Based on such information, and on data regarding patent application, obtained at the DNPI, we started by putting together two separate series, the first one describing the flow of patent applications and the second one corresponding to the total number of granted patents, over the period 1949-1967.

Such information provided the starting point of this inquiry. On its basis we then examined, first, the inter-temporal movement of both series and, second, the internal structure of the series for patents actually granted, particularly in relation to the unequal evolution of the patenting activity of private independent inventors vis a vis the patenting activity of manufacturing firms.

For this last purpose we made use of unpublished statistical information coming up from the Patent Office in Pirelli SA[2] a manufactur-

---

[1] It should be noted that the DNPI uses a universal classificatory code which is formed by around 300 'classes' and whose original design owes more to the aim of facilitating the scientific and technological search which needs to be done before granting the novelty of the invention, than to any other alternative objective more akin to our own present interests. From the point of view of its usefulness for the economics profession the DNPI classification has at least two major difficulties: a) Sometimes inventions are classified by taking into consideration the sector of origin of the invention and some other times by taking into consideration the sector of utilization of the invention. For example: an invention related to a harvester machine could sometime be entered into the class of 'machinery' (sector of origin) and yet in some other instances into the class of 'agriculture' (sector of utilization). b) In general any given class brings together inventions which correspond to very different sectors of utilization. For example: class 138 puts together medical instruments and vaccines.

J. Schmookler in his most thorough study of patents in the US faced similar difficulties. See his discussion of these problems in op. cit.: Chapter II.

[2] Thanks are due to Mr. Plaza, Director of the Pirelli Patent Office, for letting us use his valuable and unpublished information.

ing firm which until recently compiled--in alphabetical order and by name of patent-holder--the list of the yearly granted patents. Assuming that those patents granted to names which did not carry any additional information such as SA, SRL, etc. belonged to individuals, and that the difference between such count and the total for any given year corresponded to patents granted to manufacturing enterprises, we were able to estimate the relative shares of both such groups.

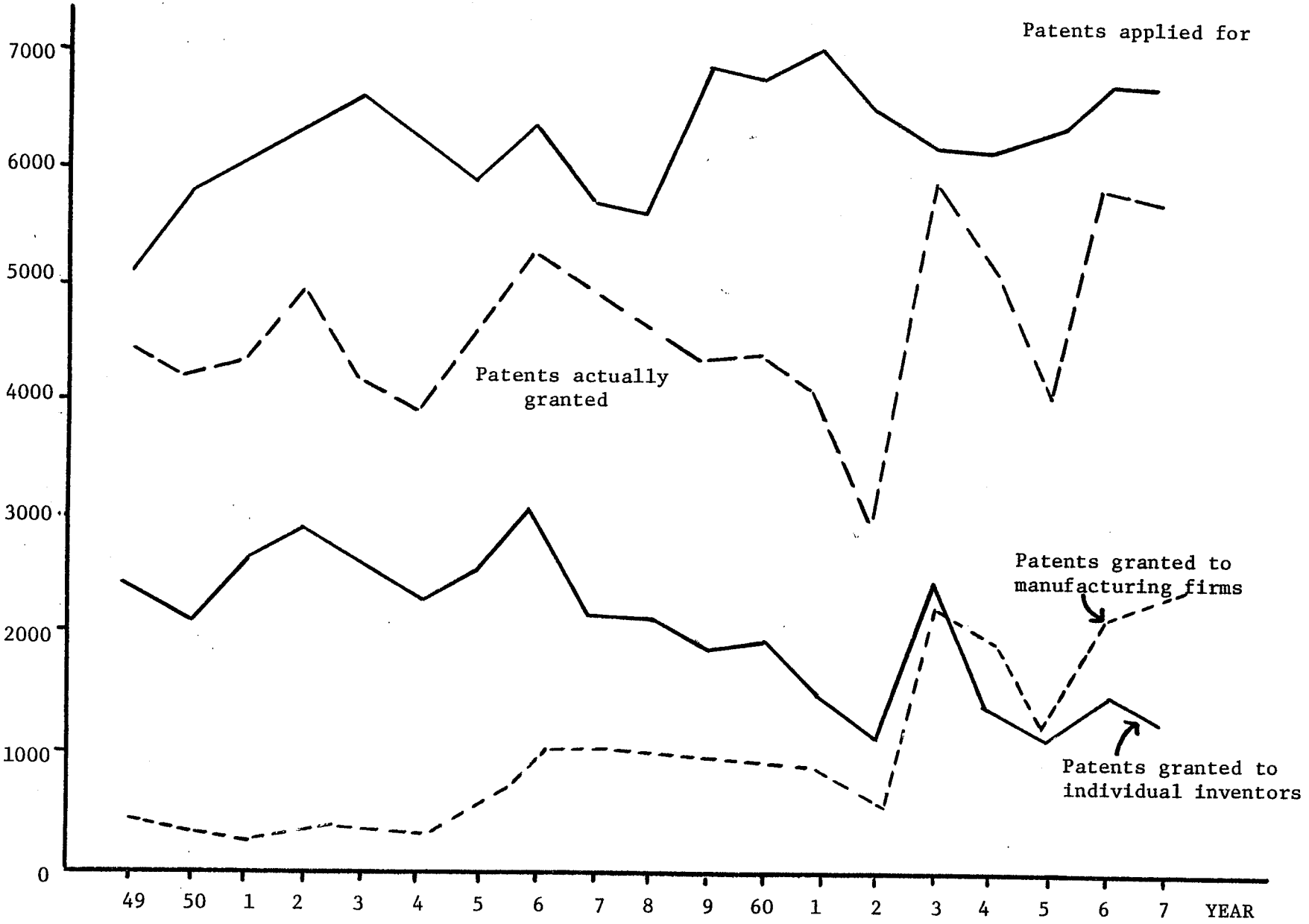
Furthermore, the annual flow of patents granted to industrial firms was then subdivided into two sectors, the first corresponding to enterprises with a systematic patenting activity within the country, and the second bringing together all those other firms which only sporadically apply for patents within Argentina. An annual flow of ten or more patents per year towards the end of the period under consideration was here used as the breaking point between the former and the later categories of firms. It is obvious that the previously described methodological sequence is not as 'clean' as one would have desired. It is based on two rather rough assumptions, whose validity we tried to explore during the course of our field work. Though both introduce some small amount of 'noice' in the data, neither is sufficiently important as to demand more refinement at this level of aggregation. Table no. 2 and its corresponding Diagram show theresults obtained following the above-mentioned steps. Let us now examine these results, beginning by the series of Patent Applied for. Observe that: First, there is a small upwards trend in patent application all the way through. The trend line shows an yearly rate of growth in applications of just about 1%. Second, two cycles can be traced. From 1949 to 1953 we note a marked upwards trend which makes

the number of applications to increase by one third in a four-year period. By comparing with the curve corresponding to patents actually granted to individual inventors, we suggest that the rapid upward trend in applications from 1949 to 1953 is essentially due to the patenting activity of private inventors and not to patenting activity coming from manufacturing firms.

Between 1953 and 1958 aggregate patenting activity faces a downwards movement, there being a new, and fairly rapid increase, during the years 1958-1961. Contrary to what happened during the patenting boom of 1949-1953 the peak at the end of the 1960's was mainly related to the patenting activity of manufacturing firms (multinational corporations). It is our impression that these two cycles in patenting activity emerge from two quite different macroeconomic set of circumstances. The first of them [1949-1953] was mainly related to an increase in <u>domestic</u> inventive activity, particularly associated to the newly born capital goods industry which is growing under the stimulous of strong potective tariffs. The second boom, however, was much less related to domestic inventive activity and has to be seen as part of the overall marketing strategy of a large group of multinational corporations massively investing in the country at the end of the 1960's. In relation to the series of Granted Patents, two comments can also be made: <u>First</u>, the number of patents granted to individual inventors loses absolute and relative weight over the period hereby considered. Whereas around 1950 independent inventors account

FIGURE NO. 1

AGGREGATE APPLICATION AND GRANTING OF PATENTS
1949 - 1967 (*)



(*) Source: National Bureau of Patents and unpublished information supplied by the patent Department of Pirelli SA.

Table No. 2

Application and Granting of Patents
1949 - 1967

Year	Total Number of Applications	Number of Granted Patents (a)	Patents granted to individual inventors		Patents Granted to Manufacturing Firms					
			Total	%/(a)	Total	%/(a)	Firms with systematic patenting	%/(a)	Firms which patent only Sporadically	%/(a)
1949	5052	4482	2445	54,56	2037	45,44	477	10,65	1560	34,86
1950	5776	4170	2109	50,58	2061	41,42	321	7,70	1740	41,52
1951	6033	4313	2624	60,85	1689	39,15	267	6,20	1422	32,94
1952	6311	4975	2954	59,39	2021	40,61	340	6,85	1681	33,76
1953	6601	4232	2646	62,54	1586	37,46	350	8,29	1236	29,17
1954	6279	3906	2346	60,08	1560	39,92	315	8,09	1245	31,83
1955	5922	4630	2615	56,50	2015	43,50	542	11,71	1473	31,79
1956	6378	5248	3113	59,32	2135	40,68	955	18,20	1180	22,48
1957	5767	5051	2231	44,17	2820	55,83	1022	20,24	1798	35,59
1958	5663	4643	215 8	46,50	2485	53,50	947	20,40	1138	33,09
1959	6919	4405	1908	43,32	2497	56,68	955	21,70	1542	34,97
1960	6803	4450	1982	44,56	2468	55,44	877	19,71	1591	35,72
1961	7060	4144	1485	35,86	2658	64,14	849	20,49	1809	43,64
1962	6495	2947	1135	38,52	1812	61,48	525	17,84	1287	43,62
1963	6259	5881	2501	42,54	3380	67,46	2348	39,94	1032	17,50
1964	6250	5264	1389	26,40	3875	73,60	1901	38,12	1974	36,48
1965	6344	4127	1207	29,26	2920	71,74	1213	29,40	1707	42,34
1966	6786	5880	1531	26,38	4329	73,62	2206	37,53	2123	36,08
1967	6742	5733	1344	23,46	4389	76,54	2314	40,38	2075	36,16

Source: Pirelli Platense S.A.
DNPI
Own data.

for around 55% of the total number of patents granted per year, at the end of the 1960's they scarcely passed the 23% mark.

Such fall in the patenting activity of individual inventors can be explained by a host of events. Among others:

a) The local picture is part of a world-wide trend originated in the growing technological complexity of the knowledge frontier, as well as to the increasing need of expensive experimental and testing equipment, research facilities, etc. Not withstanding the universality of the downward trend in the patenting activity of independent inventors, it should be noted that in the Argentine context such group is loosing ground more rapid than, for example, its counterpart in the US economy. J. Schmookler's figures clearly bring out such situation:

Table No. 3 Sources of Patenting in the US

	Patents granted to individuals	Patents granted to corporations
1901-1906	81.4%	18.6%
1956-1960	36.4%	63.6%

Source: J. Schmookler: op. cit., pg. 26.

b) The real cost of obtaining a patent increased quite considerably during the 1960's. Our figures indicate that relatively to a value of 100 in 1960 the real cost of patenting went up to 248 by 1969. Caeteris paribus this might have discouraged further patenting from the part of independent inventors.

Second, the patenting activity of manufacturing firms with ten or more patents per year increased quite considerably both in absolute and relative terms. While in 1949 this group accounted for only 10% of the total number of patents granted , in 1967 represented 40% of the total. The time

trend shows a rate of growth of over 20% per annum, giving strong indication of its rapidly growing importance. All of the firms in this group are of foreign origin. Table 4 below gives account of the relative incidence by nationality

Table 4 Nationality of the Foreign Firms with 'Systematic' Patenting Activity in Argentina.

COUNTRY OF ORIGIN	NUMBER OF FIRMS	%	NUMBER OF PATENTS	%
U.S.A	47	59	1.208	52
France	8	10	154	7
Germany	6	8	170	8
England	6	8	174	8
Switzerland	4	5	280	12
Italy	3	4	35	1
Holland	3	4	240	10
Canada	2	2	53	2

Source: Pirelli Platense, S.A.

It should be noted that about 80 multinational firms belong in this category. The Table also points out that, though in absolute value the total amount of US patenting is definitely larger, the 'propensity' to patent might be greater in the case of Swiss and Dutch firms. This subject is more thoroughly examined later on in the monograph.

Thus far we have looked at aggregate data. The analysis proceeds now at a more dissagregate level, looking first at the role private inventors

play in the domestic scenery and concentrating afterwards on the broader, and somewhat more complex aspect, of the economic significance of foreign patenting.

6. Patents and individual inventors

Three fourth of the inventions that originate in Argentina come from the local comunity of independent inventors. If for no other reason than its statistical significance, individual inventors justify a closer examination. Questions such as what is the effective technological importance of their patents, and how many of them reach the stage of actual industrial utilization, immediately come to mind. Furthermore, given the fact that Argentina has recently signed its affiliation to the Paris Union, it seems important to ask how many of the locally originated patents have been applied for in other Union-countries, thus throwing some light upon the problem of the social costs and benefits associated to the country's affiliation to the Paris Agreement. These areas will be examined on the basis of direct information which was collected by means of a questionnaire distributed among a sample of individual inventors. To this subject we now turn.

6.1 Features of the Sample

Considering the fact that in 1967 a total of 1344 patents were granted to private individuals, we randomly selected 200 of them, that is, around 15% of the total. Even though in most cases the patent corresponded to just one single patent-holder, the sample of 200 patents left us with a list of 241 inventors.[1]

---

[1] It can be thought at this point that the practice of certain firms patenting under the name of one or various of its employees, could bias in an upwards direction the relative importance of individual inventors. The fact that in our own sample such case occurred only once makes us believe that the practice is relatively infrequent in Argentina. J. Schmookler finds a fairly different pattern in the US context.

To such list we added the complete directory of names of the fifty five local inventors affiliated to the Argentine Society of Inventors, thus ending up with a sample of about 300 names.

To each one of these people we did sent, through the mail, a questionnaire accompanied by an explanatory letter, describing the purpose of our study. The proportion of answers was rather low--just over 15% of the total number of formularies--which is not very much outside of the normal experience in surveys of this kind. The mail questionnaire was complemented with personal interviews to a fair number of the individuals of the list, making it possible to reconstruct 40 individual cases around which our exploration proceeded.

6.2 Personal features of the local private inventor.

Our modal age was localized between 41 and 50 years, and we shall be talking about a social character which in 95% of our cases completed primary school, only in 50% received high school training, and just in 15% completed college education.

The educational background of the 40 individuals hereby studied is sufficiently heterogeneous as to make it difficult to establish any reliable pattern. The group is formed by three engineers, one physician, one dentist, two business school graduates, etc. It is interesting to observe that approximately 25% of these individuals received some kind of technical education, if we define as such the one provided by technical high schools and faculties of engineering.

We can compare these results with Schmookler's describing the north american inventor: 50% of his inventors are college graduate and 61-64% can be included in what he defines as 'technologists'. It is somewhat difficult to make a straightforward comparison, as a US college graduate will probably have more technical training than an Argentine

technical high school graduate, but less than a local engineer. Keeping in mind such difficulties, Table No. 5 summarizes the comparison:

Table 5 Level of Education Attained by Inventors: U.S. and Argentina

	University graduates	'Technologists' (*)
Argentina	15%	25%
United States	50%	61-64%

(*) 'Technologists' is defined by Schmookler as including: engineers chemists, heads of R&D Laboratories, etc. In the Argentine context we considered this group to be formed by university graduates and technical high school graduates.

Table 5 reveals that the level of technical education attained by the local community of independent inventors is significantly higher in the US context than in the Argentine one. On the face of such a result and taking into account the growing complexities of the contemporary knowledge frontier, it can scarcely come as a surprise the fact that the Argentine inventor seems to be loosing ground more rapidly than his north american counterpart.

Before turning to the subject of inventive productivity in the sample hereby examined a few comments seem justified in relation to the 'part-time' characteristic of the inventive activities performed by the Argentine inventors.

Just about 50% of the sampled individuals happened to be working under a dependency relationship at the time of the survey. The other half of the sample corresponded to self-employed individuals. None of them, however, could be classified as a full-time inventor, in Schmookler's

sense (i.e., full-time hired inventor)

To put it in different terms: the activity of invention is normally not being performed with full-time dedication, nor does it constitute an activity which is being performed under systematic contract with any given manufacturing firm.

The difference between our results and Schmookler's in this area is quite startling. Approximately 40% of the inventors in Schmooker's sample seem permanently to be on the payroll of given manufacturing enterprises: "A full-time dependent inventor is here defined as an individual who was hired to address all of his productive capacity to a research activity. Thus, a design engineer or a chemist working in research have been classified here as a full-time hired inventor"[1](1) His 'full-time' inventors account for 40% of his sample, whereas they were almost non-existing in our own context.

Inventive productivity

The 40 Argentine inventors produced through their life time a total of 139 inventions (available on request), out of which 90 received local patents, 2 were still under consideration by the Patent Bureau and the remaining 47 had not been patented. This means an average productivity of 3,5 inventions per individual, figure which goes down to about 2,3 when only patented inventions are taken into account. This is a subject on which the empirical evidence available for an international comparison is rather scanty. An enquiry made by J. Rossman[2] in 1930 concluded that the average number of inventions in

---

[1] J. Schmookler: op. cit., pg. 259.

[2] J. Rossman: The Psychology of the Inventor: A Study of the Patentee Washington Inventors Publishing Co. 1931.

a sample of 710 north american inventors was 40 inventions per capita figure which suggests a rather low inventive productivity in the Argentine context. Rossman's figures, however, seem rather high and point out to the strong need of further research in this area.

6.3 Interindustry Distribution and Quality of the Local Inventions

a. Industrialization of granted patents

Out of the 139 inventions generated by the sampled individuals, 53 have been industrialized, if by that we mean the utilization of the invention in production runs, over and above the level of samples for selling or advertizing purposes. Patented inventions show a rate of utilization which is marginally superior to the one attained by non-patented inventions. Thus, while 40% of the inventions in the first group reached the stage of industrial utilization, only 35% of the inventions in the second group did so. Both these figures look surprisingly similar to the ones F. Scherer and B. Sanders have shown to apply in the US context. (1) This subject is considered in some detail later on in the study. Obviously there are significant inter-industry differences both in the distribution of patented and un-patented inventions, and in the degree of utilization such inventions Table 6 below exhibits such difference:

---

[1] The two more frequently mentioned studies on patent utilization in the US context are: a) F. Scherer et.al. 'Patents and the Corporation' (Private edition, Boston 1958) and b) J. Rossman and B.S. Sanders: The patent utilization study in The Patent Trademark and Copyright Journal of Research and Education, Washington 1960.

Table 6 Interindustry differences in patenting by private inventors and in patent utilization by these same individuals

	Total	Patented	Non-patented	Industrialized	Non-industrialized
1. Foodstuffs	2	1	1	0	2
2. Textiles	6	4	2	1	5
3. Wood and furniture	8	7	1	3	5
4. Pulp and paper	3	3	0	0	3
5. Chemicals	4	1	3	4	0
6. Oil derivatives	1	0	1	0	1
7. Stone, glass...	1	1	0	0	1
8. Metals	9	7	2	2	7
9. Vehicles and Machinery	68	48	20	26	42
10. Electrical equipment	33	14	19	16	17
11. Miscellaneous	4	4	0	1	3
TOTAL	139	90	49	53	86

Source: Own survey

Table 6 reflects some interesting patterns. First, 73% of the inventions coming up from the sampled community of independent inventors is concentrated in two branches of manufacturing production: 49% in the Vehicles and Machinery Industry and 24% in the Electrical Industry. Second, the 'propensity' to apply for patents seems to differ quite considerably among industries. While 70% of the inventions in the Vehicle industry were patented, only 40% of the inventions were so in the electrical Industry. Third, between 40 and 50% of the inventions corresponding to either one of the two previously mentioned industries has been profitably exploited in production. Fourth, the large proportion of the inventions hereby considered corresponds to mechanical and engineering industries rather than to the 'process' industries, i.e. chemicals, petrochemicals, etc.

b. Quality and Importance of the Inventions

The list of 139 inventions produced by the sampled individuals was examined by a panel of local technologists. Though minor discrepancies emerged among the members of the panel, only 6% to 8% of the inventions under examination was considered to have significance and 'technological importance'. The local picutre does not seem to differ in this context from the one described by R. Nelson et.al. when they wrote: "Quite independently of the industrial branch under consideration the work of individual inventors seems to be of a different nature than the one carried out in the laboratories of the large corporation. Typically, it corresponds to small systems, or to non-integrated sections of large systems; the inventions they produce demand more mechanical ingenuity than a thorough knowledge of any given science.[1]

[1] R. Nelson, M. Peck and R. Kalanchek: Technology, Economic Growth and Public Policy. The Brookings Institution, Washington 1967.

6.4 Forces that Motivate the Act of Invention

To what extent do inventors react to stimulous emerging from the demand side? Do they really 'feel' the underlying existence of a potential market for the outcome of their inventive activity?

Acknowledging the difficulties envolved in answering questions of this sort, we did try to throw some light upon them by asking the inventors in our sample what did they reckoned to be the main stimulour inducing their inventive work. The following possibilities, among others, were suggested: 1) Vocation, 2) Previous and present readings on a given technological or scientific subject, 3) Day to day technical problems either in the household or in their jobs, etc.

Only in 7 cases--out of 40--the vocational factor appears to be the only and sole determinant of the inventive work. Instead, the need to cope with day to day technical difficulties, both in their homes or jobs, seems to be the underlying theme in most cases. A total of 26 individuals made such items their first choice among the various possible alternatives, while yet 13 individuals indicated that "expected profits" were very much among their consideration when they had to select a topic for exploration and invention. On the whole, just under 20% of the sampled individuals argue that mere 'vocation' is what directs their inventive work, being it possible to trace back considerations of potential demand and profits in the remaining 80% of the inventors hereby studied.

6.5 Other General Results Emerging from the Study of Inventors

First, besides being a part-time activity the act of invention seems to be--within the present sample--a highly individualistic one. Only 3--out of the 40 inventors under examination--worked with assistance,

or sharing the project with collegues of a similar standing.

Second, about 80% of the inventors lack research facilities, experimental equipment, etc. Tools are of a rudimentary nature.

Third, only 8 individuals--out of 40--make use of scientific instruments, pilot plant facilities, etc. Of these only five could estimate the present value of their capital stock, providing us with a figure which, on average, oscilates between 1,000 and 1,500 US dollars.

Fourth, It is important to observe that among the eight inventors that declared to have scientific instruments, research facilities, etc. we find 6 of the 9 individuals that attained economic success out of their inventive work. This result seems to suggest that technical complexity and chance of economic success are not entirely divorced considerations.

Fifth, defining as economically successful those individuals that at the time of the enquiry were receiving net revenue out of one or more of their inventions, a total of 9 individuals--that is, approximately 25% of the full list--must be thought of as included in this group. This sub-set of inventors accounted for 54 inventions, that is, more than 5 inventions per capita, clearly above the sample average; 43 of these inventions were under exploitation, making the rate of patent utilization from this group significantly higher than the one for the sample as a whole.

Sixth, only one--out of forty--individuals, had at some point made use of the Paris Treaty, applying for US patents after his original Argentine patent had been granted.

6.6 Brief Summary of the Results Obtained in the Study of Private Inventors

Even though a sample of 40 individuals is certainly not large enough as to provide food for much generalization, we do believe that our results describe with some accuracy the social actor whose behaviour we are trying to understand, as well as his role within the domestic technological scenery. Let us briefly summarize our findings:

1) There seems to be little doubt about the fact that local inventors are very poorly integrated with the expanding industrial system, and only play a very marginal role in the advancement of domestic technology.

2) Most of the flow of inventive activity coming up from local community of private inventors is concerned with mechanical and engineering fields, with very little concern for the 'process' industries (chemicals, etc.)

3) About one-fourth of the sampled individuals attained some amount of economic success out of their inventive work.

4) The large majority of the individuals seem to respond to forces emerging from the demand side, rather than to mere vocation.

5) About 40% of the inventions reached the stage of industrial exploitation. The rate of patent exploitation is significantly higher for those individuals which achieved some degree of economic success out of their inventive activity. Finally,

6) World-wide application for Argentine-granted patents seems yet to be a very rare event, certainly one which can not be attributed significant economic value. In a country in which the technological leadership is in the hands of foreign firms and in which the national industrial entrepreneurs lack interest and stimulous to absorb the risk

of innovation, the local community of private inventors has no alternative but to be marginated from the economic life of the society and gradually disappear into history. We conclude here our study of private inventors. The paper continues with the examination of the other major subset of patent-holders in Argentina, i.e. the multinational corporations with systematic patenting activity in the local scenery.

7. Patents and Multinational Corporations

Between 1949 and 1967 individual inventors lost more than 55% of their share in current patents granted by the DNPI. Almost all of this loss has been absorbed by approximately 80 foreign firms which systematically apply for patents within Argentina.

Appendix N°1 contains detailed information about the inter-temporal flow of patents. of these firms. It is this information, as well as complementary evidence obtained during the course of a survey on patent exploitation, what we use along this section in order to explore the economic significance of foreign patenting in Argentina. Let us first consider the inter-industry and inter-country distribution of both these firms and the patents they own in Argentina.

7.1 Inter-Industry and Inter-Country Distribution of Foreign Patenting

The 79 multinational firms with systematic patenting activity in the domestic scenery are thus distributed by nationality: 49 US firms, 8 French, 7 German, 6 British, 4 Swiss, 3 Italian, 3 Dutch, and 2 Canadian. Table No. 7 reflects the relative participation of firms of different nationality, as well as the absolute number of patents these firms were granted over the period 1957-1967. The figures suggest a somewhat higher 'propensity' to patent on the side of the European firms, particularly in relation to Dutch and Swiss firms. It will later on be

argued that this pattern is mainly associated to the kind of industries which Swiss and Dutch firms tend to operate, i.e. pharmaceutical and electrical products respectively.

This observation leads us into the question of the inter-industry distribution of the patents under examination. In order to examine this question we proceeded in the following way: We first selected the month of each year in which the DNPI granted the maximum number of patents, over the period 1957-1967. Having done that we sampled at random around 11% of the patents granted to all these firms over the same period, ending up with a list of around 1500 patents which were then re-classified by sector of utilization, using for such purpose the CIIU classes, at two digit level of aggregation. On the basis of the data thus collected, and here presented in Table No. 8, the following observations can be made:

First, about 80% of the patents granted to foreign firms with systematic patenting activity is concentrated in two branches of manufacturing industry i.e. the Chemical industry and the Electrical Machinery and Appliances. The former one--mainly pharmaceutical patents--accounts for 60% of the total number of patents granted to multinational corporations over the period under consideration.

Second, Switzerland, Canada and Germany concentrate their patenting activity in the chemical sector. This reflects the large stock of patents owned by pharmaceutical laboratories such as Bayer, Merck, Schering, Ciba, Roche, etc.[1]

---

[1]The subject of pharmaceutical patentings has been examined by the present author in La industria farmaceutica Argentina, CIE, Instituto DiTella, Bs.As. 1973.

Third, the Dutch patenting activity is mainly associated to Machinery and Electrical equipment, result which reflects the incidence of Philips Gloielampenfabrieken.

Fourth, the firms of Italian and French origin tend to concentrate their activities outside of the two fields previously mentioned. While the Italian firms are strong in the area of Non-matallic minerals, the French ones are specialized in Machinery and non-electrical equipment and in the transport sector. Let us now explore the economic significance of foreign patenting in Argentina.

7.2. Patents, Economic Theory and Less Developed Countries

It is only in recent years, and due to the work of economists such as J. Schmookler, Z. Griliches, C. Brownlee and others, that the economics profession has come up with a systematic body of theory concerning the role and significance of patents.

Given the major differences which prevail between a technology-generating country such as the U.S.--country studied by the previously mentioned authors--and a technology-importing country such as the one that concerns us here, it seemed to us proper to ask whether or not theory developed on the basis of the experience of the former could be applied to the later.

For the purpose of examining this subject we have chosen a sample of 12 foreign companies systematically applying for patents in Argentina, and in each case we have explored the statistical relationship between the flow of patents granted in Argentina to each mother company, and the local performance of their respective subsidiaries. Indicators of economic performance

TABLE NO. 7

Inter-Country Distribution of Foreign Patenting
(79 multinational firms with systematic patenting activity in Argentina. 1957-1967)

	Germany	Canada	U.S.A.	France	Holland	England	Italy	Switz.	Total
1. Number of Firms	7	2	46	8	3	6	3	4	79
2. Percentage over the total of 79 firms in the sample	8,9	2,5	58	8,1	3,8	7,6	3,8	5,1	100
3. Number of patents obtained between 1 and 1	993	224	7288	583	2087	734	282	1513	13704
4. Percentage over the total of patents obtained by the 79 firms	7,2	1,6	53,2	4,25	15,2	5,3	2,1	11,0	100

TABLE No. 8

Interindustry Distributing of Foreign Patenting
(Sample of 1529 patents granted over 1957-1967)
In percentages

	FOODS	BEVERAGES	TOBACCO	TEXTILES	SHOES	WOOD & COCK	FURNITURE	PAPER	PRINTING	LEATHER	RUBBER
	20	21	22	23	24	25	26	27	28	29	30
1. Germany											
2. Canada											
3. U.S.A.				0,89	0,25			0,13	0,13		1,40
4. France											1.25
5. Holland											
6. England											
7. Italy				4,65							1,09
8. Switzerland											
Total of 8 countries				0,59	0,26						0,79

	CHEMICAL IND.	COAL & OIL	NON-METALLIC MINERAL PRODUCT	BASIC METAL INDUSTRIES	METAL PRODUCTS (NON-MACHINERY)	NON-ELECTRICAL MACHINERY	ELECTRICAL MACHINERY	TRANSPORT MATERIAL	OTHER INDUSTRIES	
	31	32	33	34	35	36	37	38	39	
1.	78,90		0,92			1,83	15,6			100,00
2.	93,33					6,66				100,00
3.	56,31	0,25	1,91	0,76	3,44	7,39	23,57	1,78	1,78	100,00
4.	57,50				7,50	13,75		16,25	3,75	100,00
5.	35,71	4,76	0,47	0,47	7,61	6,19	43,33	0,47	1,90	100,00
6.	71,74		6,52	1,09	4,35	4,35	3,26	6,52	1,09	100,00
7.	30,23		37,21		6,98	6,98	11,68		2,33	100,000
8.	99,45								0,55	100,000
TOTAL	61,02	0,72	2,56	0,52	3,81	5,97	19,75	2,23	1,64	100,000

are: (1) gross sales, (2) gross benefits on sales, (3) relative share of the market, (4) annual flow of investment, etc.

The firms thus examined are: Shell, Ford, Firelli, Firestone, Good Year, Ducilo, Duperial, Union Carbide, Philips, Siemens, Citroen and Standard Electric.

Our results do not reveal significant statistical association between the flow of granted patents, on the one hand, and either gross benefits on sales or relative share of the market, on the other.

A different pattern prevailed when examining the statistical relationship between the flow of granted patents and gross sales from the local subsidiary. Particularly when the later variable was lagged one or two periods, its degree of association with patents locally granted to the mother company became statistically significant in about two-thirds of the sample under examination. Table No. 9 exhibits the results obtained from estimating by least squares, the following equation:

$$\text{Ln } P_t = \text{constant} + \alpha \text{Ln } V_{t,\ t-1,\ t-2}$$

Where P_t refers to the total number of patents granted to the mother company, V indicates sales and t represents time.

Ei firms out of twelve--Ford, Firestone, Good Year, Ducilo, Duperial, Siemens, Citroen, and Standard Electric--exhibit a statistically significant relationship, particularly when gross sales are taken with a two year lag period. This result seems to uncover a statistical pattern difficult to attribute to just random circumstances.

Having come up to this point, two questions seem justified: First, how do the present results compare with those reported by Schmookler, Griliches, etc. and, Second, what is their economic meaning?

TABLE NO. 9

Patents granted to Headquarters and local sales of subsidieries.

CASE A: statistically significant results

Firm	Specification of the lag structure.	Regression coefficient	Correlation Coefficient	F-ratio	t-Test
Ford	t-2	1.187* (0.420)	.816*	7.987	2.82
	t-1	1.229 (0.514)	.730	5.706	2.39
	t	1.312 (0.532)	.709	6.071	2.46
Firestone	t-2	1.979* (0.226)	.963*	76.337	8.37
	t-1	0.609 (0.604)	.327	0.841	0.91
	t	0.419 (0.640)	.225	0.428	0.65
Good Year	t-2	0.668* (0.139)	.895*	24.186	4.91
	t-1	0.181 (0.286)	.232	0.400	0.63
	t	0.133 (0.274)	.170	0.238	0.48
Ducilo	t-2	0.657* (0.120)	.912*	29.550	5.436
	t-1	0.411 (0.135)	.754	9.219	3.036
	t	0.270 (0.155)	.524	3.042	1.740

CASE A: statistically significant results

Firm	Specification of the lag structure.	Regression coefficient	Correlation Coefficient	F-ratio	t-Test
Duperial	t-2	1.359* (0.324)	.863*	17.591	4.19
	t-1	0.993 (0.399)	.685	6.189	2.48
	t	0.859 (0.370)	.634	5.378	2.31
Siemens	t-2	0.258** (0.250)	.436	0.938	1.03
	t-1	0.047 (0.263)	.080	0.032	0.17
	t	-0.226 (0.260)	-.334	0.756	0.86
Standard Electric	t-2	1.258* (0.360)	.818	12.182	3.49
	t-1	0.995 (0.428)	.659	5.391	2.32
	t	0.762 (0.440)	.522	3.000	1.73
Citroen	t-2	0.251* (0.120)	.721	4.343	2.08
	t-1	0.537 (0.104)	.916	26.404	5.14
	t	0.751 (0.108)	.942	47.906	6.92

CASE B: statistically non-significant results

Firm	Specification of the lag structure.	Regression coefficient	Correlation Coefficient	F-ratio	t-Test
Shell	t-2	0.04 (1.241)	.01	0.001	0.03
	t-1	1.560 (1.482)	.369	1.106	1.05
	t	2.46 (1.57)	.485	2.468	1.57
Pirelli	t-2	0.115 (0.159)	.282	0.521	0.72
	t-1	0.072 (0.203)	.134	0.128	0.35
	t	-0.054 (0.187)	.101	0.082	0.28
Union Carbide	t-2	0.152 (0.141)	.474	1.163	1.08
	t-1	0.618 (0.167)	.856	13.730	3.70
	t	0.803 (0.132)	.927	36.722	6.06
Phillips	t-2	0.018 (0.079)	.095	0.054	0.23
	t-1	-0.006 (0.069)	.032	0.007	0.09
	t	0.151 (0.092)	.500	2.671	1.63

*Significant at 5%
**Significant at 10%

Consider the first question. By means of an inter-industry sample, and after estimating a regression equation similar to the one previously shown, Schmookler and Griliches report the following result:

$$\text{Ln } P_t = \text{constant} + \underset{(0.090)}{0.487} \text{ Ln } V_{t-3} \qquad R^2 = .88$$

Observe now that our first eight results in Table No. 9 look fairly similar to the one attained by these authors working with a more aggregate set of data. Furthermore, also in our own results... "there is a clear tendency for the correlation coefficient to increase as lagged values of the independent variable are considered."

In order to tackle the second question let us first see what is the interpretation Schmookler and Griliches provide of their result.

(a) Patents, Investment and Demand. A Theory of Inventive Activity in Developed Societies

From the previously mentioned group of economists, J. Schmookler is the one that more clearly has articulated facts and statistical evidence into a theory of inventive activity. From the last of his works--recently edited by Z. Griliches[1]--we quote at length:

> Originally it appeared that the total inventive activity in the United States varied directly with economy-wide employment of labor and capital combined. This result supported the hypothesis that the potential saving in total cost constituted the source of prospective profit from inventing, that such potential saving would tend to be proportional to total cost of production, and that therefore inventive activity would tend to vary with the total cost, that is, the volume of resources employed.
>
> This chain of reasoning later proved mistaken. Measures of the two were indeed highly correlated with a third variable--gross investment--and this appears now to have been the critical factor.

---

[1] J. Schmookler, "Technical Change and the Law of Industrial Growth," in Z. Griliches (ed.), Patents, Invention and Economic Change, Harvard University Press, 1972, p. 79.

> This error was revealed once the statistics of patents classified by industry were available and patents in the railroad field were compared with an index of total out put in the railroad industry. No similarity such as that which had appeared earlier in the case of aggregate inventive activity and total national output emerged. Instead we found that railroad investment and railroad patents were very similar in their long run and shorter-run movements. The main difference between them, was that the patent statistics lagged slightly behind those of investment...
>
> Since this initial discovery we have checked for the existence of a similar relation between investment and invention in capital goods in a wide variety of industries. Wherever the economic data existed that relation has been found. That is, the ebb and flow of investment, or something associated with it, seems to produce a corresponding ebb and flow of inventive activity directed towards improving the capital goods...
>
> Moreover, when we shifted from intertemporal comparisons within an industry to cross-section comparisons involving several industries at the same time, the same relation was observed. Just as more inventive activity is devoted to improving an industry's equipment when more of that equipment is being produced, so more inventive activity is devoted towards improving capital goods in those industries which are buying more equipment...
>
> I think it is fair to say that these results are the complete reverse of a priori expectations for most of us would have expected investment to follow inventive activity, not to lead it."[1]

The last of Schmookler's paragraphs should be viewed as a criticism of a thesis presented by S. Kuznets in 1930 and more recently by E.W.G. Salter in his Productivity and Technical Change. According to both these authors, output in any given industry tends to follow an S-shaped path over the long run, as the rate of growth eventually tends to decline. The fall in the rate of growth is induced by a fall in the rate of technical progress, which normally obtains when the industry's technology reaches a certain plateau of perfection.

---

[1] J. Schmookler, "Technological Change and the Law of Industrial Growth," in Z. Griliches (ed), Patents, Invention and Economic Change, Harvard University Press, 1972, pp. 74, 75 and 76.

Objecting such view of the world, Schmookler writes:

> The evidence referred to above suggests that these analysis largely reversed cause and effect. The rate of growth of an industry has probably a greater effect on the rate of growth of the technology associated with it than the other way round. (At least this is so unless further research reveals an exceedingly perverse variation in the economic quality of the inventions made in an industry in different times). For what Kuznets took to be evidence that an industry's inventive potential was being played out--the decline in the number of inventions made in it--now distinctly appears to be a consequence of a decline in the market for inventions, which is a corrollary of declining investment in the field. This interpretation seems indisputable in the face of the marked tendency of investment to lead invention on capital goods in any given industry.

And he further adds:

> If we assume, as seems reasonable, that some form of the acceleration principle governs the rate of investment in an industry, then the line of causality seems to run from the industry's rate of growth to its rate of investment to its rate of technological progress to price changes and back to the rate of growth of output.[1]

Summarizing, Schmookler's theory states that the correlation between patents and output stems from the fact that both such variables are correlated with the rate of investment. Thus, the flow of inventive activity--which in his framework is represented by the flow of patents--becomes an endogenous variable, follows the path of gross investment and, as this one, tends to reflect demand expectations.

Is there any reason to believe that such conceptual structure can be used in order to throw some light upon the economic role of patents in the context of Argentina? To such question we now turn.

(b) Patents, demand and imports. An alternative interpretation of the role of patents in less developed societies

Two different reasons suggest that Schmookler's theory does not readily apply in the specific case we are here exploring.

---

[1] J. Schmookler, "Technical Change and the law of Industrial Growth," op. cit., pp. 78, 79.

On the one hand, and this we already know from previous sections of the paper, patents granted by Argentina to the head officies of multinational groups with active local subsidiaries can not be taken as an indication of domestic inventive activity. We can not really argue that in this alternative context the flow of patents allows us to build a theory of inventive activity.

On the other hand, and as it will be shown in this section, a very large fraction of the patents locally granted to foreign firms are not effectively used in production. Instead, they become an instrument for market control, while the patented product is being imported either from the company's headquarters or from any one of the various subsidiaries from the group.

Before actually considering the empirical evidence which supports the previous statement, let us examine the relationship between patents and gross investment, as such relationship will become an integral part of the alternative interpretation we shall hereby advance as to the economic role of patents in LDCs.

b.1 Patents and Gross Investment

Corroborating Schmookler's findings, our own data reflects a significant degree of association between the flow of granted patents and the flow of gross investment. Diagrams 2 through 5 exhibit the relationship between both series at the firm level, in two firms of the pharmaceutical industry and two other firms from the electrical industry, clearly the more important branches of manufacturing production as far as the granting of patents is concerned. Similar evidence is available for various other firms. Statistically speaking, therefore, our data confirms much of

Diagram 2

Patents granted to the mother company and investment of the local subsidiery.

Firm A : Pharmaceuticals

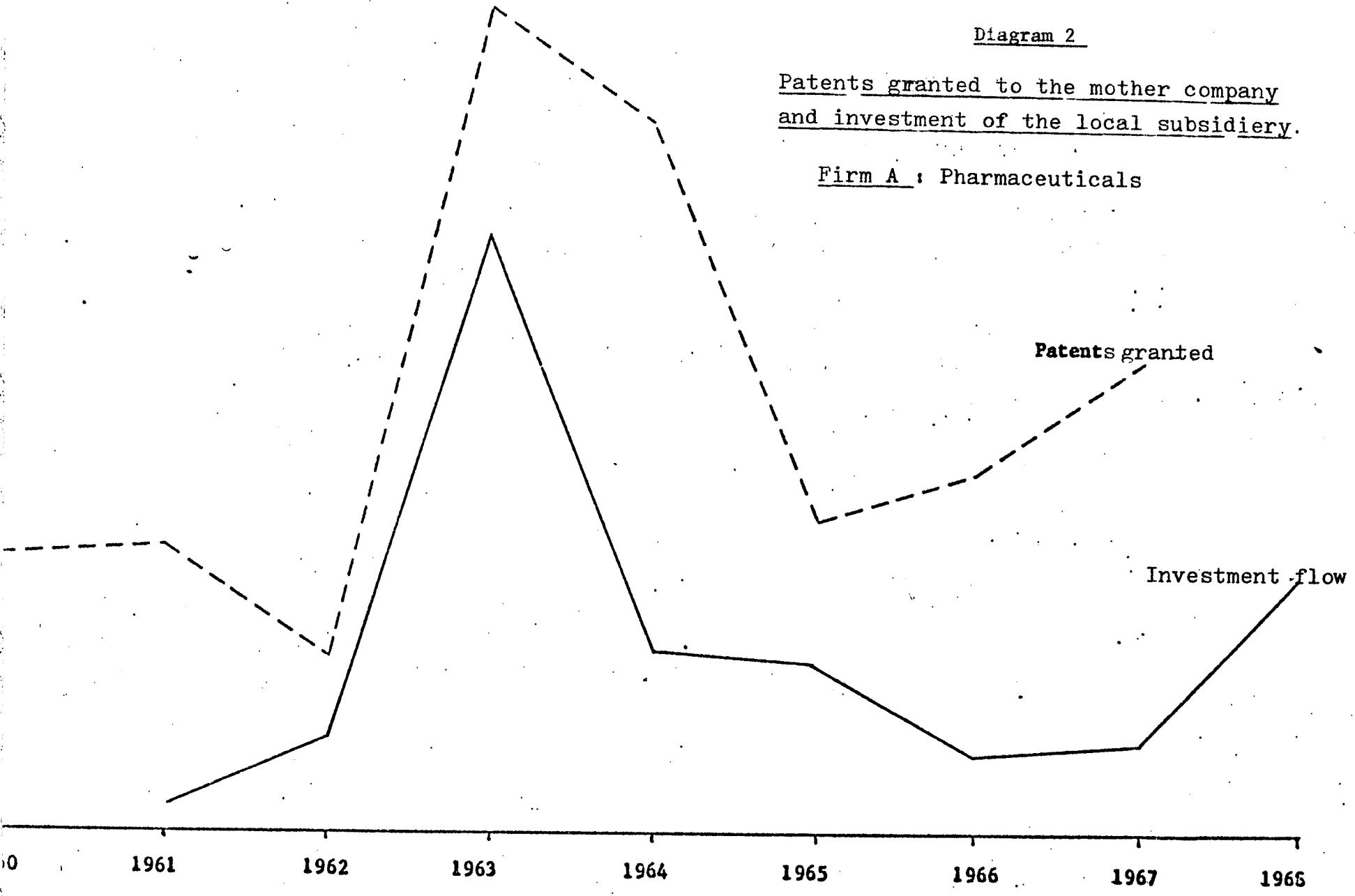


Diagram 3

Patents granted to the mother company and investment of the local subsidiery

Firm B : Pharmaceuticals

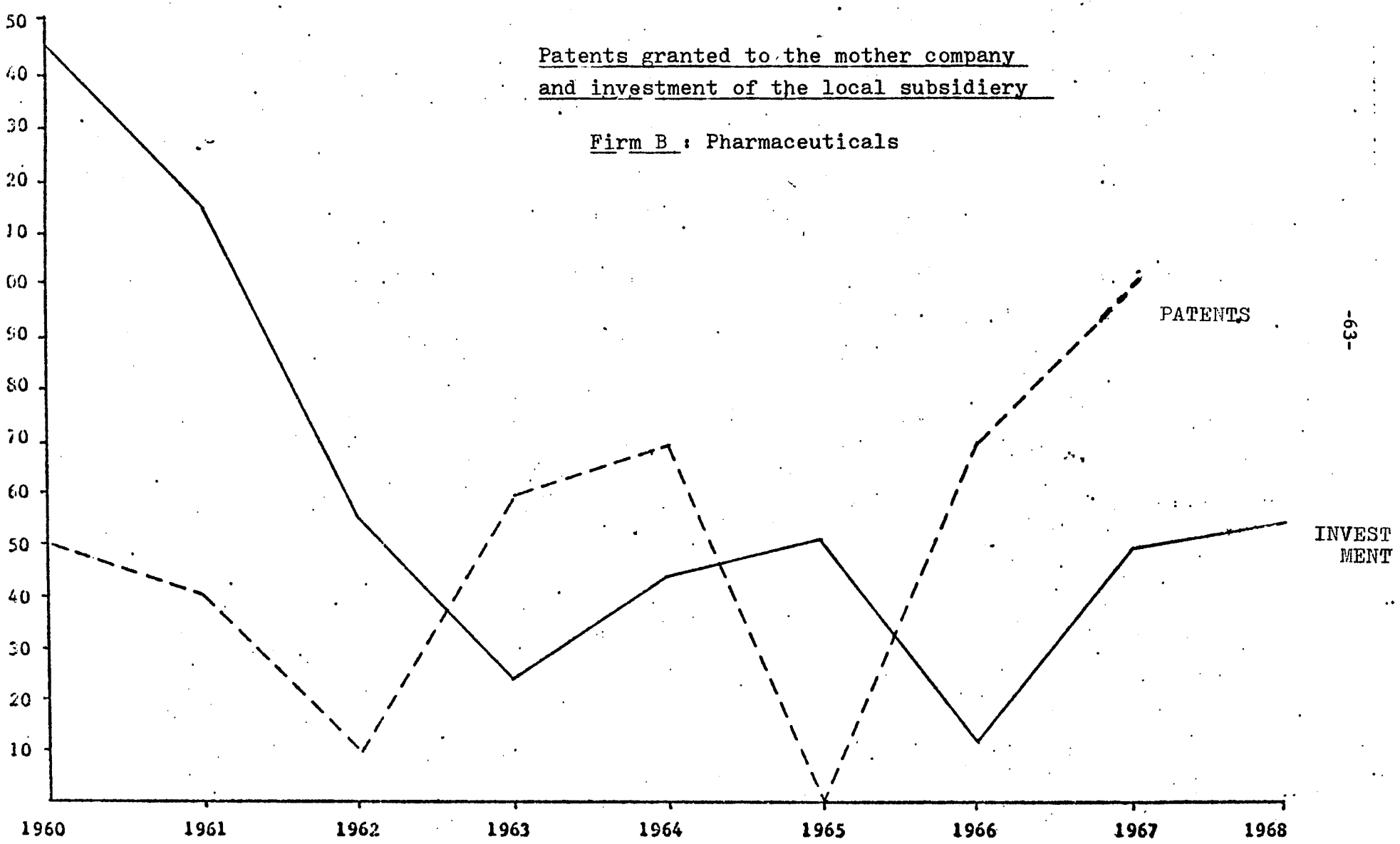


Diagram 4

Patents granted to the mother company and investment of the local subsidiery

Firm C : Electrical products

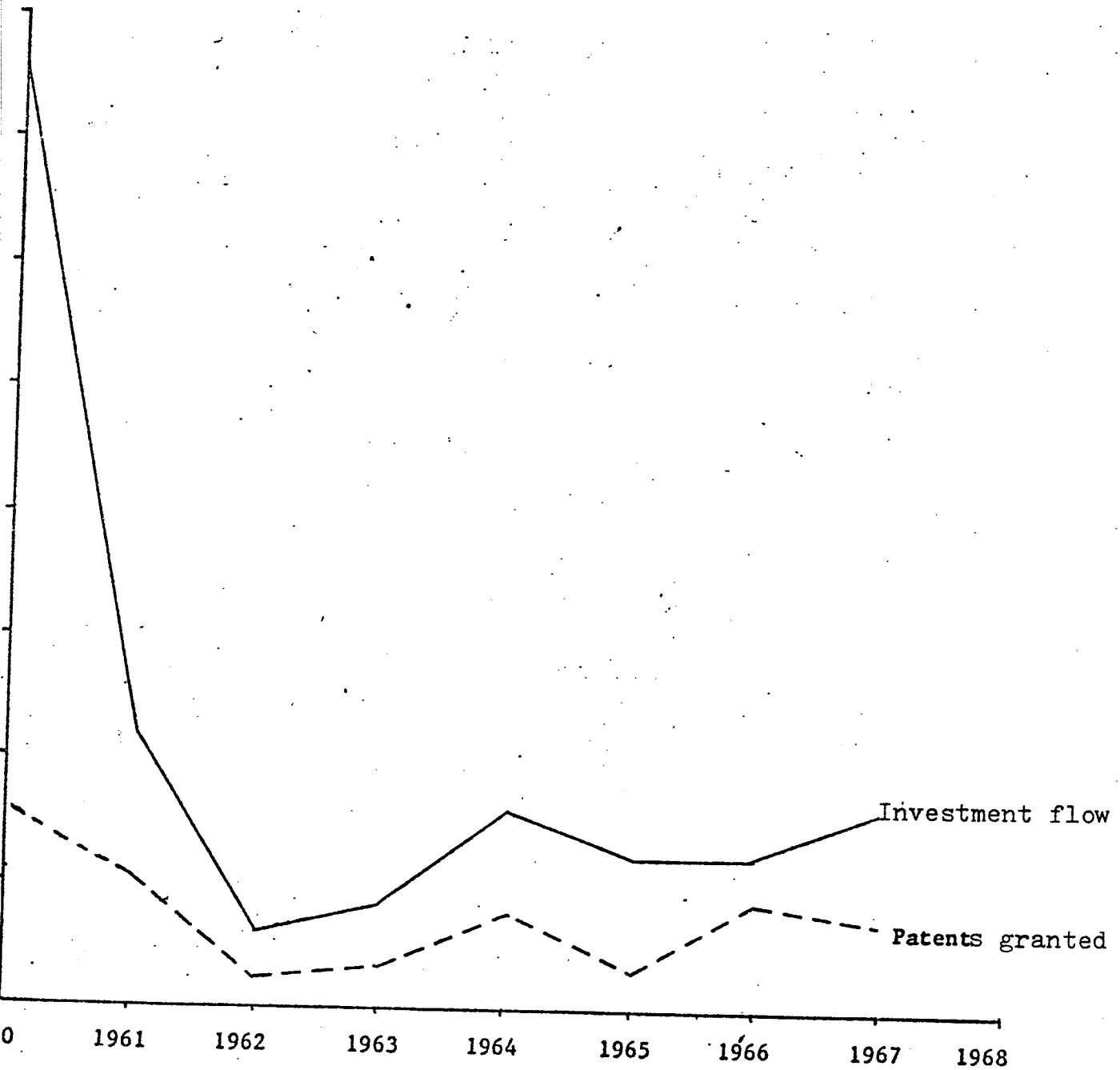
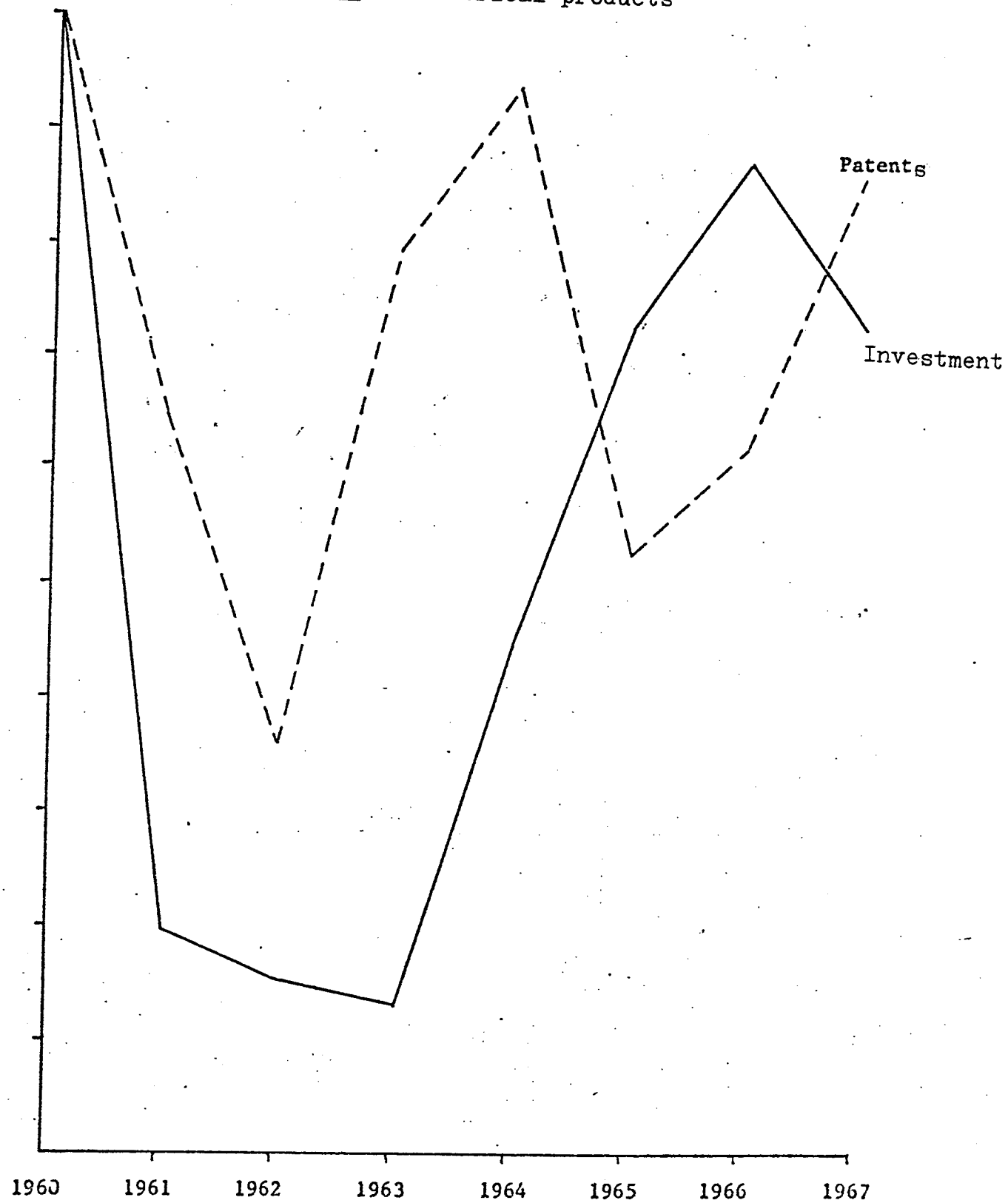


Diagram 5

Patents granted to the mother company and investment from the local subsidiery

Firm D : Electrical products



Schmookler's findings. We do not feel, however, that such statistical similarities constitute a sufficient condition to make the theory stand in the case of Argentina. Let us consider our reason for so thinking.

Within the analytical framework employed by Schmookler, the possibility of patents being used to protect an import market just did not constitute an interesting research avenue and was hence left completely unexplored. We believe that such omitted alternative becomes the crux of the matter in the context of less developed countries, and it is this that precludes a straightforward utilization of received theory.

For the purpose of examining this central point we carried up a statistical survey on patent utilization, whose methodological steps where the following: to each one of the 80 international firms with systematic patenting activity in Argentina we send, by way of the mail, a first very short questionnaire with the purpose of knowing whether the local subsidiary had any participation at all in the selection of the patents each mother company eventually applied for within Argentina, or if the decision as to number and type of patents to be locally applied for, remained entirely a headquarters responsibility without much say from the local bureaucracy.

Approximately 50% of the answers fell in each one of these two subgroups, thus leaving us with a new sample of around 35 firms in which additional information concerning their patent policy could be asked at the level of the local subsidiary.

A second questionnaire was at that point designed, inquiring in some detail about the local utilization of a specific sample of patents randomly drawn from the overall stock of patents owned by each multinational group locally.

Considering the controversial nature of some of our questions the fact that we got 12 questionnaires back, containing very detailed information about 102 patents, is not altogether discouraging. The firms answering our second questionnaire are: American Cynamid, Elli Lilly, Merck A., IBM, Siemens, Sandoz, Lepetit, Xerox, Standard Electric, Minnesota Mining and Manufacturing, Firestone, and Pilkington Bros. These firms account for a stock of 2500 patents accumulated over the period 1957-1967, is just about 20% of the total number of patents granted over the same period of time to the 80 multinational corporations with systematic patenting activity in Argentina.

Table No. 10 summarizes our results. Out of 102 patents for which we have detailed information, only 15 were actually under exploitation at the time of the survey (or had been exploited in the past); 29 covered current imports; and the remaining 58 patents were not under present exploitation, neither were they covering present imports. A certain fraction of those 58 patents were "abandoned," i.e. maintenance fee had not been paid regularly to keep them "active," while yet another fraction was presently being kept active either for future utilization or for the protection of future imports.

Table No. 10

Patent Utilization Within Argentina
(sample of 12 firms and 102 patents)

	Number of patents
1. Locally exploited in production	15 patents
2. Covering present imports	29 "
3. Not being presently used in production neither being the product imported	58 "

Source: own survey

Two major features emerge from these results. First, local utilization of foreign patents is rather small. This is clearly seen when we compare the previous figures with data for the U.S. economy. J. Schmookler, employing data collected in a statistical survey by B. Sanders,[1] argues that around 56% of the U.S. granted patents are commercially exploited, while F. W. Scherer in an independent piece of research carried out at Harvard's Business School in the late 1950s arrived at a fairly similar result--54% of the patents sampled for the study were found to reach the stage of economic exploitation.[2]

Second, quite apart from the previous finding, the role of patents as instruments for the protection of an import trade is also quite apparent in our data. In this respect the economic value of patents locally granted to multinational corporations greatly depends upon the judicial interpretation of Article 5 of the Paris Convention, a subject with which we had dealt at length in previous parts of this monograph. (See pp. 26ff, our comment about recent court cases in which the local courts regarded the importation of a product as sufficient local exploitation of a granted patent.)

Putting together the various different threads of the empirical evidence uncovered by our research, the following picture seems to emerge: import-substitution industrialization, strongly encouraged by Argentina in the whole post-war period, and particularly since the middle 1950s, has often meant the expansion of poorly integrated industries that normally started local production with a very high rate of import content, in terms of raw materials, parts, and so forth. In such conditions the local

---

[1] B. Sanders, "Patterns of Commercial Exploitation of Patented Inventions by Large and Small Companies," Patent, Trademark and Copyright Journal, Spring, 1964.

[2] F.M. Scherer, et al., "Patents and the Corporation," private edition, (mimeo, Mass. 1959).

patent system was called on to play a role that nowhere resembles the role the patent system played in more developed societies. Whereas in the later it acted as the provider of an incentive to inventive activity, in the former it merely supported the overall investment strategy of multinational firms which started local operation with very low vertical integration.

In other words, our present alternative hypothesis suggests that in the context of less developed societies embarqued in domestic import-substitution-industrialization programs, the patent system has only acted as an instrument for market control, lacking many of the basic features that allowed economists of the developed world to examine its role in the context of the theory of inventive activity.

8. The Main Results of the Statistical Study of Patents in Argentina

(a) Along the post-war period Argentina has annually granted around 6,000 patents. A very low upwards trend can be observed in the series for Granted Patents.

(b) Local individual inventors have fallen quite dramatically in their share of the total amount of patents yearly granted. During the early 1950s they accounted for about 60% of the total number of patents annually granted, their share being a mere 20% by the end of the 1960s.

(c) The local inventors hereby studied exhibit a low level of technical training. Only 15% of our sampled individuals achieved a university degree, as compared with about 50% in Schmookler's studies about the U.S. community of private inventors.

(d) Inventive productivity seems also to be very low in our own sample, coming up to just about 4 inventions per capita. Again this figure is rather low by U.S. standards.

(e) Approximately 75% of the patents granted to individual inventors correspond to two mechanical industries: vehicles and non-electrical machinery and electrical machinery and appliances.

(f) Nearly 40% of the inventions for the vehicles and non-electrical machinery industry reached the stage of industrialization, whereas just about 50% of the inventions to the electrical machinery industry did so.

(g) Most of the inventions coming up from independent inventors correspond to areas which demand a very small amount of scientific knowledge; instead, they do demand a great deal of mechanical skills and ingenuity. Process industries are not very much within the concern of private inventors.

(h) In approximately 80% of the individuals hereby sampled we observed a clear answer to market incentives as major determinants of their inventive work. Only 20% of them seemed to be motivated almost exclusively by vocational elements.

(i) About 1/4 of the individuals in the sample attained economic success out of their inventive activity.

(j) The lack of a meaningful relationship between independent inventors and manufacturing industry is notorious and fairly different from the picture that prevails in more developed societies. "Hired inventors" are just not to be found in the domestic environment.

(k) Only one of our sampled individuals thought it rather convenient to make use of Argentina's affiliation to the Paris Convention and apply in other member countries for Argentine-granted patents. In other words, the Country's membership to the Paris Agreement can not be justified in terms of the economic quid pro quo derived from such membership.

(l) Between 75% and 80% of the total number of patents yearly granted are owned by approximately 80 multinational corporations with systematic patenting activity in the local scenary.

(m) Nearly half of the foreign patents locally applied for, belong to U.S. firms, Switzerland and Holland follow in relative importance, with about 10% each.

(n) Nearly 80% of the foreign patents locally applied for, correspond to two branches of manufacturing production: chemical products (which is mainly pharmaceutical items) and electrical products. The first industry accounts for nearly 60% and the second one for yet another 20% of the stock of foreign patents accumulated over the period 1957-1967.

(o) Foreign-owned patents seem to be statistically correlated with the sales performance of the respective local subsidiaries. Furthermore, such flow of patents also seems to be highly correlated with the flow of gross investment. Both such statistical relationships very much resemble findings previously reported in the economics literature by authors such as Schmookler, Griliches, and others.

(p) While in the case of these authors the flow of patents can be interpreted as an index of local inventive activity and therefore provides important empirical evidence for the construction of a theory of innovation, it is argued here that in LDCs patents play an entirely different role and can not be approached in terms of received theory, which mostly reflects the U.S. experience.

(q) Approximately 1/3 of the patents studied during the course of a survey among foreign patentees had the purpose of protecting an import market presently supplied either from headquarters or from any one of the various members of a transnational group.

(r) Just about 16% of the patents examined in our survey of patent utilization were under present local utilization or had been so at some point in the past. Such figure compares very badly with available evidence for the U.S. in which rates of utilization of the order of 54%-56% have been found by B. Sanders, E. M. Scherer and others.

(s) The mere importation of a patented product produces social costs of at least two different kinds, which have to be entirely blamed on the patent system and the Treaty of Paris. The first of these social costs appears when the complete substitution of imports is both economically and technically feasible, but is blocaded by the two previously mentioned legal institutions. A large array of recent court cases for patent violation exactly reveals the nature of this case in the Argentine context.

The second group of social costs is related to the various forms of price manipulations which can be found to prevail in the import trade of multinational groups. Particularly important in this respect is the pharmaceutical industry in which the protection through patents of a broad spectrum of specific intermediate markets for active chemicals allows a widespread array of restricted practices of the sort hereby mentioned.

Our findings are far from being optimistic. If we are to judge by the evidence submitted in this monograph, neither the affiliation of Argentina to the Paris Convention, nor its maintenance of a weak domestic legislation concerning the granting and domestic exploitation of foreign patents, appear to be policy decisions that can be defended on the basis of a straightforward economic cost benefit analysis.[1]

[1]This view obviously implies a certain time dimension. As long as the country remains a marginal exporter of industrial goods, and as long as its domestic flow of inventive activity has second order importance in the international scenery, there does not seem to be much to be gained by joining the Paris Convention. Clearly our policy suggestion would be different if those basic limitations are at some point overcome. Various different developed countries have at different points in their histories violated internationally agreed rules of the game, only to become strong supporters of the status quo after their specific and individual disadvantages had been overcome.

To continue as a member of the Paris Convention when, for some time to come, the domestic flow of inventive activity is not yet strong enough as to collect the benefits of the country's affiliation, while the social costs of membership are self-evident, can hardly be advocated as being a choice based on the "national interest." To maintain the present legislation (and judicial practices) with a very weak conception of what the meaning and purpose should be of locally exploiting foreign patents, also seems hardly justifiable on strictly economic grounds.

These conclusions, however, by no means imply that the present author rejects the need of appropriate legislation to induce the production of new knowledge, neither do they imply lack of recognition of the fact that an adequate rate of return should be allowed in order to encourage invention, innovation and international diffusion of technology.

However, there where legislation which is a straightforward imitation of legal codes prevailing in more developed societies, fails to achieve its basic social objectives, and ends up causing more harm than benefits, a more flexible mechanism of bilateral negotiation between the host government and multinational enterprises could possibly bridge the gap and generate social benefits, even within the framework of oligopolistic or monopolistic situations.

It is obvious, however, that bilateral negotiations such as those advocated here should go well beyond the subject of patents, as this is just only--and a very marginal one--of the topics which require basic change in the social and economic life of LDCs.

Appendix N 1

Patents yearly granted in Argentina to multinational firms with systema tic patenting activity. 1957-1967.

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	Total
American Aniline Products (USA)	-	-	-	-	-	-	-	-	-	-	13	13
American Cynamid Company (USA)	16	18	38	25	26	14	20	22	9	16	42	246
Allied Chemical Corp. (USA)	-	1	-	2	4	6	11	29	22	46	16	137
Abbot Laboratories (USAO	4	3	8	9	9	6	14	17	12	15	14	111
Aluminium Laboratories Ltd. (Canadá)	-	-	5	4	1	1	-	-	-	-	11	22
Badische Anilin y Soda Fabrik (Alemania)	2	3	7	-	5	1	10	12	11	-	22	73
Beecham Group Ltd. (Inglaterra)	-	-	-	-	-	-	-	-	-	-	11	11
Borg-Wagner Corp. (USA)	3	5	2	-	9	4	6	12	-	-	33	74
C.A.V. Ltd. (USA)	-	-	-	-	11	10	20	10	-	-	12	63
Ciba S.A. (Suiza)	57	60	77	51	53	33	152	130	58	67	88	826
Commissariat a l'Energie Atomique (Fran.)	-	4	3	-	9	4	14	12	12	21	13	92
Continental Carbon Co. (USA)	-	-	-	2	-	-	7	-	-	-	10	19
Corning Glass Works (USA)	5	5	6	8	8	2	4	5	3	12	13	71
Deere & Co. (USA)	-	-	-	-	1	-	1	-	-	14	14	30
Deutsche Gold und Silber Scheideaus (Alem.)	4	-	5	3	8	9	17	6	7	9	10	78
Dow Corning Corp. (USA)	5	1	-	1	-	4	12	31	11	33	17	115
Du Pont E.I. de Nemours & Co. (USA)	54	52	45	59	23	12	56	48	35	117	78	579

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	Total
Eastman Kodak Co. (USA)	-	1	3	4	3	1	6	11	11	24	45	109
Eaton Yale & Towne Inc. (USA)	-	1	1	-	1	3	8	-	-	4	20	38
Eli Lilly Co. (USA)	1	4	2	2	1	2	5	8	4	6	25	60
Etablissements Kuhlmann (Francia)	-	-	-	-	-	-	-	6	-	4	12	22
F.M.C. Corp (USA)	-	-	-	-	-	8	20	21	6	11	29	95
Farbwerke Hoechst A.G. (Alemania)	6	5	7	10	10	4	8	19	18	31	52	170
Farbenfabriken Bayer A.G. (Alemania)	22	27	26	11	25	21	34	51	21	31	44	313
Ford Motor Co. (USA)	-	-	-	1	1	-	8	3	2	16	20	51
Geigy J.R. S.A. (Suiza)	9	9	26	-	25	18	28	12	19	41	64	251
General Electric (USA)	46	27	28	54	33	19	30	34	16	26	38	351
Girling Ltd. (Inglaterra)	-	-	-	-	-	-	13	10	-	18	24	65
Glaxo Group Ltd. (Inglaterra)	2	1	2	-	5	2	-	-	-	11	12	35
Halcon International Inc. (USA)	-	-	-	-	-	-	1	11	10	20	19	61
Hoffman La Roche & Cia. (Suiza)	34	23	28	32	28	16	17	25	27	50	116	396
Imperial Chemical Ind. (Inglaterra)	24	36	41	24	27	10	46	50	51	103	87	499
Institut Francais de Petrole des Carburants	-	-	-	-	-	-	23	-	-	-	10	33
Standard Electric Corp. (USA)	77	64	19	24	23	37	117	52	27	87	114	641
International Business Machines Corp.(USA)	10	6	3	4	6	5	8	21	13	45	34	155
Leesona Corp. (USA)	-	-	-	1	-	-	10	5	1	6	13	36
Lepetit S.p.A. (Italia)	2	2	4	5	4	1	6	7	-	7	10	48
Libbey Owen Ford Glass (USA)	14	-	10	-	1	1	4	7	5	4	10	56

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	Total
L'Oreal S.A. (Francia)	-	14	-	-	-	-	-	-	2	5	15	36
Joseph Lucas Ind. Ltd. (Inglaterra)	-	-	-	-	1	-	7	7	3	4	26	48
Merck & Co. Inc. (USA)	21	22	28	37	19	14	24	22	41	52	56	336
Monsanto Co. (USA)	9	6	1	6	4	-	16	20	27	163	105	367
Midland Ross Co. (USA)	-	-	-	-	-	-	-	-	-	2	12	14
Miles Laboratories Inc. (USA)	1	1	5	7	6	10	10	14	4	8	10	76
Minnesota Mining & Manufacturing Co.(USA)	18	8	7	6	15	7	16	27	10	19	26	159
Modern Telephone S.R.L. (USA)	-	-	-	-	-	-	-	-	-	-	86	86
E. Merck A.G. (Alemania)	13	22	-	23	8	14	13	15	5	7	20	140
Motorola Inc. (USA)	-	-	-	-	-	-	-	3	-	12	15	30
Olin Mathieson Chemical Corp. (USA)	23	19	14	19	22	13	17	41	31	11	13	233
Parke Davis & Co. (USA)	13	3	25	9	7	3	12	13	15	6	20	126
Philip Morris Inc. (USA)	-	1	1	-	-	-	3	1	1	8	10	25
Philips Gloeilampenfabrieken (Holanda)	122	95	99	204	133	73	158	188	106	123	171	1472
Pilkington Brothers Ltd. (Inglaterra)	-	3	1	2	4	2	4	5	9	22	24	76
Pirelli S.p.A. (Italia)	23	20	14	12	22	11	26	28	7	18	15	196
Pittsburgh Plate Glass Co. (USA)	41	20	14	9	8	3	18	27	9	32	21	202
Radio Corporation of America (USA)	122	95	99	204	133	73	158	128	22	41	33	1108
Regie Nationale des Usines Renault (Fr.)	-	-	-	1	8	16	15	7	-	14	18	79
Rohm & Haas Co. (USA)	14	7	6	11	20	11	35	34	21	50	21	230
Rhone Poulenc S.A. (Francia)	-	19	2	5	13	-	18	30	10	13	21	131
Rousnel Uclaf (Francia)	-	-	-	-	-	7	15	18	17	19	37	113

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	Total
Sandoz Patents Ltd. (Canadá)	4	10	17	26	20	-	1	26	19	37	42	202
Stamicarbon N.V. (Holanda)	2	-	9	8	8	2	12	8	6	14	14	83
Stauffer Chemical Co. (USA)	1	5	1	-	-	2	5	13	14	8	19	68
Shell Ind. (Holanda)	8	3	8	17	29	44	150	114	36	68	55	532
Schering A.G. (Alemania)	5	6	7	4	4	3	7	4	2	1	18	61
Scherico Ltd. (Suiza)	-	-	3	4	1	3	4	8	2	3	12	40
Squibb E.R. (USA)	-	2	-	1	-	1	1	-	-	1	16	22
Siemens A.G. (Alemania)	23	14	17	21	20	5	6	15	6	17	14	158
Snia Viscosa S.N.I.A. (Italia)	-	-	-	-	-	7	7	-	3	11	10	38
S.A. André Citroen (Francia)	-	-	-	2	1	2	15	11	7	11	28	77
The Bendix Corp. (USA)	-	2	4	-	-	8	19	18	7	16	26	100
The Firestone Tire & Rubber Co. (USA)	8	18	5	1	-	1	10	10	4	8	14	79
The Goodyear Tire & Rubber Co. (USA)	31	12	20	14	4	7	42	24	17	18	22	211
The National Cash Register Co. (USA)	7	10	14	14	19	10	25	30	13	49	41	232
The Upjohn Co. (USA)	3	-	-	-	-	2	7	-	10	31	19	72
The Wellcome Foundation Ltd. (USA)	-	-	-	-	-	5	3	-	-	7	16	31
United States Rubber Co. (USA)	8	18	-	-	-	3	32	30	23	10	28	152
Union Carbide Corp. (USA)	26	19	13	2	13	13	17	28	10	20	18	179
Xerox Corp. (USA)	-	-	-	-	-	-	-	-	-	16	23	39
												13704