

CONTRACTS OF TECHNOLOGY TRANSFER IN THE BRAZILIAN POLYMER INDUSTRY (BR.3.057)

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Resumen

The polymer industry (plastics, rubbers, fibers, adhesives, paints and varnishes) is perhaps the fastest growing segment of the petrochemical industry. This is because polymers are progressively substituting other materials such as glass, wood, paper and metal. In Brazil, the polymer industry emerged in the seventies when three petrochemical complexes were created, and today it represents 1.5% of the GNP, employs around two thousand people and produces almost four million tons of resins. The polymer industry is science-based and needs constant technological innovation to feed its competitiveness. Thus, the capacity to create technology is vital in the process of long-range survival of firms in this industry. However, Brazil develops little of its own technology but instead is still a heavy importer of polymer technology. In Brazil, the process of technology transfer is monitored by the National Institute for Industrial Property (INPI), which registers all the contracts related to technology transfer. INPI classifies these contracts as (1) use of patents; (2) use of trademark; (3) supply of technology; (4) services of technical and scientific assistance; and (5) franchise. For the purpose of this study, a database was created using this corpus of contracts in the polymer area, registered in INPI from 1985 to 1999. This paper discusses the main forms of technology transfer in the polymer industry and attempts to evaluate the degree of technological dependence and relevant implications.

Área y bloque temático

Área 3: Transferencia tecnológica como instrumento para la innovación empresarial

Bloque 3.2: La propiedad intelectual en el proceso de transferencia tecnológica

Palabras clave: Brasil/technology/transfer polymer industry/polymer/patents/know-how

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INTRODUCTION

In the last few years, technology has become an essential element to guarantee a long-term competitive advantage to firms. This is especially true in a world with a fast growing process of economic globalization, which increased competitiveness among companies. As a science-based industry, the polymer industry needs constant technological innovation to feed its competitiveness. Thus, technology is a vital element in the process for long-range survival.

The Brazilian market for polymers is considered an area of great opportunities. The country still has a low per capita consumption of plastics, which is a sign that it can absorb a huge quantity of products before it is considered saturated. This industry was introduced in Brazil in the seventies when three petrochemical complexes were created. As there was no polymer technology available in Brazil, the sector had to use foreign technology to fill this gap.

This paper discusses the main forms of technology transfer in the polymer industry and attempts to evaluate the degree of technological dependence in this area. It should be pointed out that the results presented above are the preliminary findings of an on-going research on the way the Brazilian polymer industry deals with technology.

BRAZILIAN POLYMER INDUSTRY

The polymer industry is one of the fastest growing segments of the chemical industry in the world. This industry grew around 62% in the 80s, the decade that can be considered the golden era when various materials were substituted by plastics. In 1992, the production of plastics reached more than one hundred million cubic meters, and there is still considerable room for growth for this material before the world market is saturated (Utracki, 1995).

The petrochemical industry began to establish itself in a structured manner in Brazil around 30 years ago. It started with the implanting of three petrochemical complexes, and today it represents more than 2% of the GNP, with sales of around five billion dollars. In Brazil, the segment of engineering plastics is growing at a rate of 20% per year, while that of thermoplastic resins is growing on average 9% per year. The Brazilian market is considered an area of opportunities since the country has an heavy population base that guarantees a

constant demand. Also, the per capita consumption of plastics in the country (23 kg/year) is low in relation to countries such as the United States (100 kg/year), Japan (80 kg/year), and France (55 kg/year) (Polímeros, 1995; Perrone, 2000).

Almost all the firms in the Brazilian polymer industry are monoproducers and do not have economy of scope, which makes it difficult for them to integrate in the process of globalization. Today the country is self-sufficient in the production of commodity type polymers; the features of these polymers are high volume of production, lack of differentiation in the final product, and low prices. On the other hand, the country still lacks production of polymers that have a higher degree of specialization, that need more technological sophistication, and that have a higher aggregate value.

Pavitt (1984) characterizes the chemical industry, including the polymer sector, as a science based industry, since its main source of technology is research and development activity. At present, nearly all the technology used by this industry in the country is foreign and was obtained through licensing and joint-ventures. Investment in R&D represents less than 1% of its net sales, which is a low rate in relation to large multinational firms that invest on average 3% of the sales (Bruno, 1995; ABIQUIM, 2000).

FIRMS IN A BORDERLESS WORLD

The economic globalization drastically changed the competitive arena where the firms have to act. They began to be evaluated not only by their financial assets but, mainly, by their technological assets. To survive in a global economy, a firm needs to be internationally competitive and this means that it has to integrate technology in its business strategies. The technological strategy also had to become global instead of domestic as it used to be.

In this scenario, firms had to construct technological barriers as competitive advantages and, at the same time, they had to diversify their products and occupy new markets. To decrease costs of labor, they had to gradually transfer their technologies to locations where these costs were lower. And, in this new economic environment, firms began to export technology, know-how and key-components of their products and started importing finished products (Nakahara, 1997).

Firms try to expand their markets in order to decrease the time of their return on investments and reduce uncertainties related to R&D. International competition became an important issue in the strategic planning of multinationals and the international protection of their technology became essential for the survival process of these companies.

TECHNOLOGY TRANSFER

It is crucial to any country to have access to all kinds of technologies, in order to improve the quality of life of its people. This is possible by importing technology, which is done through special contracts.

McCulloch (1981) explains that until the 60s such contracts were signed between firms, without the intervention of national governments. The parts were free to establish the bases of their agreement. However, this *laisser-faire* process generated a number of abusive clauses in the contracts, especially from the side of the supplier of technology. In the 70s, several countries, aware of the problems related to technology transfer, started adopting strict regulations to control the process of import of technology.

In 1971, Brazil passed a very restrictive Patent Law, establishing that the Brazilian Patent Office (INPI) could intervene and prohibit certain clauses of technology transfer contracts. This law was valid until 1996, when, due to international pressure, the Brazilian government had to promulgate a new Patent Law. The new law maintained the obligation of all contracts of technology transfer to be registered in INPI, but INPI no longer had the right to intervene in the clauses of contracts.

Today the contracts of technology transfer, according to the Brazilian law, are registered in the INPI under the following categories:

- Use of patents
- Use of trademarks
- Supply of technology
- Technical and scientific service
- Franchise

- Others

The “Use of patents” and the “Use of trademarks” are related to the commercial use of rights issued in Brazil. “Supply of technology” is related to commercialization of technology that is not protected in the Brazilian territory through a patent; this is, in fact, contracts of know-how. Technical services involve the supply of techniques, methods of planning and programming, as well as research, studies and projects for specialized technical services. “Franchises” involves technology transfer of services, the teaching of operational standards and the use of trademarks and patents. And “Others” includes share of research, which are contracts of participation in costs of R&D. Such contracts constitute the rules for the technological flow between companies established in the country and the research center of the supply company, when it is located abroad, or between subsidiaries and the headquarters of the same company.

BRAZIL AND THE TRANSFER OF POLYMER TECHNOLOGY

To verify how the Brazilian polymer industry deals with technology, a database is being constructed. This database contains all the technology transfer contracts registered in INPI, in the polymer area, from 1985 to 1999. The summary of the database is in Table 1.

**Table 1 – Registered contracts in INPI – Brazil, in the polymer area
(1985 to 1999)**

Category	Number of contracts	%
Supply of technology	99	53.5
Technical and scientific service	62	33.5
Use of patents	20	10.8
Others	4	2,2
TOTAL	185	100,0

We can observe, as expected, that there is no case of contracts for the use of trademarks and franchises in the polymer sector. In these 14 years, a total of 185 contracts were registered in INPI by the Brazilian polymer industry. Of these, 99 contracts were in the area of technology supply, i.e., transactions involving non-patented technology. Also there area a high number of services contracts (62). In addition, only 10.8% of the contracts registered in INPI are for the use of patents.

A preliminary analysis of the data reveals that the Brazilian polymer industry prefers to negotiate the complete technological “package”, which includes the supply of technology and services, 87% of all registered contracts in INPI. This means a complete technological dependence on foreign suppliers of technology.

If we consider the mean of all 185 contracts, we verify that seven contracts of technology supply, four contracts of services and one contract of use of patents were registered each year. As we know, polymer technology takes a long time to be absorbed, the start-up of a polymer plant takes several years, and there is a small number of Brazilian polymer producers. Thus,

we can conclude that the supply of technology was high. And the Brazilian companies are not interested in the use of patents.

Going one step further, the contracts were divided into two groups:

1. Contracts within the same group, i.e., contracts involving internal transfer of technology; and
2. Contracts with third party, i.e., contracts involving transfer of technology between non-related firms.

Table 2, above, shows the results.

Table 2 – Contracts of technology transfer registered at INPI, according to the player involved in the transactions (1985 to 1999)

Category	Same group		Third partys		TOTAL
	Number of contracts	%	Number of contracts	%	
Supply of technology	9	9	90	91	99
Technical and scientific service	12	19	50	81	62
Use of patents	8	40	12	60	20
Others	1	25	3	75	4
TOTAL	30	16	155	84	185

Table 2 shows that 84% of the contracts of technology transfer were made with third parties. Usually, this kind of transfer was made between a foreign supplier of technology and a Brazilian firm. On the other hand, the 30 cases of transfer of technology within the same group are associated with negotiations between headquarters and their subsidiaries in Brazil.

From the total of 99 contracts related to commercialization of technology that is not patented in Brazil (“Supply of technology”), 91% of them were made with third parties. The second most common form of technology transfer is technical service and 81% of such contracts were signed in links with third parties. On examining each case of technology transfer, it was observed that, when a supply of technology occurred with third parties, it was often combined with technical services. However, the same characteristic was not observed when the transfer was made within the group; in these cases, contracts of supply of technology and technical services were signed independently.

The number of contracts of exploitation of patents is relatively small, compared with the total number of the legal instruments. Nevertheless, it should be noticed that when they occur with third parties, generally, they are combined with supply of technology or with technical services. In contrast, when they occur within the group, there was not observed any related additional contract. This means that when they negotiate the exploitation of a patent, Brazilian companies usually also negotiate the supply of know-how and/or technical services to be able to implement the patent.

Once more, the table shows the dependence of Brazilian companies on foreign technology.

Table 3 represents the contracts of technology transfer according to their country of origin.

Table 3 – Contracts of technology transfer registered at INPI, according to the origin of the technology supplier (1985 to 1999)

Origin of technology supplier	Number	%
United States	61	33.0
Germany	24	13.0
Brazil	22	11.9
Japan	18	9.7
Netherlands	13	7.0
Italy	13	7.0
France	13	7.0
Great-Britain	9	4.9
Canada	6	3.2
Switzerland	3	1.6
Sweden	1	0.5
Belgium	1	0.5
India	1	0.5
TOTAL	185	100,0

As can be verified, the United States is the great technology supplier of the Brazilian necessities in the polymer area. Brazil comes in third place, with 22 contracts, mainly because of the former state-owned Brazilian Telecom, which use to have a big center for research in telecommunications products, including polymers. Germany and Japan can also be considered important source of technology for the Brazilian industry.

ANALYSIS OF THE RESULTS

The Brazilian polymer industry was consolidated through the selling of international technology, especially from the United States. The data from the tables show the preference of importing technology.

Contracts of technology supply are contracts of exploiting know-how. In these contracts, the supplier of technology agrees to transfer to the customer the knowledge of how to make the

product (or process). These are the fastest way to have access to more advanced technologies. Usually, contracts of technology supply are negotiated simultaneously with technical assistance contracts.

On the other hand, the limited number of contracts of use of patents can be explained (1) by the small number of patents granted in Brazil in the polymer area and (2) because these contracts do not include transfer of know-how. Generally, the document of a patent does not include the description of the know-how and so the licensee does not have access to know-how of the licensed technology. To be able to use a patent, the firm needs to have highly prepared technical personnel and an expressive R&D budget. This is not exactly the case of the Brazilian polymer firms, which have technical personnel but lack the funds to invest in R&D (Hemais et al, 1999).

The fact that the Brazilian polymer industry import technology means a large amount of money that is being sent out of the country for payment of royalties. And this large transfer of money promotes the deficit in the Brazilian commercial balance. Data from the Brazilian Central Bank show that the payment of royalties in 1990 was US\$200 million but it increased tremendously eight years later to US\$2 billion (Banco Central do Brasil, 2000).

As was disclosed in recent research (Hemais et al, 2001), the Brazilian polymer industry has decreased the amount of investment in R&D in the last ten years and is not carrying out long-range programs of technological development. Viewing these facts in light of the results pointed out in this paper, we can imagine that the technological dependence of the Brazilian polymer industry is still a problem without a solution in a short/medium range.

CONCLUSION

As the main finding of this paper is that the Brazilian polymer industry is a strong importer of technology through contracts of technology supply, i.e., through the import of know-how. The firms contract technology instead of maintaining R&D programs directed to this aim. At the same time, they are closely linked to the supplier of technology through contracts of technical assistance, which have made the Brazilian firms almost completely dependent upon the foreign technology supplier. Many times, these suppliers are partners of the firms and this fact shows how difficult it is for these firms to maintain their own project of technology development without colliding with the partners' interests.

This paper shows preliminary findings of a research project that is just starting and a database that is still not completed. However, the numbers shown are strong enough to support the conclusions above.

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