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INVESTMENTS, TECHNOLOGY TRANSFER AND  
COMPETITIVENESS:

THE CASE OF VENEZUELA

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on the Interaction between Investment and Technology Transfer

## Presentation

The present study on Venezuela's situation with respect to "Investments, Technology Transfer, and Competitiveness", was done within the framework of the activities of the Special Working Group on the Interaction between Investment and Technology Transfer, set up by the Council of Trade and Development to implement the recommendations approved by the United Nations Conference on Trade and Development in its eighth period of sessions, held in February 1992 in Cartagena, Colombia, and published in the final document "A new Association for Development: The Cartagena Commitment".

The study follows, as far as possible, the outline suggested by the Special Working Group for the topic in question. The main sources of information were official documents and personal interviews with officials of public organisms related to the matter under study, to whom we owe a debt of gratitude. Financial limitations and the political climate of the country impeded field work to gather the direct opinion of the enterprises and that explains why references in this regard come from somewhat scarce secondary sources.

The complexity of the topic in question, difficult to cover in the established length, on one hand, and the recent turbulent process of changes in economic and institutional policy taking place in the country, on the other, do not allow us to arrive at definitive and precise conclusion. For these reasons follow-up studies are necessary with a causal analysis approach that will allow us to evaluate more deeply the interrelationships between investments, technology transfer, and competitiveness that have been developing in Venezuela since 1989.

Finally, we must point out that the opinions expressed in this study are the author's and do not necessarily reflect those or the public organisms involved in the implementation of the same.

## Introduction

By way of introduction, we shall now present some indicator of Venezuela's economic and social structure.

1. **Economic indicators.** In 1992 the Gross Domestic Product grew at a rate of 7.3%, lower than that of 1991 which was 10.4%. In 1990 the growth rate of the GDP was 5.7% after the 1989 fall of -7.8%, the year transformations began to constitute a market economy. The lower GDP growth rate of 1992, in comparison to 1991, was due to a drop of 1.9% of the GDP in the petroleum sector because of a decrease in demand in the international markets which, in turn, affected the average price of crude, varying from \$15.96 per barrel in 1991, to \$15.25 in 1992.

In 1992, non-petroleum activity grew by 9.5%, slightly above the 8.9% growth rate of 1991. The manufacturing sector grew by 12.1%, higher than the 10.4% registered the previous year. In the GDP growth of 1992, the participation of the private sector was decisive since its growth rate was 13.5% while that of the public sector of the economy was 1.3%.

As regards the percentage distribution of the GDP, the activities of crude oil, natural gas, and refined products contributed 20.4% in 1992, a lower figure than the 22.4% of 1991; manufacturing activity was 17.5%, improving its participation of 16.7% the previous year; construction was 6.4% as against 5.8% in 1991; commercial activities made up 14.6% as against 13.4% the previous year; agriculture fell to 4.7% as compared to 4.9% in 1991.

Between 1980-1990, year average variance rate was -5.4%. In 1990, investments were US\$ 8,172 million (1988 dollars) of which 68.36% corresponded to the public sector and 31.64% to the private sector; in 1991 investments doubled to US\$ 16,827 million, of which 58.65% corresponded to the public sector and 41.35% to the private one. Investment structure for 1990 was 74% in non-exportable services and goods, 8% in exportable goods and 18% in oil.

In 1992, exports were US\$ 14,870 million, representing a drop of 26.6% in comparison to 1991. The fall in exports was marked by petroleum exports which fell by 31.2% between 1991 (US\$ 17,270 million) and 1992 (US\$ 11,886 million). In the area of non-petroleum exports, not including iron, there was a slight increase from US\$ 2,756 M in 1991, to US\$ 2,756M in 1992; in this area of activity are the products exported to Latin American

markets, particularly to Colombia with which there exists free trade.

Imports in 1992 rose by 21.8% as compared to 1991, moving from US\$ 10,042 million to US\$ 12,227 million. The balance of payments in 1992 closed with a global deficit of US\$ 1.5 billion, a drop of 53.1% compared to 1991. The current account balance was negative to the tune of US\$ 3.7 billion, given the drop in petroleum exports and the increase in imports in response to the expansion of domestic demand and the decrease in tariffs and non-tariff barriers. The merchandise balance in 1992 was favorable by US\$ 2.6 billion though this represented a 74.5% drop compared to that of the previous year. International reserves moved from US\$ 6,555 million in 1988 to US\$ 13,001 million in 1992.

Foreign debt for 1991 amounted to US\$ 34,081 million, only US\$ 259 million lower than the amount for 1986. Total debt service payments was US\$ 5,103 million in 1986; after a renegotiation carried out in 1989 with the International Monetary Fund, payments were US\$ 4,339 million and US\$ 4,454 million in 1990 and 1991 respectively.

2. Social indicators. In 1991, Venezuela's total population was 19.8 million inhabitants with an average annual growth rate of 2.7%. 92% of this figure is located in urban zones.

The labor force in 1991 was 7.4 million; its average year growth rate between 1981 and 1990 was 4.0% and the unemployment rate was 8.7% of the labor force. Out of this total of 6.7 million of employees in 1991, 59.5% were located in the formal economic sector and 40.5% in the informal one.

Gross income per capita fell by 2.6% in 1979-1990; to this it is necessary to add up the inequality in income distribution, for 1990, 43% of the families in the country received 18% of the total income, and 19% received 44% of the total income. Critical poverty grew in the 80's and in 1990 it was estimated at 43% of the families. Income per capita was US\$ 3,519 in 1991.

Schooling rate reached in 1991 28% of the total pre-school population, 89% in basic education, 44% in high school and 27% in higher education. The illiteracy rate in 1990 was 11.3% of the population 15 years and over. Life expectancy was 70.3 years while the infant mortality rate was 33.9 for every 1,000 live births.

TABLE 1

## VENEZUELA. ECONOMIC INDICATORS

## GROSS DOMESTIC PRODUCT

	1986	1987	1988	1989	1990	1991(p)
	(Millions of dollars of 1988)					
TOTAL GDP	61.061	63.796	67.740	61.932	65.027	71.180
GDP PER CAPITA	3.432	3.491	3.611	3.218	3.295	3.519
	(Average Annual Growth Rates)					
TOTAL GDP (1)	6,3	4,5	6,2	-7,8	5,7	9,2
Agriculture and Fishing	7,7	4,0	4,6	-5,1	-1,3	5,8
Petroleum	8,7	5,2	4,1	1,3	13,6	9,9
Manufacturing	7,1	2,6	6,8	-11,8	4,1	7,4
Construction	6,3	3,0	7,9	-27,0	6,4	34,3

(1) At Market prices. (p) Provisional

SOURCE: B.C.V.

TABLE 2

## VENEZUELA. GROSS DOMESTIC INVESTMENT

	1986	1987	1988	1989	1990	1991(p)
	(Millions of dollars of 1988)					
GDI	14.354	16.397	18.888	8.942	8.172	16.827
Public Sector (%)	---	---	---	---	68,36	58,65
Private Sector (%)	----	----	----	----	31,64	41,35

(p) Provisional

SOURCE: B.C.V.

TABLE 3

## VENEZUELA. BALANCE OF PAYMENTS

	1986	1987	1988	1989	1990	1991(p)
	(Millions of dollars of 1988)					
CURRENT ACCOUNT BALANCE	-2245	-1390	-5809	2161	8279	1663
Trade Balance	669	1567	-1998	5632	10637	4791
Exports (f.o.b.)	8535	10437	10082	12915	17444	14892
Imports (f.o.b.)	7866	8870	12080	7283	6807	10101
Service Balance	-2793	-2866	-3664	-3284	-2075	-2785
Unrequited Transfers	-121	-91	-147	-187	-283	-343
CAPITAL ACCOUNT BALANCE (1)	-1149	538	-1039	-3530	-2659	3494

(1) Exclude reserves. (p) Provisional

SOURCE: B.C.V.

TABLE 4

## VENEZUELA. EXTERNAL DEBT

	1986	1987	1988	1989	1990	1991(p)
	(Millions of dollars of 1988)					
TOTAL EXTERNAL DEBT	34340	34680	34865	32491	33305	34081
Long-Term	32763	30595	29591	29203	28293	29069
Short-Term	1577	4085	5274	2290	2000	2000
IMF Credit	0	0	0	998	3012	3012
Service Payments on the Total External Debt	5103	4872	5559	3829	4339	4454
Interest	3085	2747	3129	3085	3246	2928
Amortization	2018	2125	2430	744	1093	1526
Total External Debt	54,1	54,1	51,5	58,1	63,5	67,7
to Gross Domestic Product (%)						

(p) Provisional

SOURCE: B.C.V., B.I.D.

TABLE 5

## VENEZUELA. BASIC SOCIAL INDICATORS

INDICATOR	1971	1980	1990	1991
TOTAL POPULATION (1)	10.721	15.024	19.429	19.890
GROWTH RATE (2)	---	---	---	2,7
POPULATION 15 YEARS AND OVER (3)	---	---	11.981	12.331
LABOR FORCE (4)	---	---	7.080	7.417
UNEMPLOYMENT RATE (5)	---	---	9,9	8,7
URBAN POPULATION (%)	---	83,3	90,5	---
LIFE EXPECTANCY (6)	65,2	68,5	69,9	70,3
INFANT MORTALITY RATE (7)	53,4	40,6	34,8	33,9
ILLETERACY (8)	23,5	15,3	11,3	---

(1) In thousands. (2) Average Annual Growth in the period 1983-1991. (3) In Working Age.  
 (4) Economically Active Population (E.A.P.). (5) Percentage in the E.A.P. (6) At birth, in years  
 (7) Per 1,000 live birth. (8) Percentage of Population 15 years and over

SOURCE: B.C.V., B.I.D., OCEI



I. Technology trends linked to investments and their determinants

A. General tendencies in technology trends and their relationship to mechanisms for the transfer of technology

1. The structure of technology trends

1.1. Capital good imports

Between 1968 and 1973, total imports grew an average year rate of 9.9%, moving from US\$ 1,510 million in 1968 to US\$ 2,626 million in 1973; capital goods average year growth rate was 11.1%, from US\$ 400 million to US\$ 762 million, rising thus its share in total import from 26.5% to 29% in the same period.

After the oil shock of 1973-74, which raised oil prices substantially in international markets, the government decided to expedite the nationalization of the iron and petroleum industries and implanted an ambitious strategy of economic growth, outlined in the Fifth National Plan, aimed at reactivating the process of substitutive industrialization which had already exhausted the "easy stage" of producing non-durable consumer goods begun in the fifties through an increase of State participation in the siderurgical, aluminum, petrochemical and metalmechanical industries basically. The fundamental assumption was that of exploiting the comparative advantages of energy and natural resources the country possesses to build an industrial complex for the domestic production of capital and intermediate goods, of substituting imports and diversifying the country's exports.

In the period 1974-1982, imports amounted to US\$ 84,691 M of which US\$ 21,522 M, 25.4%, went to capital good. However, there are two distinguishable moments in this period: the first between 1974-1978 in which the import of capital goods grew at an average annual rate of 43.9% with negative trade balances in 1977 and 1978; and the second between 1979-1982 in which capital goods imports decreased at an average annual rate of 4.7% despite the fact of a slight recovery in 1981 and 1982 as a consequence of the new rise in oil prices.

As a consequence of the foreign debt crisis and the capital flight that ensued, a system of exchange controls and an import regime based on licenses and delegations were adopted in 1983, reducing consumption and provoking the fall of imports by 53% with respect to the US\$ 13,584 M spent in 1982. From then on, the recovery of growth was extremely slow to the extent that it

was only in 1988 that the level of 1981 was reached, equivalent to US\$ 12,000 M, but with a negative trade balance of US\$ 2,000 M. In capital goods imports, the crisis was reflected in a drop of 43% in 1983, growing thereafter at an average annual rate of 13.5% between 1983 and 1987. In 1988, the last year of state interventionism as the main factor of economic activity, imports in general rose sharply, but not as the result of economic recovery, but rather of the imminence of new liberalization policies to be implemented as of 1989 which enterprises took advantage of to replace and acquire new equipment, parts, and spares. In 1990 and 1991 capital goods imports represented 24.5% of total imports valued at US\$ 6,608 M and US\$ 9,977 M respectively.

## 1.2 Foreign Direct Investments

Towards the end of the sixties, accumulated FDI was Bs. 27,733 M (about US\$ 6,100 M at that time) representing a modest increase of 28.8% with respect to 1960. The decapitalization of the petroleum industry came about in that decade after the introduction of new taxes and royalties and the suspension of new concessions by the nation's government, as well as its entrance in OPEC in 1960 as a founding member. It is estimated that between 1960 and 1971 FDI was in the order of US\$ 3,818 M while remittances abroad were in the order of US\$ 12,566 M, leaving a negative balance of US\$ 8,748 M (D.F. Maza Zavala, 1985).

The meager results of the industrialization policy and pressures in the balance of payments led the Andean countries of the Cartagena Agreement to adopt the well-known Decision 24 for a Common Regime of Treatment of Foreign Capitals and Trademarks, Patents, Licenses, and Royalties, in December 1970. Venezuela subscribed the Cartagena Agreement in February 1973 and Decision 24 came into effect in January 1974. From then on, the entrance and operation of FDI were subject to the regulations of the Superintendence of Foreign Investments (SIEEX), and organism created to control observance of Decision 24.

According to SIEEX statistics, FDI between 1977 and 1982 was US\$ 550 M, of which US\$ 343 M entered in 1981-1982. This low level of FDI was the result of the combination of internal factors relating both to the restrictions imposed by Decision 24, and to the drop in the rate of private investment as of 1978, and external factors related to the profound production and trade transformation in the world economy after the 1973 oil crisis which changed the structure and direction of FDI, now aimed towards the very industrialized countries and the nascent industrialized countries of south-east Asia, concentrating on the development of new technologies and the service sector, as a

result of which Latin America lost ground in attracting FDI. (SELA, Series ED/9, August 1990).

The foreign debt crisis aggravated the FDI problem and, what is more, provoked capital flight. In the face of financial pressures to service its foreign debt and the fall in oil prices, and faced with restrictions to diversify exports and reduce imports beyond modest limits, in other words, faced with difficulties to balance macroeconomic deficits, the government was forced to take measures to convert foreign debt into investments and to attract FDI. That, in fact, was a situation common to all the Andean countries to the extent that, in 1987, the Commission of the Cartagena Agreement was forced to revoke Decision 24 and adopted Decision 220 in its place to stimulate the entrance of FDI. This latter was in turn revoked by Decision 291 in March 1991.

Making the FDI more flexible has allowed a recovery of foreign investments which rose from an accumulated figure of US\$ 1,318 M in 1986 to US\$ 5,877 M in 1992, representing an average annual growth rate of 57.6%, excluding the hydrocarbon, petrochemical and related activities, insurance, and banking sectors. In sectorial terms, participation in the manufacturing industry rose from US\$ 1,132 M to US\$ 3,237 M; its relative participation in accumulated FDI, however, fell from 85.9% to 58.5% in the same period. The sector of financial establishments, real estate, and services went from US\$ 83,5 M to US\$ 1,833 M, attaining a growth of 2.096% in the period thus increasing its relative participation in accumulated FDI from 6.3% to 31.2%. The restaurant and hotel sector also improved its participation, moving from US\$ 34 M to US\$ 243 M, rising in relative terms from 2.6% to 4.1% of total FDI. Agriculture and fishery went from US\$ 42 M to US\$ 203 M, rising in relative terms from 3.1% to 3.6% of accumulated FDI. In 1991 and 1992 FDI was stimulated by the privatization process begun in 1990.

As regards the countries of origin of FDI, the USA continues in first place with 54.8%, followed by Holland with 9.5%, the UK with 5.3%, Switzerland with 4.8%, Panama with 4.1%, Japan 3.7%, Latin America and the Caribbean (excluding Panama) with 1.7%.

### 1.3 Mixed enterprises

Decision 24 defined a mixed enterprise as "that constituted in the receiving country and whose capital belongs to national investors in a proportion ranging between 51% and 80%, as long as...that proportion is reflected in the enterprise's technical, financial, administrative, and commercial management". Decision

24 also contained the terms and conditions for the transformation of FDI in a national or mixed enterprise, dependent on whether it participated or not in sectors of economic activity reserved for the national, public, or private investor.

Quite apart from the obligation established in the Decisions of the Cartagena Agreement, associations between national investors and foreign firms have taken place with certain intensity. By 1984 foreign capital invested in the country was spread among roughly 1000 basically foreign enterprises and about 500 others in association with national investors. In the specific case of the manufacturing industry, of the 70 larger enterprises in the country in 1980, 13 were foreign firms and 12 were associations between local and foreign investors (M. Naim, 1984). The basic State enterprises have also had experiences of association with FDI to develop projects whose degree of technological complexity demands qualified human and financial resources. The National Congress recently authorized PDVSA (the State petroleum company) to associate with foreign enterprises to develop a gas exploitation project in Venezuela with an estimated cost of roughly US\$ 12,000 M.

In the information, electronics, and the telecommunications industry, foreign social capital reached 89% in 1987 and approximately 40% of the enterprises have foreign capital (OCEI, 1989).

#### 1.4 The Licenses Agreements

Licensing agreements began to be regulated in Venezuela within the framework of Decision 24 of the Cartagena Agreement, requiring prior authorization of the competent national organism to be able to operate in the country. In addition, the licenses agreement had to exclude binding or restrictive clauses imposing conditions of the licensor on the licensee as regards raw materials, the volume of production, use of other technologies, export rights, permanent use of personnel supplied or recommended by the licensor, and so on.

Available information sets the number of licenses agreements approved between 1974 and 1975 at 219, and at 814 between 1976 and 1980. The distribution of payments made was as follows: 50% in technical assistance, 35% in trademarks, 4% in know-how, 4% in advice and consultation, 4% in engineering services, and 3% under diverse items, excluding the banking and petroleum sectors (CONICIT, 1980).

The assessment carried out by the SIEX was limited to the economic and juridical analysis of the licenses agreements, setting the maximum to be paid for imported technology and making sure that restrictive clauses were not included. The technical evaluation to select technology and ensure their appropriateness for the technical and social environment of the receiving enterprise was practically overlooked because of a lack of the necessary infrastructure as regards technical information, skilled human resources, and budget to assess the different technologies available in the market. Thus, the entrepreneur's limitations to identify precisely his technical requirements led to a lot of unnecessary import of technologies and deficient negotiation processes, making local efforts to assimilate and adapt imported technology more complex and onerous.

Licensing agreements are now regulated by Decision 291 of the Cartagena Agreement and Decree 2095, limiting the negotiation to the licensor and licensee, and making registration of the contract in the SIEX compulsory.

#### 1.5 Donations of technical cooperation

Technology transfer through donations of technical cooperation has not been much significant in Venezuela since its income per capita level has limited its access to them. Furthermore, as a result of the increases in oil prices in the seventies, the country became a donor of financial resources for technical cooperation offered by international organisms (OECD, 1990). Planning Ministry (CORDIPLAN), through its Office for International Cooperation, manages programs and projects offered by international agencies and cooperation organisms in developed countries in the area of technical cooperation for development.

As regards bilateral relations, the country has subscribed several horizontal cooperation agreements in science and technology with the USA (National Science Foundation), Canada (National Research Council), Germany (Deutsche Forschungsgesellschaft), Spain (Ibero American Cooperation Institute, CYTED-D), France (Study Center for Engineers, Scientific Research National Center, ORSTOM), Italy (National Research Council), United Kingdom (Royal Society, British Council), and the Economic Community; there exist cooperation links in Latin America with the national organisms for science and technology in Argentina, Brazil, Colombia, Chile, Cuba, Ecuador, Guyana and Mexico), through which the programs of international policy in science and technology are executed under the coordination of CONICIT.

## 2. Mechanisms for technology transfer

An effective transfer of technology implies and adaptive "learning process" to attain the suitability of the process and the product for the local environment and its subsequent optimization based on the domestic characteristics of its functioning, which leads to improvements in plant outputs and in the design of products and processes driving from incremental technical knowledge generated by local professional and technical cadres (Katz, 1990).

### 2.1 Linkages with enterprises

A. In the adaptive process of learning, links with national enterprises for technical assistance in production and engineering, research for new products, and managerial advice in marketing and finance, help improve the enterprises' innovative capacity. Thus industrial establishments of different sizes and branches of activity, which received technical assistance, moved from 35.1% in 1988 to 36.8% in 1991. Technical assistance sources were foreign enterprises, which increased their services from 55% to 60% in the total of the enterprises which received assistance, national enterprises, which averaged 47% of the total enterprises, and public sector centers, which decreased from 8% to 5% their participation in this period. Areas with the highest demand of technical assistance were production and engineering with 75% to 79% of the enterprises, marketing and finance, over 30% of the enterprises, and new products, which decreased from 35% to 30% of the enterprises.

Enterprises which had introduced technological innovations through hired services moved from 32.2% in 1988 to 35% in 1991. Technological innovation were mainly in equipment (70%), processes (38%), products (25%), and organization (28%) (OCEI, 1988-1991).

In a recent study on the technological learning process and the entrepreneurial behavior of the national chemical industry, it was demonstrated that the most successful enterprises in the transfer of technology, the breakdown of technological packages, and the development of innovations, are those that maintain simultaneous processes of internal technological learning (which may include the search for information, the negotiation of technology, adapting spare parts and machinery, developing new products, making equipment and parts, and designing processes) with solid external links to develop new products, processes, the making of equipment, and specialized technical assistance, either with local or foreign firms, universities, and research and deve-

lopment centers. These are firms catalogued as having an active behavior and represent 23.5% of a sample of 119 enterprises studied (Pirela, Rengifo, Arvanitis, Mercado, 1991).

## 2.2 Internationalization

Internationalization through the creation and strengthening of commercialization networks is a recent mechanism limited to a few enterprises in the country since traditionally they have been limited to producing for the domestic market. Such is the case of PDVSA, the state petroleum company, which contributes more than 80% of total exports and which has association agreements with European and American enterprises for the direct commercialization of petroleum and its derivatives in international markets. The state aluminum and steel enterprises have undertaken a similar route. Private companies in the areas of beverages, textile and clothing, metalmechanic, and chemicals are entering the US market through their own commercialization networks and some of them are even placing shares in the New York Stock Exchange. In the Andean context, particularly in relations with Colombia, commercial banks are taking the lead by opening offices abroad while facilitating conditions for national enterprises to export to the subregional market.

## 2.3 Capacitation and Recapacitation of Workers

As technological change modifies working conditions, new and higher qualifications for workers are required to master new techniques and automated processes present in the modern enterprise. Under these circumstances, the improvement of the capacities of the workers has become a major necessity for the enterprises to be able to maintain their levels of quality, productivity and innovation in line with international competition.

Despite the significant expansion of school enrollment, the increase in the schooling rate, and the decrease of illiteracy rates, in Venezuela there persist important deficits of skilled labor which is an obstacle affecting the process of technology transfer and the development of many enterprises (OCEI 1986; CONINDUSTRIA, 1989). In the metallurgical, metalmechanic, and mining industry alone, it is estimated that there is a need for 35,000 skilled workers over the next three years.

The accelerated growth in school enrollment and the finance crisis in the 80's, which considerably reduces the social expenditure, contributed to deteriorate the conditions of the educational system, which is reflected in the repetition index (11%), in school desertion (9%) and in capacitation level of the graduates. These circumstances, together with the low level of technical education received by the population, explain the lack of education within the labor force which enters the labor market.

The National Institute of Educational Cooperation (INCE), created in August 1959, is the main work capacitation organism, directed and administrated by the State, entrepreneurs and workers. Since 1991, INCE experiences a profound restructuration which involves the functional and administrative decentralization and deconcentration as well as the modernization of its strategies and teaching-learning methods which grants a greater participation to enterprises and industrial associations, and recapacitation of labor force. In 1991, INCE offered 26,119 courses with a total of 4,028,195 hours-course, which benefited 337,198 participants. 21.8% of the capacitation and professional formation courses were organized by the enterprises themselves, being their costs deducible from their corresponding tax payments. Enterprises which reported programs for the formation of their staff, as well as those organized by INCE, decreased from 48.8% in 1988 to 46.5% in 1991; these programs join the formation of the staff within the enterprise (79%) and its formation outside the enterprise (45%) (OCEI, 1988-1991).

#### 2.4 Research and Development Activities

With the creation in 1967 of the National Council of Scientific and Technological Research (CONICIT), begins in Venezuela the era of "directed growth" of science and technology through explicit policies for promotion and development of scientific and technological research; thus strengthening the institutions and activities of science and technology which spontaneously grew since the beginning of the 50's, pioneered by the Venezuelan Association for the Advance of Science (ASOVAC).

Public policies regarding R&D were oriented from the beginning and basically to create a local research and development capacity, so most of the available resources were channeled towards the programs of human resources formation and research activities in the areas considered strategic in the national development plans. Granting of scholarships, financing of research projects, attendance to congresses, development and equipping of infrastructure for laboratories, centers and other services, were part of the investments made under the assumption



that by developing research nuclei it would be feasible to accumulate a satisfactory and useful offer for the necessities of the country, which could be utilized by industrial representatives to solve the production problems, and by public organisms in the implementation of public development programs and policies.

Despite repeated effort on hand of the organisms in charge of the scientific and technological policies, the linkage between the R&D centers and the enterprises did not work out, since the incipient scientific and technological culture of the Venezuelan society and the singular way in which both parties were developed, isolated and independently from each other, did not favor such linkage. On the one part, R&D centers were generally born alien to enterprises, thus being their patterns of success focused in academic criteria of excellence and universalism, associated to the scientific world, without paying attention to the applicability of the results of the research.

On the other part, enterprises has depended upon import of technology and technological services, perceiving it as a natural fact, being this strengthened by the overvaluation of the currency, which facilitated these imports, and by the context of the economic protectionism, which inhibited the foreign competition. Under such circumstances, the concern of enterprises was reduced to the terms of negotiation and the purchase of technology and its further adequation to the domestic conditions, thus making unnecessary the linkage with R&D centers as well as the creation at internal level.

The linkage model was supported by a lineal conception of the relation science-technology, in which the enterprise appeared as limited to the role of mere receiver and not as an organism generating the technological change; in addition, that linkage model had the implicit idea of major innovations, instead of incremental innovations which continue to be the most appropriate innovations for the level of technological development of the majority of the country's enterprises.

Such circumstances then explain, the modes participation of enterprises in R&D activities. In 1988, 37% of the enterprises claimed to have R&D units, limited themselves to routine tasks of quality control (82%), engineering (47%), administrative and managerial improvements (37%), market acquaintance (28%). Given the changes in the context of economic policy during 1989, enterprises with R&D units decreased to 32.7%, and were devoted mainly to quality control and engineering (OCEI, 1988-1991). On the other hand, the study of the chemical industry revealed that only 22 of the 119 enterprises studied carry out R&D activities, by

which we mean the existence of a formal unit of at least three persons with sufficient technical capacity working in it.

## B. Factors affecting technological trends

### 1. Government policies in the countries of origin

In recent years, the most important policy on investments coming from the countries of origin of FDI has been the Initiative for the Americas, launched by President Bush in June 1990 as part of the search for a new dialogue between the USA and the countries of Latin America and the Caribbean, after the "lost decade" of the eighties, and which, at bottom, constitutes a mechanism to expedite the economic reforms taking place in the region, promoted by the multilateral financial organisms with the support of the US government. The Initiative includes actions in three areas of vital interest for all the Latin American countries: 1) the foreign debt; 2) stimulating investment; 3) the strengthening of trade relations (SELA, SP/RC-IA/DT N° 2, 1991).

With regard to investments, the Initiative aimed to constitute a fund with the contributions of the developed countries to give donations to programs and projects promoting reforms in the national treatment of foreign investments, the privatization of public enterprises, and the protection of industrial property. On the basis of three reforms, it was hoped that FDI trends would return to the region. Nevertheless, the funds committed to it have been very squalid and its increase has been conditioned by the backing of other countries such as Japan and Canada. With respect to trade relations, the aim of the Initiative is the gradual elimination of tariff and non-tariff barriers, the linkage of trade to intellectual property rights, to agree on the means to improve the flow of goods, services, and investments among the countries involve, the setting up of clear mechanisms of conflict resolution, and so on.

The newness of the Initiative, which President Clinton has offered to continue, does not allow a precise evaluation of its achievements and, thus, we can only note that it is an appropriate scenario to review the region's relations with the USA with a view to facilitating an increase in investments, production, and exports, which are necessary conditions to recover economic growth and overcome the grave social crisis afflicting Latin America and the Caribbean. Under the stimulus of the Initiative, the Commission of the Cartagena Agreement passed Decision 291 which liberated the treatment of FDI. At the same time, several Latin American countries have signed Framework Agreements with the USA to set the terms and commitments on trade

and investments at a bilateral level. Venezuela has yet to sign this type of agreement. The major expectation, focusing on the possibility of undertaking free trade agreements of the NAFTA type, diminished in June 1993 when the "fast-track" procedure expired. As regards technology, the Initiative poses no explicit mechanism for appropriate technology transfer, technical and professional training, which would help improve the region's capacity to create its own technology.

In the case of the EC, trade relations are conducted on the basis of the Cooperation Agreement between the EC and the Cartagena Agreement, signed in 1984 and periodically reviewed in its action programs. In recent years, the country has intensified cooperation in science and technology with the EC, through joint research projects and the assistance of scholarships and assistantships for researchers and teachers in European academic centers.

As regards technical assistance through multilateral institutions, the most important recent development is that of the United Nations Industrial Development Organization (UNIDO) which designated Venezuela as the headquarters of the industrial automatization regional program which the organization has been promoting since 1990. Internally, the program is coordinated by the Engineering Institute Foundation, an industrial technological R&D center with an outstanding record in its relations with industry, and the National Council for the Development of the Capital Goods Industry (CONDIBIECA), the advisory organism of the National Executive in matters relating to capital goods.

## 2. Strategies of enterprises

The strategies of enterprises in respect of technology trends are conditioned by diverse variables: the size of the enterprises, the diversification of its products, the type of productive activity it is involved in, the degree of patent application, the existence of R&D activities, the market, etc. We shall now analyze some of them.

In the Qualitative Survey (OCEI, 1986), the enterprises polled maintained a balanced position with regard to the entrance of FDI: 45.3% were in favor and 45.8% against. But when acceptance is analyzed depending on the size of the enterprise, measured by the number of employees, 53.9% of the large enterprises (more than 100 employees) favored FDI, while 50.6% of the small firms (between 5 and 20 employees) were against. Among the branches of economic activity, according to the Uniform International Industrial Classification, Version 2, industries in branch 37

(basic metals) were 57.1% in favor, followed by branch 35 (chemicals and chemical products derived from petroleum) with 56.6%. The enterprises expressing greatest rejection were in branch 34 (the of paper and paper products) with 53.6%, and branch 33 (wood and wood products including furniture) with 52.5%. The main reason of enterprises favoring FDI was the transfer of technology it generates. The data shows that the larger the size and the greater the technological intensity of the enterprises' products, the greater is its openness to technological trends.

In the study on the chemical industry (Pirela, Rengifo, Arvanitis, Mercado, 1991) the importance of size in enterprises' strategies regarding technology transfer was also established. Of the 28 companies with active behavior towards technological learning and technology transfer, 16 were large enterprises, 8 were medium size, and 4 were small. On the other hand, the passive behavior enterprises, that is the most backward from the point of view of innovative capacity, the level of technological learning, mechanisms of external linkage and organizational structure, were 19 in number, of which 10 were small, 7 medium-sized, and 2 large. Between them, we can place two more categories of enterprises: those tied technologically to overseas, characterized by their extreme and intense linkage to foreign enterprises, 22 in all, of which 12 had less than 50 workers, and 5 more than 200; the self-sufficient, 24 in all, 17 of which had less than 100 workers, characterized by an almost total lack of foreign links. Finally, there were 26 enterprises of non-differentiated behavior, 10 of which employed less than 30 workers. Product diversification seems to be the main factor behind the technological learning of the enterprises and this is evident in 98 of the 119 companies in the sample. At the same time, it is the main motive for the search of foreign technical relations and this is borne out by 81 enterprises. Active behavior enterprises are, together with those technologically tied, the ones most inclined to the development of products.

### 3. The economic and regulatory framework of the receiving countries

#### 3.1 Policies and regulations on foreign investments

The legal norms in force on FDI are contained in Decision 291 of the Commission of the Cartagena Agreement on the Common Regime of Treatment of Foreign Investments and on Trademarks, Patents, Licenses, and Royalties, and in Decree 2095 (Official Gazette N° 34930 of 03/25/92). According to these, foreign investments do not requires prior authorization but subsequent registration which must be applied for in the competent organism

within sixty days subsequent to the date of enrollment in the corresponding Mercantile Registry of act of constitution giving rise to the respective foreign investment.

**Definitions.** By FDI is understood those contributions coming from abroad, the property of foreign natural or legal persons, to form an enterprise's capital. The foreign investor is the owner of a foreign investment. The foreign enterprise is one in which foreign capital is more than 49% of the capital. The mixed enterprise is one in which foreign participation is between 20% and 49% of the capital. The national enterprise is one in which foreign capital is less than 20%. In order to qualify and enterprise, the reflection of said capitals in the technical, commercial, administrative, and financial management of the enterprise is also taken into account.

**Investment modes.** 1) Currency. This is registered in US dollars and in bolivars at the rate of exchange on the date of its entrance. 2) Physical and tangible goods. Such as industrial plants, machinery and/or new or reconditioned equipment, spare parts, pieces and parts, raw materials and intermediate products. 3) Capitalization of debts. Additions to an enterprise's capital through the issue of shares, the amount of a credit operation or technological loans, and licenses received and not canceled. 4) Investment in national currency. Coming from a) investment and reinvestment of resources with the right to be remitted abroad (profits); b) an investment produced by the sale of shares, participations or rights or receiving enterprises, or other sums with the right of remittance abroad. 5) Intangible technological contributions. The valuation in monetary terms of intangibles such as trademarks, industrial models, technical assistance and technical knowledge, patented or not, which can be presented under the form of physical goods, technical documents and instructions. 6) The conversion of public foreign debt in investment. This is regulated by special laws on this matter (Decree N° 2530 of 09/14/1992).

**The competent National Organism.** The competent national organism in matters relating to foreign investment is the Superintendence of Foreign Investments (SIEF), attached to the Ministry of Finance. Exceptions to this are the banking and insurance sectors, the control of which falls under the respective superintendence of banks and insurance companies; and foreign investments in the petrochemical, coal, and mining sector, as well as those in hydrocarbons and related services in the activities of exploration, exploitation of oil-fields, extraction, refining, transportation by special means, storage and commercialization of hydrocarbons, all of which are the competence of the Ministry of Energy and Mines.

The SIEX is responsible for registering the FDI and subregional investments, the contracts on the import of technology and those on trademarks, patents, licenses, and royalties. It must also provide users of technology with information on the sources of technology and the provisions of similar contracts, and register the investments made by constituted foreign enterprises that set up branches in the country.

**Restrictions on FDI.** Foreign investors have the same rights and obligations as national investors except the provisions of the special Laws and the limitations set by the Regulation of FDI. According to this the following sectors of economic activity are reserved for national investors: a) television and radio; newspapers in the Spanish language; b) professional services the exercise of which is regulated by national laws.

The participation of FDI in direct tasks of exploration, exploitation, refining and transportation of petroleum, asphalt and other hydrocarbons must have the prior authorization of the National Congress. According to the General Law of Banks and other Credit Institutions, the participation of FDI in the sector is limited to a maximum of 20% of the capital paid by the receiving financial institution.

**General guarantees of FDI.** Dividends of profits obtained by foreign investors in each economic exercise may be remitted abroad in their entirety, exempt from income tax. The owner of FDI is entitled to remit abroad the product of the sale of his shares and participations, as well as funds deriving from capital reduction or the liquidation of the enterprise.

The foreign enterprise may set up branches in the country by simply meeting the provisions of the Commercial Code and carrying out the respective registration procedure in the SIEX. It also has access to internal credits and may issue shares, bonds, or other short or long term titles with no restrictions other than those laid down in the laws governing this matter. Products made by foreign enterprises are entitled to the advantages deriving from the Cartagena Agreement Liberation Program so long as they fulfill the standards and requisites of origin in force at a subregional level.

### 3.2 The promotion of foreign investments

In September 1990, Decree 1102 created the National Council for the Promotion of Investment Civil Association (CONAPRI) whose aim is to promote, support, and strengthen the development of

private national or foreign investments in the country. On October 31, 1990, CONAPRI was formally registered and among its founding members are the most financial organisms and public enterprises, and the most important national and foreign enterprises in the country.

To meet its objectives, CONAPRI offers a range of services that include: 1) information on investment possibilities in Venezuela; 2) guidance for the investor as regards location, costs, incentives, the legal and institutional framework; 3) identification of potential partners for joint investments; 4) advise on investment financing; 5) assistance to the investor in carrying out administrative processes in Venezuela; 6) the organization of missions of investors; 7) studies on the legal and institutional framework for FDI in Venezuela; 8) post-investment support services; 9) publication of bulletins and specialized information.

### 3.3 Policies and regulations relating to technology

The legal dispositions on the importation of technology and the use and exploitation of trademarks and patents, set out in Decree N° 2095 of the 02/13/1992, point out that contracts entered up by enterprises and/or natural or legal persons, public or private, of Venezuela, with foreign enterprises and/or natural or legal persons, need no authorization of the SIEEX (or of the Ministry of Energy and Mines, is such be the case). The sole obligation is to register such contracts in the competent organism within sixty calendar days after the signing of the same. Thus, there is no restriction as regards amount to be paid, such as honorarium or royalties, for agreements between the contracting parties, even between the main branches of enterprises and subsidiaries.

Contracts on the importation of technology may cover matters such as technical assistance, technical knowledge (know-how), engineering and consultation services in general, personnel training, technical, administrative, and managerial advice, as well as the exploitation in Venezuela of patents and trademarks which are the property of foreign natural or legal persons, and contracts to distribute finished products identified with commercial trademarks that are the property of foreigners.

When contracts involve a license to use trademarks, patents or industrial models, they must be accompanied by the corresponding registration which, in accordance with the Industrial Property Law, is issued by the Ministry of Development's Industrial Property Registration Office or, in its

defect, the application for registration. Payments for the use of licenses may not be for a period exceeding that of the duration of the Industrial Property Registration granted.

Contracts may not include restrictive clauses typified in Article 14 of Decision 291 of the Commission of the Cartagena Agreement, limiting free competition. Should such clauses be included, the SIEX will not register the contracts. Restrictive clauses are understood to be those in which: 1) the supply of technology or the use of a trademark bears with it the obligation of the receiving country or enterprise to acquire capital goods, intermediate products, raw materials or other technologies from a specific source, or to make permanent use of personnel recommended by the enterprise supplying the technology; 2) the enterprise selling the technology or ceding the use of a trademark reserves the right to set sale or resale prices of products made on the basis of the respective technology; 3) the volume and structure of production is restricted; 4) the use of competing technologies is prohibited; 5) total or partial purchase options are established in favor of the supplier of the technology; 6) the purchaser of the technology is obliged to transfer inventions or improvements obtained from the use of said technology to the supplier; 7) there is an obligation to pay royalties to the holders of patents or trademarks, for patents or trademarks not used or that have expired; 8) barring exceptional cases, the export of products made on the basis of the hired technology is prohibited or limited.

### 3.4 Fiscal and financial incentives relating to technology

The fiscal incentives in the area of technology are set out in the Income Tax Law which has been in force since September 1991. In Chapter III, dealing with deductions and net income, Article 27 establishes the different general expenses incurred not imputable to cost, which may be deducted from gross income to obtain the net taxable income. Among them are royalties and other analogous participations as well as remunerations, fees and analogous payments for technical assistance or technological services employed in the country; payments for research and development effectively made during the fiscal year; expenses incurred abroad in the case of export of goods manufactured in the country, or where Venezuela services are rendered abroad, among others.

Income deriving from the concession of the use and exploitation of trademarks and other brand qualify for the costs and deductions allowed by the Law except where they are paid in the form of royalties to beneficiaries not residing in the country. Net income deriving from royalties and other analogous



participations obtained by beneficiaries not residing in the country will be constituted by 90% of the amount obtained (Articles 50 and 51).

Legal persons are entitled to a 10% tax rebate on the amount of new investments spent on research and development carried out in the five years following the enactment of the Income Tax Law, so long as they are related productivity or production of new goods (Article 61). Investments aimed at eliminating or avoiding environmental pollution will receive the same treatment (Article 62).

With regard to financial incentives and their relation to the development of technological activities, there is no uniform policy regulating them, and so the incentives are dispersed among diverse public institutions having their specific laws, objectives, and areas of application. In general terms, the financial incentives referred to short, medium, and long-term credits with preferential interest rates, a period of grace to amortize capital and interest payments on the guarantees demanded, in areas such as sales support, working capital, fixed investment, exports, and, in less degree, technological research and development. Within the framework of those programs, the development of the small and medium size industries was consolidated.

Since the foreign debt crisis at the beginning of the eighties and the subsequent fall in oil revenue, public financing institutions faced reduced possibilities of maintaining and expanding their programs and credits and, due to the commercial, exchange, and monetary liberalization measures adopted in 1989, they have begun serious reforms and transformations of their policies and programs, to the extent that some have been eliminated in an effort to adapt to the new economic and institutional reality of the country, and extending their range of action beyond their original aims of financing to include programs of quality control, productivity, industrial standards, industrial maintenance, relations with suppliers, negotiation of technology, and so on.

Research and development activities relating to the technological demands of enterprises have come under the responsibility of CONICIT and FINTEC (Fund for Technological Innovation), an organization attached to the Ministry of Economy and Industry, especially created in 1981 to finance enterprises' technological innovation and development, but which was never endowed with the financial resources needed to carry out its tasks, on one hand, because of the financial crisis of the eighties, and, on the other, due to the little importance

enterprises gave to such tasks at that time. FINTEC is now in a process of liquidation.

### 3.5 Industrial Property

In Venezuela, industrial property rights are governed by Decision 313 of the Commission of the Cartagena Agreement, published in the Official Gazette on February 14, 1992, and ratified by the Republic of Venezuela via its publication in the Extraordinary Official Gazette N° 4451 on August 5, 1992.

In accordance with this Decision, member countries will grant invention patents to creations that have industrial application, that are new, and possess an acceptable level of inventiveness (Article 1). Excluded are inventions contrary to public order, morals, and sustainable development of the environment; animal species and races and the procedures to obtain them; inventions on matter that compose the human body and on the genetic identity of the same; inventions relating to pharmaceutical products that appear on the list of essential medications of the World Health Organization (WHO), and inventions relating to nuclear and fissionable materials (Article 7).

The Third Transitory Disposition of Decision 313 establishes that each country, within the framework of its national legislation, may exclude the patenting of pharmaceutical products for up to ten years as of the date Decision 313 came into effect (author's underlining).

The duration of the patent will be fifteen (15) years, counted as of the date of the respective application, and may be extended only once for a period of five (5) years if the patented product or procedures are being produced industrially, either by its owner, or through a license, in the country where the patent has been applied for, and if production takes place within the five years subsequent to the date of application for the patent.

The content, interpretation, and conditions of applicability of Decision 313 have given rise to sharp discussion, especially in the pharmaceutical sector, where national enterprises opposed to patenting and transnational enterprises favoring it have confronted each other openly. The topic of industrial property and its consequences for the pharmaceutical sector has become the focus of trade negotiations with the USA. In May 1992, the Pharmaceutical Manufacturers Association (PMA), the USA's Union of Pharmaceutical Companies, sent the US Trade Representative of the Federal Government their opinions on the process of renewal

of benefits granted by the Generalized System of Preferences (GSP) in trade matters, criticizing the behavior of six Latin American countries, including Venezuela, beneficiaries of the GSP, with regard to the protection of industrial property rights and recommending that they be excluded from the GSP. As a result, Venezuela was put on the watch list of the US Trade Representative, running the risk of later trade sanctions.

Though it is true that Venezuelan exports benefiting from the GSP account for only US\$ 240 M annually, its eventual exclusion from the GSP may bear graver consequences that can compromise the recent process of economic transformation which views the broadening and diversification of exports as one of its basic pillars. It is thus understood why the Foreign Trade Institute, Venezuela's official representative organism in the Cartagena Agreement, has been pushing together with Colombia for a review of Decision 313, a process that began in May 1993.

Simultaneously, the National Congress is now discussing a Bill on Industrial Property that will replace the existing Law in force since 1955. The Copyright Law was recently passed by the National Congress, guaranteeing the protection of intellectual rights different from those of industrial property. Finally, it must be noted that the Industrial Property Registration Office is undergoing a process of administrative and functional transformation that will grant it the status of an Autonomous Service and greater flexibility in carrying out its activities which are being completely automated with the technical support of the World Office of Industrial Property.

### 3.6 Quality standards and control

In 1973 National Council for Industrial Standards (COVENIN) was created and nowadays it operates as an autonomous standardization service which assists in the fulfillment of the Law for Technical Standards and Quality Control, in force since 1979. Up to date, COVENIN has approved more than 3,000 industrial standards and its quality seal, "Certificate Norven", recognized by ISO, has been granted to more than 200 enterprises and 300 certified products, whose quality allows them to enter in international markets. Imported products similar to national products for which the National Council of Industrial Standards contemplates compulsory quality standards, must be accompanied by the corresponding certificate of quality issued by the competent organisms in the country of origin. The certificates must contain test results and be notarized and legalized in the respective Venezuelan Consulate.

Imported products must bear in print on the exterior of each receptacle, pack, or package, the following information in Spanish and in legible, indelible characters: name of the company of the supplying country and address of the same; name and nature of the product; country of origin; net and gross weight in kilograms; number of limits; commercial type or variety; graphic presentation of the product; ingredients that make up the product in the case of canned foods or foods in glass containers.

### 3.7 Economic policies and regulations

Venezuela's new economic policy since February 1989 came as a response to a situation of deep crisis, characterized by a series of phenomena reinforcing each other in their interaction. The most outstanding of these are the foreign debt, economic stagnation, unemployment and underemployment, a balance of payments deficit, a fiscal deficit, a drop in oil prices, inflation and high, rising critical poverty, which reveal the painful results of what ECLA called the "lost decade" of the eighties. The new policy calls for the opening up and liberation of the economy under a strategic orientation that aims to construct a new model of economic and social development based on the freedom of the market as the determining factor, which demands a new role of the State, concentrating more on guiding and designing macroeconomic policies and implementing social and infrastructural programs that facilitate conditions for the creation of wealth.

Changes in the economic rules include the elimination of the controlled price regime for inputs, products, and basic services; the liberation of the import regime based on fixed volumes and exonerations and controlled exports, the freeing of interest rates according to market forces; free and floating currency exchange and open access to the same; freedom to invest and hire; clear rules for foreign investments; privatization of State enterprises.

In the midst of this profound process of change, Venezuela joined GATT in September 1990. Likewise, laws were passed, like the Law to Promote and Protect the Exercise of Free Competition (Official Gazette N° 34880 of 01/13/92) which seeks to promote and protect free economic competition to the benefit of producers and consumers. The Law establishes a series of practices and conducts considered anti competitive, such as agreements on price control or the formation of cartels, the dividing up of markets or geographical areas among competitors, the abuse of a dominant position in the market, and so on, and sets the terms through which those affected by such practices and conducts may process their complaint in the competent organism.

The Consumer Protection Law (Extraordinary Official Gazette N° 4403 of 03/24/92) defines consumers' rights within the framework of a free competition economy and the attributions of the Institute for the Defense and Education of the Consumer (IDEC), the public organism responsible for protecting consumers' rights and processing reasoned complaints against enterprises or commercial establishments.

The Law on Disloyal Practices in International Trade (Extraordinary Official Gazette N° 4441 of 01/18/92), known as the Antidumping Law, regulates the policies, guidelines, and measures aimed at preventing and impeding the harmful effects on national production by imports of goods made under condition of dumping, or of goods whose production, manufacture, storage, transportation, or export have benefited from subsidies, in all cases where the dispositions of the Cartagena Agreement on distortions of competition caused by practices of dumping or subsidies are not applicable.

#### 4. Human resources and technological base

##### 4.1 The availability of skilled labor

In 1992, the economically active population (EAP), the population 15 years and over, was 12.7 million, equivalent to 62% of the total population. 8% of the EAP was illiterate, 1.7% without schooling, 37.7% had completed primary schooling, and 53.3% were of a level between incomplete secondary schooling, secondary schooling, and higher education. Of the total employees for March 1992, 19% has higher education, 25% high school, 5% medium technical level, 4% are skilled workers trained in INCE, 31% are qualified workers which have not secondary schooling and 16% are non qualified workers. As to experience of the employees, 11% has 15 or more years of experience, 17% is between 10 and 15 years, 21% between 5 and 10 years, and 24% between 2 and 5 years; 28% has less than 2 years of experience (FUNDEI, 1993).

42.6% of employees are familiar with the new technologies, such as computer science; likewise, 51% of workers identify with the objective of their companies. Among the youth, 65.8% manifested a preference for a career in engineering.

In 1988, the proportion of pupils per teacher at the primary level was 26, and 17 at the secondary level. 28% of those between 18-23 years of age were enrolled in institutes of higher education; between 1950 and 1987, there were 32,396 students graduating from institutes of higher education, a very

representative figure if we consider that the "explosion" in educational enrollment came about in the sixties and seventies. Graduates in engineering in 1986-1987 reached the figure of 6,753 including the areas of civil, industrial, computer, mechanical, electronic, and electrical engineering; there were 17,113 graduates in the social sciences in the areas of business administration, law, and economics. Students enrolled in the different branches of engineering rose from 13,930 in 1986, to 15,849 in 1987, while those in computer sciences represented 54.1% and 56.6% of enrollment in 1986 and 1987 respectively. Students of the social science went from 27,889 to 28,336 in 1986 and 1987, of whom 47.2% in 1986 and 59.8% in 1987 respectively corresponded to business administration. In school year 1989-1990, students enrolled in universities were distributed per knowledge area as follows: 55.6% in Social and Science and Humanistic, 17% in Engineering and Architecture, 13.8% in Medical Science, 4.6% in Agriculture, 1.5% in Basic Science and 7.5% in other disciplines.

Despite these significant advances, reality reveals persistent difficulties to obtain skilled labor as well as to recruit competent managers and engineers. To a certain extent, this is logical, given the small size of the market, the novelty of the process of industrialization and massive training of human resources, the lack of competition between enterprises up to recently, and the pronounced theoretical orientation of university training.

#### 4.2 National research and development activities

According to CONICIT's official statistics, in 1989 the country had 5,457 scientists and technologists and 836 units of research and development. Scientists and technologists are distributed according to specialization area as follows: 32.8% in natural and exact science, 12.5% in medical science, 15.7% in engineering branches, 18.7% in technology and agriculture and livestock science, and 15.9% in social and administrative science. Of the total of scientists and technologists, 52.8% has postgraduate level, 35.9% do not possess postgraduate level and the rest has non-systematical postgraduate studies. The number of scientists and technologists amounts to 3.56 and 9.1 per 10,000 economically active inhabitants respectively (CONICIT, 1991a).

In 1992 the total of scientists and technologists articles incorporated into the Science Citation Index was 553, which corresponds to 7.78 publications per 100 scientists and technologists; this figure represents 5.1% of the total of indexed publications originated in Latin America in 1992. The

patents granted to Venezuelan citizens in the country moved from 63 in 1990 to 73 in 1991.

To stop the "brain drain" and foster the entrance of young people to the scientific and technological research career, strongly affected by the crisis of the eighties and the retirement of pioneer generations of the 50's and 60's, CONICIT implemented in 1990 the Researcher Promotion Program (PPI), to encourage and award the researchers in universities and public research and development centers. PPI classifies the researcher in four levels, from researcher candidate up to Level III Researcher; currently a thousand researchers are incorporated into the program, of which candidates, the so-called relief generation, represent 15% of the total.

Additionally, through its Program of Human Resources, CONICIT supports Postgraduate Study Centers in national universities and grants scholarships for these studies in Venezuela and abroad, in selected areas, so that the institution that presents the candidate guarantee him his incorporation into tasks of R&D.

Through the National Center for the Improvement of Science Teaching (CENAMEC), training and capacitation programs are developed for teachers and pupils in secondary education, oriented towards the teaching and learning of mathematics, chemistry, physics and biology; yearly CENAMEC organizes Olympiads in this discipline, with the participation of the best pupils in the country. Together with the Venezuelan Association for the Advance of Science (ASOVAC), it holds every year the Youth Science Festival, where works and research projects of youths and high school pupils are presented to promote scientific studies.

The increase of R&D activities registered since 1989, has represented an increase in the public financing resources applied to science and technology. Measured at current prices, investment for years 1989 amounted to Bs 6,100 million and Bs 21,900 million for 1992, representing an average yearly increase of 64.7%. In 1984 constant prices, financing resources for science and technology amounted to Bs 1,317 million in 1989 and Bs 2,311 million in 1992, for a yearly increase of 18.9%. En comparative terms of 1984 constant prices, in the period comprised between 1984 and 1992, the expenditure in science and technology grew by 6.1%.

The increase in financing resources for science and technology, was due to the aperture of new financing sources

through international organizations such as the Interamerican Development Bank, international technical cooperation, and the incorporation of science and technology among the sectors which receive the financing resources attainable by way of the privatization of public services and enterprises. According to the Privatization Law, the resources derived from it should be applied in "no less than ten percent (10%) to programs aimed at scientific and technological development and research activities, preferably oriented towards technological innovation, industrial development, small and medium-size enterprises and to the creation of microenterprises". (Official Gazette N° 799, dated 04/15/1992).

As regards industrial research, several institutions were set up during the seventies and beginning of the eighties, the majority attached to the public sector, trying to establish links with the productive sector and encountering barriers associated with the absence of a "technological culture" in the enterprise, the result of a model of protectionist industrialization.

A good example of the country's potential in R&D when there are clear policies and human and financial resources for it is INTEVEP, the national oil industry's R&D center. Set up in 1974, two years before the nationalization of the oil industry, it has succeeded in harmonizing the short-term demands for technical assistance of PDVSA's subsidiaries for the adaptation of known technologies, with the medium-term R&D tasks to generate innovations in technologies in transition, and long-term basic research seeking new technologies, maintaining strong links with the public universities' research centers.

INTEVEP employs 1,839 persons of whom 1,170 are university graduates. 57% of these -1,041 employees- are devoted to scientific and technical tasks, 25% to technical support, and the rest, 18%, to administration. In 1992 it obtained 51 patents, accumulating 300 in the period 1979-1992, and it registered 16 commercial trademarks to bring the total to 169 in the same 4 year period.

#### 4.3 Linkage between University and Industry

Within the framework of the industrial reconversion process begun with the commercial aperture in 1989, CONICIT has been promoting a technological policy aimed at both creating a innovation system articulated around productive enterprises, in order to develop innovative capacity and make use of the country's comparative advantages, and transform them into competitive advantages, as well as generating a process of



technology transfer which paves the way to the available technologies, assimilating and adequating them to the specific reality of the country and the enterprises.

To these ends, instruments of technological policy offer incentives to generate and develop the innovation process within the enterprises; support to the creation of new enterprises which make intensive use of knowledge; reinforcement of linkage mechanisms between productive system and R&D centers, considering the enterprise as the dynamic agent of this linkage; implementation of financing mechanisms for innovation and technological development under modalities which allow private sector to participate in specific technological projects and areas oriented towards the market.

Taking into account these policy criteria, the Program of Technological Negotiation Round has been implemented, a model of the linking process between R&D centers and enterprises to carry out technological development projects based upon the demands of the enterprises, whose financing is shared by the enterprise itself and CONICIT, which gives risk capital for the same. The success of this mechanism has not been only the number of technical consultations and concrete projects and the committed financing amount, but also, that the interested parties have learnt to know each other's motivations and interests. In November 1993 the Third Technological Negotiation Round and the First Latin American Technological Negotiation Round will be held, since the countries in the region have considered this mechanism as positive as basis for the creation of a regional technological market.

Likewise, the Program of Technological Parks has been put into motion; to this program innovative entrepreneurs and researchers can resort to develop innovative projects in established enterprises or to generate new high technology enterprises. Nowadays, three project of Technological Parks are underway in the country, with the support of universities and enterprises representatives. For the development of this program CONICIT has subscribed an agreement of technical assistance and financial cooperation with the Commission of the EC.

The program of Enterprises of Technological Basis, in turn, is aimed at offering possibilities for functional and operative transformation of R&D centers assigned to universities and public institutions, to service and research enterprises which can offer under the market rules, their services to other enterprises; this program began by mid 1992 and presently different projects are being developed under this operative modality.

With the assistance of the Interamerican Development Bank, CONICIT has been promoting since 1991 the Bolivar Program, a linkage mechanism for the regional integration, technological innovation and industrial competitiveness, which gives the chance to both research centers and entrepreneurs of two or more countries, preferably but not limited to Iberoamerica, for the joint development of innovative project with the view to compete in the international markets.

Up to date, Bolivar Program has received 110 projects, of which, 33 have located their counterparts and 17 have received affirmative response of their counterparts; these last are in the phase of market and feasibility analyses, which will be considered by the Bank League of the Bolivar Program, a group of Latin American banking institutions formed within the Bolivar Program with the aim to finance the projects of the program. Areas comprised in the presented projects are: agriculture, agricultural products processing, automotive spare parts, biotechnology, catalyzers, design, electronics, materials, metal mechanics and telecommunications.

It is also worthwhile to point out that CONICIT and SELA's Latin American Commission on Science and Technology (COLCYT) are promoting training programs in technology management and technological prospects and information, aimed at directors of enterprises and R&D centers, and which are offered periodically in different countries of the region. With regard to this latter aspect, it is worthy of note that higher education centers are paying growing attention to the topic of technology management to the point where three universities now offer regular postgraduate courses while other institutions offer short courses on this and related topics.

##### 5. General infrastructure

The modernization of the country over the past three decades has provided it with an infrastructure which, in general terms is good even though in some sectors the situation is really critical, either because they are poorly equipped, inefficiently managed, or are lacking adequate maintenance of facilities, equipment, and services.

**Transports.** According to the methodology of the France Index = 100, adding the diverse systems of cargo and passenger transportation, in 1987 Venezuela's cargo mobilization capacity was 36 while its passenger capacity was 24 (CONAPRI 1992).

The national port system comprises 10 general service ports and 9 specific service terminals (fishing, tourism, ferries). are, in addition, other terminals that are of the exclusive use of industrial enterprises for the loading and off-loading of inputs and raw materials, among them the State's petroleum, mining, and petrochemical industries.

The ports and terminals were recently transferred from the Central to the Regional Governments and their administration has been assumed by private enterprises within the framework of the privatization of state enterprises. In this way, it is hoped that there will be a rationalization of the costs of port services as well as competition among the companies operating the ports, with the State concentrating its action on regulating activities relating to quality and services. According to a survey of the World Economic Forum, the present level of access to Venezuelan ports satisfies companies' needs by 52.2% (CONAPRI 1992).

Air cargo and transport services are offered through 11 international and 41 national public airports. This represents 1.2 airports per million inhabitants. Commercial flights cover the most important international routes and in 1989 reached 117,000 with an average of 88.1 passengers embarked or disembarked for every 1000 persons. Satisfaction of the air transportation service was 59.7 over 100 in 1991.

Venezuela's highway network is wide, paved, and with modern services, connecting the country's main industrial and commercial cities since a significant volume of internal trade is carried out by road. In 1988, there were 40 kilometers of main highways for every 100 square kilometers, the equivalent of 1.84 kilometers per million inhabitants. The conditions of the network contribute to the fact that there were 12 inhabitants for every vehicle in 1988. In contrast, the railway network barely covers 0.03% of the national territory.

**Telecommunications.** There is broad penetration of radio in Venezuela to the extent that there are 42 radio receivers for every 100 inhabitants, a figure surpassed in Latin America only by Argentina with 67 units. The penetration of television is even greater, reaching 86 sets for every 100 inhabitants, a figure far higher than that of any other country in Latin America. There are 4 TV stations, three private and one public, all with national coverage, and several other regional stations. There are also cable TV channels and access to international channels via satellite.

In 1990, telephone coverage reached 76 lines for every 100 inhabitants though the quality of the service is very deficient to the extent that it is estimated to be more than a decade behind in the development of new technologies. In 1991, the national telephone company was partially privatized and it is now under the control of a consortium that includes transnational enterprises world leaders in the area of telecommunications, and it is carrying out a broad program of modernization and expansion of its telecommunications network and services.

The facsimile services have undergone rapid growth to the extent that, in 1991, Japan's MITI reported facsimile exports to Venezuela of 3.19 units for every 10,000 inhabitants, a figure surpassed only by Mexico with 3.23.

In general terms, it is estimated that the present telecommunications cover the requirements of enterprises to the extent of 25.8 over 100.

**Energy supply.** One of Venezuela's comparative advantages is its energy capacity given its condition of an oil country with proven reserves of 64 million tons of crude, its natural gas reserves that guarantee sure exploitation for 100 years, calculated on the basis of present production indices; in addition, there is its capacity for the production of hydroelectric energy and its tropical location that favors the development of non-conventional energy sources such as wind and solar energy.

**Special regime zones.** There are two special regime zones in Venezuela, the free port of Margarita Island in Nueva Esparta State, in which merchandise trade is freed from taxes and volumes; and the Free Zone of Paraguaná, in Falcón State, oriented towards manufacture for export.

## II The effects of new and incipient technologies and the political responses

### A. The effects of new and incipient technologies

The incorporation of new technologies to the productive process is of great importance in determining enterprises' competitive advantages and, by extension, the competitive advantages of nations, since they help reduce costs, improve the quality of products and services, save energy and substitute raw materials for new inputs, improve administrative capacity and workers' productivity. For an efficient incorporation and internal assimilation of the new technologies, companies must

improve their functions of management, organization and information systems, human resources policy, distribution in the plant, quality control systems, marketing and sales, and so on. In other words, the incorporation of new technologies demands the incorporation of organizational and administrative innovations from whose synergy comes the continuous improvement of quality and productivity of the company's goods and services and, therefore, of its competitiveness in the markets.

The diffusion of new technologies in enterprises, specifically computer equipment, comprised in 1988 61.4% of the industrial establishments, rising to 71.5% in 1991. The use assigned to computers is processing administrative, statistical, and managerial data (94.6%), and, secondly, automating production (26.4%).

Regarding the consequences of incorporating computer equipment, the most outstanding are the reduction of administrative costs and time (84%), and the incorporation of qualified personnel (45.9%). 0.8% pointed out the interruption of production due to problems in the computer equipment.

In the 1980-1987 period, imports of the information sector amounted to US\$ 1187.2 M, of which US\$ 285.3 M (24%) corresponded to the public sector, and US\$ 901.9 M (76%) to the private sector (OCEI 1989). In 1989, the professional electronics industry comprised 130 enterprises, employing a total of 7,500 persons of whom 2,000 were university professionals and 750 were devoted to R&D activities. There were 150 products in the market with an equal number of products under development; the technological balance of the industry was US\$ 137 M in imports as against US\$ 1 M in exports; the national value added was 70% (CONICIT 1991b).

Studies on the competitiveness of the confection industry show lags by the enterprises relating to the incorporation of numerical control and computer-assisted design technologies, with the consequence of high operating costs, wastage, quality problems, and, thus, competitive weakness in the markets (Molina, Alonso, Pérez, 1991).

In contrast, the banking sector has automated its systems and operations to the extent that the electronic data processing equipment installed is equal to those used in the banks of developed countries. As of 1983, the banking system switched its strategies to the development of the personalized system, giving rise to competition in the financial market to gain clients through the offer of automatic tellers. Likewise, shared

networks of banking interconnection have been developed, integrating the country's most important financial institutions.

#### B. Analysis of the Government's responses

The Government's strategic orientation regarding new and incipient technologies are set out in the Eighth National Plan and is based on achieving scientific and technological dominance in three basic dimensions: 1) independent scientific and technological development, which requires establishing priorities according to the country's economic, social, and cultural demands, strengthening R&D institutions, training specialized human resources, and financing new technologies in select areas. 2) Effective technology transfer, by strengthening the evaluative, administrative, and negotiating capacity of technology in companies executing projects; implementing mechanisms to break down technological packages; developing greater managerial knowledge of technological aspects; giving adequate protection to intellectual property; and implementing an effective policy of foreign investment that favors access to recent technological developments. 3) A scientific and technological forward view to assess the potential, requisites and impacts of new discoveries and the possibilities of their development in Venezuela, and the study of a scientific and technological development based on the conditions offered by the tropical environment (CORDIPLAN, 1990).

The Third National Science and Technology Plan presented by CONICIT in 1991, the "Guidelines of Scientific and Technological Policy", sets out government policy in greater detail through eight guidelines: 1) Activate the national scientific and technological system; 2) acquire capacity in the handling of new technologies relating to the areas of biotechnology, electronics, information science, new materials, and fine chemistry; 3) orient scientific and technological capacity towards the solution of specific problems and towards the development of opportunities in preferential sectors; 4) decentralize the administration of science and technology; 5) train and take advantage of human resources; 6) develop scientific and technological information; 7) incorporate science and technology into the framework of the country's international relations; 8) increase the amount and efficiency of use of financial allocations for science and technology.

The Third National Science and Technology Plan pays preferential attention to five basic areas: a) social development, including health, environment and education; b) agriculture and agricultural products processing industry; c) electronics and information science; d) metallurgics and metal mechanics; e) chemistry, petrochemistry and plastics.

In order to develop new technologies in the areas of biotechnology, electronics, information science, new materials and fine chemistry, as well as basic disciplines and those associated, CONICIT is carrying out since June 1992 the Program of New Technologies, cofinanced by Interamerican Development Bank. The Program is comprised by four basic components:

1. Financing in research and scientific - technological services projects, addressed at both public and private institutions, through two financing modalities, contingent recovery and shared risk and benefits.
2. Training of human resources for researchers and technicians belonging to the institutions which belong to the Program, upon presentation of a Training Institutional Plan which guarantees the continuity of those professionals trained in the areas of new technologies.
3. Technology diffusion and transfer, to incorporate the results of national research activities to the production process of goods and services.
4. Reinforcement of the scientific and technological infrastructure, through the creation of a cooperative academic net among Research Centers and National Universities (REACCIUN), and the consolidation of the Biomedical Research Center (BIOMED).

In a year, the Program has approved more than 50 research and service projects, which involve more than 8 institutions and 300 researchers, with a total cost of Bs 1,805.7 million; 140 scholarships have been granted to postgraduate studies, involving Bs. 837.5 million; specialization studies have been sponsored for Bs. 28.5 million and cooperation agreements have been subscribed with 16 public institutions linked to the development of the Program of New Technologies.

### III. The contribution of technology trends and investment to competitiveness, and the creation and development of technological capacity

The Government's efforts since 1989 aim at creating the conditions for Venezuela to be able to attain a level of competitiveness that will allow it to join the world market with a manufacturing production that diversifies and increases revenues and reduces the vulnerability of oil revenues. To this end, institutional and legal structures which hindered the free competition, are being transformed, and mechanisms have been created so that innovations may be developed which permit static comparative advantages of the nation to be transformed in competitive advantages at an international level.

The amendment of the legal order promotes the entrance of foreign capital, guaranteeing it conditions for its profitability, juridical security and reduced risks, in an effort to complement internal savings, persuaded that foreign direct investment is an effective way to incorporate into the country advanced technologies and managerial methods, which contribute to improve the competitiveness of the enterprises and to gain access to international markets. However, this is not sufficient to guarantee competitiveness and the development of a domestic technological capacity; it is necessary for enterprises to adopt a new managerial approach to become open systems maintaining ties of technical cooperation with their suppliers of inputs, services, products, information, technology, advice and technical assistance; with their foreign partners in terms of complementation, technological frontier, economies of scale, shared risks, information; and with their clients to obtain information on their level of satisfaction and new needs.

It is also necessary to establish a new framework and orientation for the formation of human resources; to create a social and institutional environment that will allow competitive articulation among economic agents; that the state promote competitiveness and improve the infrastructure and services to eliminate overcosts and generate competitive advantages, among other important factors.

Within the framework of a global strategy integrating these diverse elements can the currents of technology and investment find the appropriate environment to install themselves and play an important role as stimulators of competitiveness and the creation of a local technological capacity, helping to improve levels of productivity, training and retraining of labor, the handling of technological innovations and methods and techniques of international trade and marketing.



#### IV. Conclusions

Venezuela's industrial experience regarding the transfer of technology demonstrates the use of several channels to achieve the same, mainly the importation of capital goods, FDI, and licensing agreements. In most cases, technology transfer has been carried out without a coherent plan, previously defined, in the search of technological mastering, given the lack of technology culture within the enterprises and the existence of a normative framework which inhibits the competition and the development of technological capacities within them.

Measures of governmental control on investment currents and technology transfer, in order to face the high costs associated to a poor selection and negotiation of technology, had effects contrary to those sought since the flow of FDI diminished and, internally, the conditions were not in place to generate the technologies needed to sustain the country's economic and industrial development.

In the new context of economic liberation of the markets, and of stimulating competitiveness and exports that has been implanted since 1989, the currents of investment are receiving flexible treatment encouraging their entrance into the country since they are viewed as a dynamic factor of economic growth, technology transfer, innovative managerial methods, improvement of competitiveness and access to foreign markets.

Despite the diverse and profound changes introduced as of 1989, Venezuela is still far from having a significant level of international competitiveness which demonstrates that it is no easy task to overcome in such a short time the inertia of 30 years of an economic model looking inward and lacking all external competition, living at the expense of state protectionism. The time is too short and the results are still partial and irregular, making it premature to draw definitive conclusions on the process of change.

Although GDP has achieved positive growth rates since 1990, FDI has come back to the country, non-traditional exports have given signs of potential growth, research and development activities begin to be of interest for a greater number of enterprises and the trade liberation and regional integration have advanced successfully, political instability since 1992, together with the unfavorable behavior of oil prices and indexes of accumulated critical poverty have seriously compromised the course and broadening of the economic measures, thus affecting the rhythm of internal growth, the entrance of FDI, and the development of the incipient export of manufactures.

The partial results of the measures taken by Venezuela, not without contradictions and social conflict, seem promising so long as articulations between the social agents protagonists of the process of change improve, and there is unequivocal agreement that competitiveness is not an end in itself but the means to improve the population's standard and quality of life.

## Bibliography

In the preparation of this monographic study, a broad bibliography has been consulted of which those used directly throughout the text are listed below.

BANCO CENTRAL DE VENEZUELA. 1978. La Economía venezolana en los últimos treinta y cinco años. Caracas.

BANCO CENTRAL DE VENEZUELA. 1978. Anuario de Cuentas Nacionales. Serie Estadística 1068-1982. Año 1983. Serie Estadística 1984-1989. 2 Tomos. Año 1990. Año 1991.

BATISTA, ASDRUBAL. 1991. Bases Cuantitativas de la Economía Venezolana 1830-1989. Comunicaciones Corporativas D. Caracas.

CEPAL. 1989. Reestructuración Industrial y Cambio Tecnológico. Consecuencias para América Latina. Santiago de Chile.

CEPAL. 1990. Transformación Productiva con Equidad. Santiago de Chile.

COMMISSION OF CARTAGENA AGREEMENT. Official Gazette (various).

CONAPRI. 1992. The Venezuelan Advantage. Caracas.

CONICIT. 1981. Costos de Importación de Tecnología 1976-1980. Caracas.

CONICIT. 1991a. Informe Estadístico 1989. Caracas

CONICIT. 1991b. III Plan Nacional de Ciencia y Tecnología. Caracas.

CONINDUSTRIA. 1989. Encuesta de Coyuntura del Sector Industrial. No. 15. Caracas.

COPRE. 1992. Ciencia y Tecnología en Venezuela. Un Reto, una Esperanza. Vol. 12. Caracas.

CORDIPLAN. 1990. El Gran Viraje. Lineamientos del VIII Plan de la Nación. Caracas.

- COUNCIL OF THE CARTAGENA AGREEMENT. 1982. Ordenamiento Jurídico del Acuerdo de Cartagena. Vol. 1. Lima.
- ESQUEDA, P., C. MACHADO A., L.A. CALCAÑO. 1991. Construcción de Capacidades Tecnológicas en Venezuela: Una Visión Histórica. Instituto de Ingeniería. Caracas.
- FUNDACION EDUCACION-INDUSTRIA. 1993. Encuesta Nacional de Recursos Humanos. Year 1992.
- INTERAMERICAN DEVELOPMENT BANK. 1988. Economic and Social Progress in Latin America. Special topic: Science and Technology. Washington.
- INTEVEP. 1993. Resumen de Actividades. Ed. INTEVEP. S.A. Caracas.
- LAGOVEN. 1991. La Ciencia en Venezuela: Pasado, Presente y Futuro. Serie Cuadernos Lagoven. Caracas.
- MACHADO A. CARLOS. (Cord.) 1988. Nuevas Tecnologías en Venezuela. Instituto de Ingeniería. Caracas.
- MAZA ZAVALA, D.F. 1985. Los Mecanismos de la Dependencia. Ed. Panapo. Updated Edition. Caracas.
- MOLINA R., O. ALONSO, T. PAEZ. 1991. Estudio de Competitividad del Sector Confección en Venezuela. ILDIS. Caracas.
- NAIM, MOISES. RAMON PIÑANGO. 1984. El Caso Venezuela, una ilusión de armonía. Ed. IESA. Caracas.
- NATIONAL COMMISSION FOR INDUSTRIAL COMPETITIVENESS. 1991. Competitiveness: a national project. Final report of the Commission. Especial number. Caracas.
- OCDE. 1991. Development Cooperation in the 1990s. Paris.
- OCEI. 1986. Encuesta Cualitativa del Sector Industrial. Caracas
- OCEI. 1989. La informática en Venezuela hoy. Caracas.
- OCEI. 1993. Indicadores de la Fuerza de Trabajo. Total nacional y por regiones. Segundo semestre de 1992. Caracas.

PIRELA, A., R. RENGIFO., R. ARVANITIS, A. MERCADO. 1991. Aprendizaje Tecnológico y Conducta Empresarial: Taxonomía de la Industria Química en Venezuela. CENDES-UCV. Caracas.

PURROY, MIGUEL I. 1982. Estado e Industrialización en Venezuela. Ed. Vadell Hermanos. Valencia. Venezuela.

REPUBLICA DE VENEZUELA. Official Gazette. (Diverse numbers). Caracas.

SELA. 1990. Tendencias Globales de la Inversión Extranjera Directa en la Década de los Ochenta: Implicaciones para América Latina. Serie de Estudios sobre Desarrollo. ED/9.

SELA. 1991. La Iniciativa para las Américas en el contexto de las relaciones de América Latina y el Caribe con los Estados Unidos. SP/RC-IA/DT N° 2. Caracas.

SELA. 1991. Desarrollo Industrial y Cambio Tecnológico. Políticas para América Latina y el Caribe en los Noventa. Ed. Nueva Sociedad. Caracas.

UNCTAD. 1988. Políticas y Legislación relacionadas con la Tecnología en un Entorno económico y tecnológico cambiante. Informe de la Secretaría. TD/B.C. 6/146. Ginebra.

UNCTAD. 1990. La Transferencia y el Desarrollo de Tecnología en los Países en Desarrollo. Compendio de Cuestiones de Política. Naciones Unidas. New York.

UNCTAD. 1992. Una nueva Asociación para el Desarrollo: El Compromiso de Cartagena. Octavo Período de Sesiones de la UNCTAD. Cartagena de Indias, Colombia.

UNIDO. 1978. Experiencias Nacionales en la Adquisición de Tecnología. Serie "Desarrollo y Transferencia de Tecnología". United Nations. New York.

VALECILLOS, HECTOR. 1990, Proceso y Crisis de la Inversión Privada en Venezuela. Ediciones FACES-UCV. Caracas.

VIVAS, LEONARDO. 1988. Política Tecnológica en la Estrategia Industrial. ILDIS-Ministerio de Fomento. Caracas.

WORLD BANK. 1991. Report on World Development. The Urging Task of Development. Washington.