SUPPLIER RELATIONSHIPS WITHIN THE ARGENTINE AUTOMOTIVE INDUSTRY: STAMPING STRATEGIES AND THE ROLE OF THE STEEL INDUSTRY

by

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Supplier Relationships within the Argentine Automotive Industry: Stamping Strategies and the Role of the Steel Industry

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ABSTRACT

The world motor vehicle industry has been changing at a very rapid pace over the last few years. Globalization of production, marketing and technology transfer, new production and management methods, and a profound change in the relationship between the terminal and parts industries have caused dramatic changes in the automotive industry in recent years.

Since the general opening of the market in 1991, a national program of privatization, and integration with Brazil, the Argentine automotive industry has been forced to make major changes in order to adapt to the new environment. Supplier relationships have became a major focus of these changes for Argentine automakers, and a key element in creating and sustaining competitive advantage in the regional market.

The objective of this thesis is to analyze the supplier relationships within the automotive industry in Argentina in general, and more specifically with regard to stamping operations, and to examine the role of the local steel industry in those relationships.

The study shows the emergence of a new paradigm in the relationship between vehicle and component manufacturers. The implications of this new paradigm, together with a trend toward contiguous locations and outsourcing of activities, suggest there will be greater collaboration between components and terminal manufacturers, expected agreements between both parts and, specifically, between steel and automotive industries with regard to stamping operations.

After considering various scenarios, the thesis offers some strategic recommendations for Argentine steel producers. These recommendations suggest that steelmakers can influence location decisions made by the auto industry through the way in which steelmakers contract with integrators.

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CHAPTER I

INTRODUCTION

Although automobile assembly in Argentina began in 1906, the motor vehicle industry as it is known today, with local component producers and assembly operations, was established near the end of the 1950s. Along with many other industries in Argentina, the automotive industry saw its most significant development in the 1960s and mid-1970s under a flourishing system of import substitutions.

In the late 1950s, imports of vehicles and components were severely restricted and multinational automotive companies were forced to choose between abandoning the Argentine market altogether or producing vehicles with 90 to 95 percent local content. Prior to that time almost all vehicles had been imported as knocked-down kits or built-up units.

With the relaxation of restrictions on local content, the industry, which had become highly vertically integrated during the 1960s and 1970s, shifted a large proportion of their purchases of parts and components to their parent companies. In 1980, for example, imports of parts and components reached $314 million or $1,080 per vehicle produced and in 1994 $1,513 million or $3,700 per vehicle. These figures were $71.9 million or $327 per vehicle in 1970.[1]

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[1] 1970 and 1980 data: Nofal, M.B. (1989, pp. 142-143); 1994 data: the author's calculations based on INDEC chapters 84, 85 and 87.

There were several reasons for making the decision to shift parts purchasing to the parent company, including economies of scale, volatility of local demand, and "branch plant" mentality on the part of subsidiaries of multinational automotive firms operating in Argentina.

Since the economic opening of Argentina in 1991, the program of privatization, and economic integration with Brazil, new issues have brought about a reconsideration of the most suitable location for activities (Argentina or Brazil or some other location in the world) and industry configuration (i.e., degree of vertical integration, horizontal consolidation, etc.).

This thesis examines the relationship between suppliers and automakers in Argentina, with special emphasis on stamping operations. After examining different reasonings, some strategic recommendations are offered for Argentine steel producers. These recommendations suggest how steelmakers can have some influence on the location decisions made by the auto industry through the way in which the steel industry contracts with integrators.

Chapter II gives a brief overview of the development of the automotive industry in Argentina from 1916 to date. In this chapter, particular attention is paid to import substitution policies, the move by multinational companies into the country, and investment and vertical integration decisions.

Chapter III begins by examining the relationship between suppliers and terminal industries, and then focuses on the steel and automotive industries through their common

linkage: stamping operations. An example -- the Propulsora-Ford contract -- illustrates the way both industries deal with issues like asset specificity.

Chapter IV provides a framework within which to explain the relationships between suppliers and the terminal industry based on issues such as incentives to produce locally, parent company policies, asset specificity, and replacement markets. Further consideration is given to mechanisms of problem solving.

Chapter V examines some variations of supplier relations in the automotive industry across locations.

Finally, Chapter VI considers various issues facing the industry as it goes forward, and concludes by offering some strategic recommendations for Argentine steel producers.

CHAPTER II

THE AUTOMOTIVE INDUSTRY IN ARGENTINA

In the last five years (1991-1996) the Argentine automotive industry has faced a period of high growth sparked by the introduction of the Convertibility Plan in April 1991.

The industry as we see it today is the result of almost forty years of public policies and company decisions.

In this chapter I will briefly review the history of Argentina's automotive industry from the beginning of the century to date. In doing so, I will divide it into four periods, based on the economic policies prevailing during each period:

- the era of assembly, from 1916 to 1958
- the era of import substitution, from 1959 to 1975
- the era of economic opening, from 1976 to 1982
- the era of international specialization, from 1983 to date.

The names I give to the periods reflect the main government economic policy applied to the industry in each of them.

2.1. The Era of Assembly (1916-1958)

The assembly of automobiles in Argentina dates from 1906, when a local entrepreneur named Anasagasti started assembling vehicles using parts imported from France.[2] However, the first serious attempt to assemble cars on a larger scale came in 1916, when Ford set up an assembly operation in Buenos Aires. The Ford Motor Company, founded in Detroit in 1903, was a pioneer in extending its assembly plants all over the world. In 1904 Ford opened a Canadian factory and thereafter assembly plants were opened in Britain in 1911 and in France in 1913. The Ford assembly plant in Argentina was the first in Latin America, but others followed in Brazil in 1919, Chile in 1924 and Mexico in 1925.[3]

During that period there were no tax incentives for setting up facilities in and of these countries, and the decisions to establish new facilities were taken based on expected savings to be gained from shipping semi-knocked down (SKD) or completely knocked down (CKD) kits, as opposed to completely built-up (CBU) vehicles to those countries. Later, during the 1930s, tariffs advantages were given to assemblers as opposed to CBU importers.[4]

As the network of highways and the economic growth of the country expanded, car imports grew very fast during the 1920s. An import peak of 70,000 cars in 1929 (shown in

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[2] Kronish, Rich et al., 1984, p. 41.

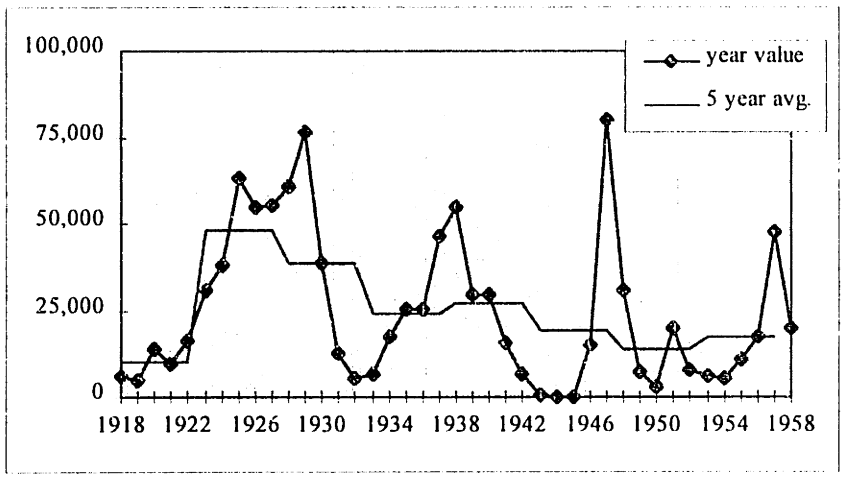
[3] Wilkins, Mira and Hill, Frank E. , 1964.

[4] In Argentina CKDs could be imported with a 30% discount of the import tariff, and the SKD with a 15% discount. (Jenkins, Rhys O., 1987, p. 19).

Figure 1) represented a market twice as large as Italy's and one-third the size of the UK's in the same year.

Figure 1

Motor Vehicle Imports in Argentina, 1918 - 1958.



Source: Adefa Annual Reports, various years.

Although multinational companies set up car assembly facilities in the most important Latin American countries, they did not integrate vertically nor did they develop a local supply of parts. The local operations served simply as outlets for CKDs supplied by the parent companies. As a result, the local content of assembled vehicles was low, and car assemblers contributed little to capital accumulation or increased technology.[5]

[5] In Brazil, locally produced parts accounted for only 18% of the weight of a car in 1953; in Mexico imports accounted for 80% of purchases by assembly parts in 1960. (Jenkins, Rhys O., 1987, p. 56).

2.2. The Era of Import Substitution (1959-1975)

a. Early Years (1959-1962)

The deterioration in the terms of trade faced by most Latin American countries in the 1950s, and the predominance of import substitution at the time made the automotive industry a primary target for government intervention.

Between 1951 and 1953 the Argentine government passed two laws in an effort to attract foreign capital and promote the automotive industry.[6] In 1952, one year after the stated-owned IAME (Industrias Aeronauticas y Mecanicas del Estado) started producing vehicles, Mercedes Benz began manufacturing in Argentina; in 1955 IKA (Industrias Kaiser Argentina) began its operations in the country.[7]

However, it was not until 1959 when Decree 3,693 was passed that the motor vehicle industry was established on a large scale in Argentina. Like Decree 41,018 of 1957 in Brazil, Decree 3,693 of 1959 in Argentina established an increasing domestic content requirement for vehicles, starting at between 55-80% of the vehicle cost in the first year, to 90-95 % after four years. Table 1 and Table 2 shows the local requirements imposed in Brazil and Argentina, respectively.

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[6] Appendix B contains a review of the regulatory framework in the Argentine automotive industry from 1951 to date.

[7] Kronish, Rich et al., 1984, p. 50.

Table 1

Local Content Requirements in the Brazilian Automotive Industry (percent by weight)

Year	Local Content (%)
1956	35-50
1957	40-60
1958	65-75
1959	75-85
1960	90-95
1961	95-99

Source: Brazilian decree 41,018 / 1957

Table 2

Local Content Requirements in the Argentine Automotive Industry (percent CIF value)

Year	Commercial vehicles	Cars 190-750 cc	Cars 750-1,500 cc	Cars 1,500-2,500 cc	Cars more than 2,500 cc	Others
1960	55	55	60	65	70	80
1961	60	60	65	70	75	85
1962	65	65	70	75	80	90
1963	70	75	80	85	85	95
1964	80	90	90	90	90	95

Source: Argentine Decree 3,693 / 1959

The main policies followed by Argentina and other Latin American countries were protectionist measures for manufacturers (ban on imports), requirements of local content, preferential tariffs for parts and capital goods, and tax exemptions.

After Decree 3,693 was passed, 29 additional proposals for manufacturing vehicles were submitted, although seven firms never actually started operations.[8] Even though some of the projects offered a productions series of less than 1,000 units per year, no firm's proposals were rejected. [9]

Table 3

Investment Authorizations in the Automotive Industry, 1959 - 1964

Local Company	Parent Company or Licenser	Local Company	Parent Company or Licenser
IKA-Renault	Kaiser-Renault	Autoar	NSU
Mercedes Benz	Daimler Benz	Dinborg	Borgward
Dinfia	State owned	Metalmecanica	BMW
Citroën	Citroën	Alcre	Heinkel
Chrysler-Fevre	Chrysler	Cisitalia	Cisitalia
Fiat	Fiat	Goliath-Hansa	Goliath-Hansa
Ford Motors	Ford Motors	FAU	Fuldamobil
General Motors	General Motors	Onfre Marimon	Fiva-Villiers
SAFRAR-IAFA	Peugeot	Panambi	Messerchmidt
Ind. Aut. Santa Fe	DKW	Los Cedros	Heinkel/Studebaker
Siam Di Tella	BMC	ITA	Porsche
Isard	Hans Glass		

Sources: Sourrouille, 1980, p. 49; Kronish, 1984, p. 51.

As shown in Table 4, by 1961 13 companies were producing over 3,000 vehicles a year.

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[8] Cardozo de los Santos, Javier, 1989, p. 23.

[9] Sourrouille, Juan V., 1980, p. 50.

Table 4

Firms and Production in the Argentine Automotive Industry, 1961

Company	Production	% of total
IKA	42,201	31.0
Siam Di Tella	14,082	10.3
G.M. Argentina	13,457	9.9
Ford Motors Argentina	13,441	9.9
Fiat Concord	11,339	8.3
Chrysler Fevre	7,382	5.4
Isard	5,170	3.8
IAFA	5,000	3.7
Metalmecanica	4,441	3.3
Citroën Argentina	4,229	3.1
Mercedes Benz Argentina	3,700	2.7
DINFIA	3,243	2.4
Ind. Automotrices Santa Fe	3,050	2.2
Others (*)	5,453	4.0
Total	136,188	100.0

(*) Includes Autoar, Cisitalia, Dinborg, F.A.U., and Los Cedros.

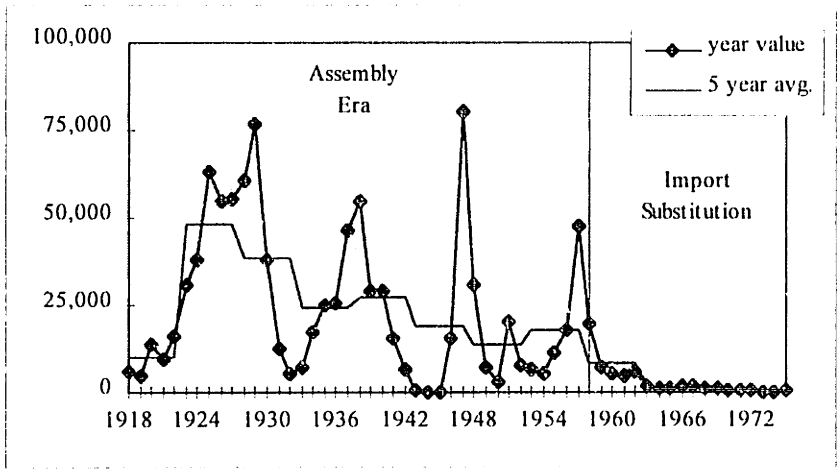
Source: Appendix C, based on Adefa Annual Reports.

b. Growth Period (1963 - 1975)

As a result of the new regime, motor vehicle imports decreased dramatically from 1958 on as shown in Figure 2 and the production showed steady growth as shown in Figure 3.

Figure 2

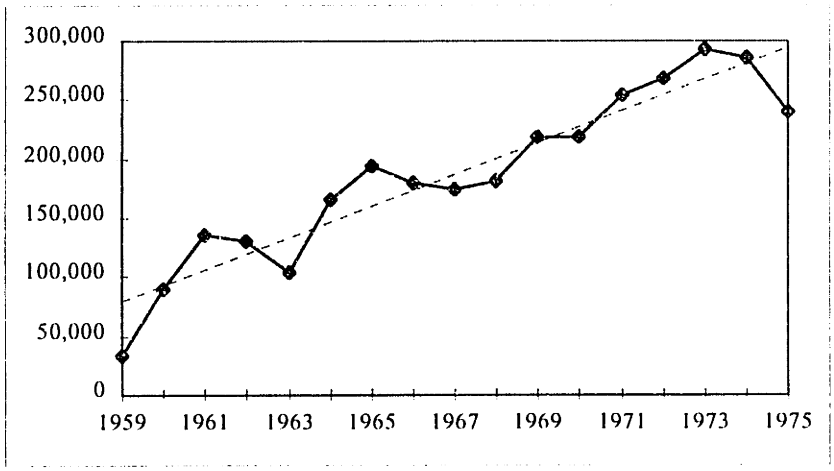
Motor Vehicle Imports in Argentina, 1918 - 1975



Source: Adefa Annual Reports, several years.

Figure 3

Motor Vehicle Production in Argentina, 1959 - 1975

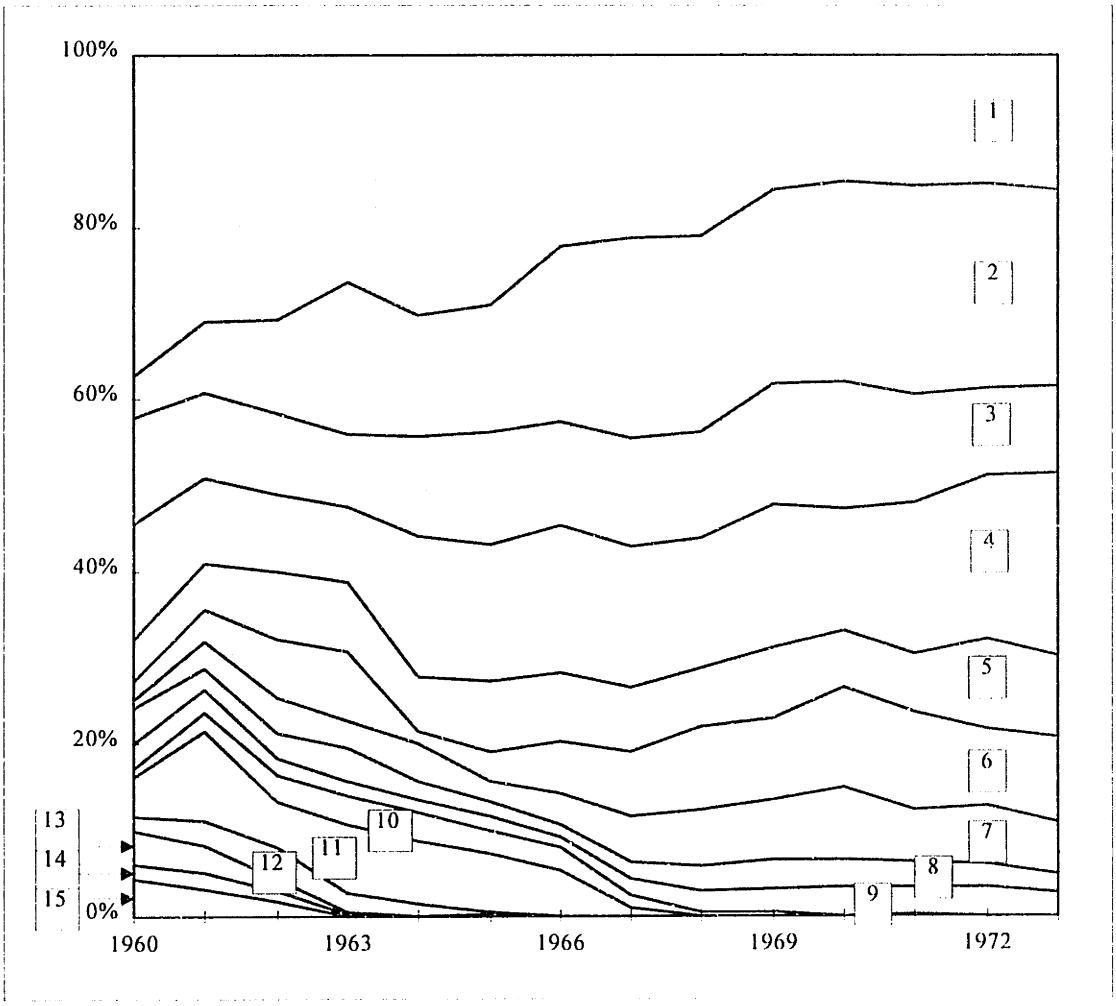


Source: Adefa Annual Reports, several years.

Despite the fact that during this period a large number of companies went out of business, the number of remaining companies was also large. By 1972 the industry was highly fragmented, and nine companies were manufacturing vehicles the largest of which comprised 26% of total production, as shown in Figure 4.

Figure 4

Motor Vehicle Firms and Share in Production, 1960 - 1973.



Note:

1: Ind. Kaiser Arg.	7: Citroen	13: Metalmecanica
2: Fiat	8: DINFIA (IME)	14: Autoar
3: General Motors	9: Mercedes Benz	15: Others(FAU, Dinborg,
4: Ford Motors	10: Ind. Aut. Santa Fe	Los Cedros, Cisitalia,
5: Chrysler	11: Siam di Tella	Goliath Hansa, Panambi,
6: IAFA	12: Isard	Marimon, ITA, Deca

Source: Appendix C, based on Adefa Annual Reports.

The biggest change in this period had to do with ownership: in the early 1960s two-thirds of automobile production came from locally-owned companies; ten years later almost all the output came from foreign-owned companies.

2.3. The Era of Economic Opening (1976 - 1982)

a. The New Rules

During 1974 and 1975 the country experienced a period of political crisis. With the death of President J.D. Peron in 1973 and the mismanagement that occurred in the years following, the military seized power in 1976.

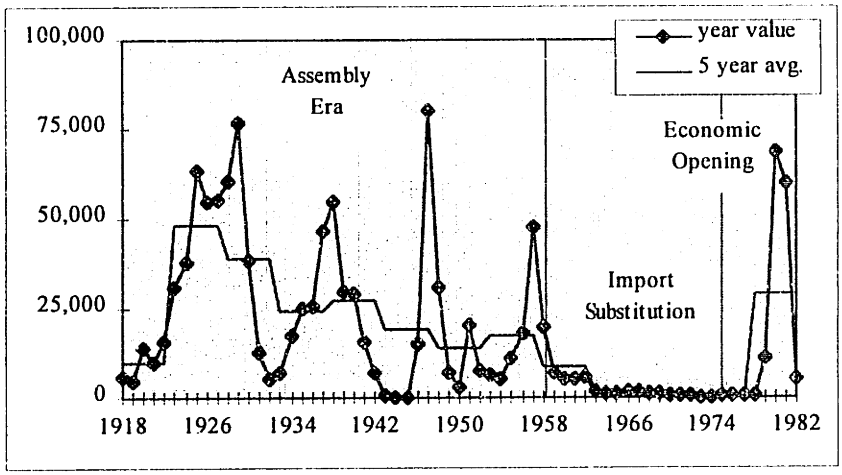
After 20 years of protectionism, in 1979 decree 21,932 was passed which established a schedule of decreasing required local content in vehicles, from 90-96% in 1979 to 75-88% from 1982 on. Further, it allowed imported parts to be considered as local if those parts were offset by exported parts under a compensated trade balance system (*intercambio compensado*). The system consisted of preferential duties on imported parts when compensated with exports.[10]

[10] Decree 203 of 1979 set up rules for compensated trade. In Article 2, it established that exports should be no less than three times imports unless the company received special authorization from the Ministry of Economics, in which case exports could be no less than imports. Under this system, imports were limited in value. It also established that "exports" could mean vehicles, parts, and components, while "imports" meant only parts and components.

At the same time, the new automotive regime allowed vehicle imports with a schedule of decreasing tariffs, from 95% in 1979 to 45% in 1981. Tariff cuts and local currency overvaluation further promoted car imports as shown in Figure 5.

Figure 5

Motor Vehicle Imports in Argentina, 1918 - 1982



Source: Adefa Annual Reports, various years.

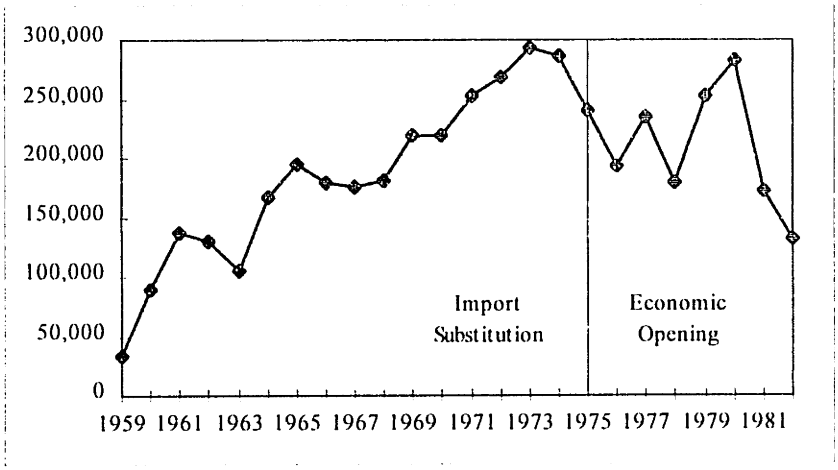
From 1979-1981, the automotive industry trade balance deficit was $500 million, nearly 30% of the entire economy's trade balance deficit in that period.[11]

At the same time, the motor vehicle production decreased dramatically (as shown in Figure 6), and in 1982 the level of production was only 130,000 units, the same level as in 1962, twenty years earlier.

[11] Cardoso de los Santos, Javier, 1989, p. 46.

Figure 6

Motor Vehicle Production in Argentina, 1959 - 1982



Source: Adefa Annual Reports, various years.

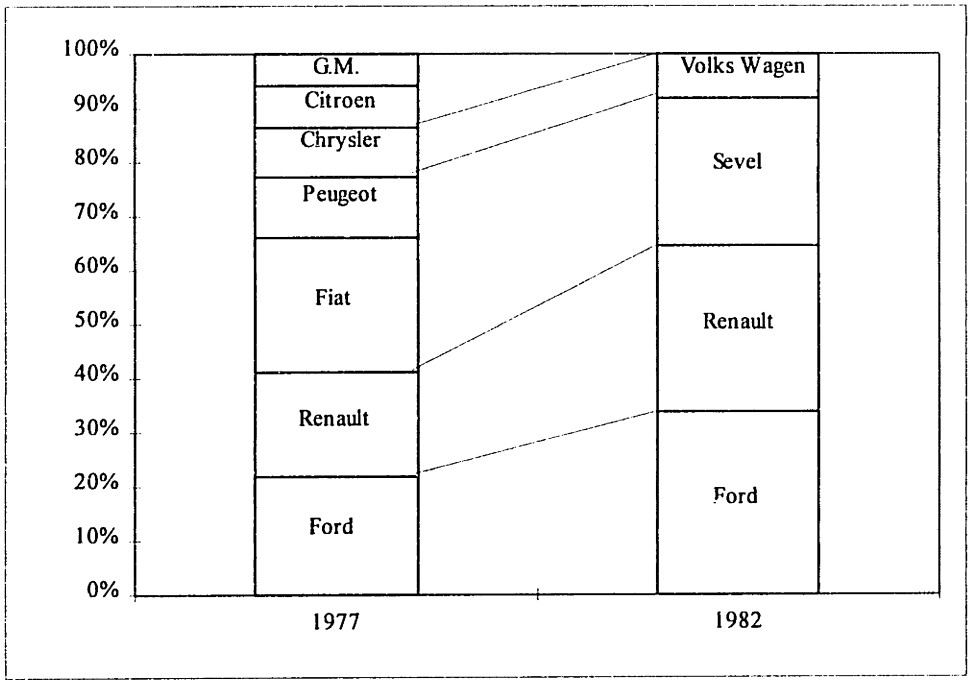
b. Industry Concentration

Between 1978 and 1981 the industry became more concentrated due to the withdrawals of some companies (General Motors in 1978, Citroën in 1979 and IME - a manufacturer of comercial vehicles - in 1980) one takeover (Volkswagen acquired Chrysler's assets between 1979 and 1980), and one merger (Fiat and Peugeot in 1981; in 1981 Peugeot left the merged firm and in 1982 Sevel took over)

Figure 7 shows the consolidation process of the Argentine automotive industry from 1977 to 1982.

Figure 7

Motor Vehicle Firms and Production Share (cars only), 1977 - 1982



Source: Adefa Annual Reports, various years.

In 1987 Ford and Volkswagen merged in Argentina and Brazil and formed Autolatina.

In 1982 there were seven companies manufacturing vehicles (both commercial and passenger cars), but of the seven four accounted for 96% of total output.

2.4. The Era of International Specialization (1983 - to date)

a. Transition Period (1983-1988)

In 1982 the neo-liberal experiment ended. Imports of cars were banned again but the new regime tended to be more flexible regarding local content

regulations. As an example, Decree 1,605 of December 1982 authorized additional imports under the compensated trade balance regime.

In 1983 democracy was reinstituted in Argentina. After seven years of military rule and during the first six years of democracy, the Argentine economy and consequently automotive production, remained stagnant.

b. New Market Opening and Expansion (1989 to date)

After a severe economic crisis in 1990, in March 1991 the Argentine Congress passed the Convertibility Plan, which was the starting point of a new economic policy. Since then, the country has experienced a period of growth comparable to that experienced in the 1960s.

In the automotive industry, the principal changes introduced were an average increase of 40% in the authorized foreign content of motor vehicles, an agreement with automakers to import cars and parts under reduced tariffs if compensated with exports, and import quotas on imported vehicle when they were not produced locally.[12]

One of the main points is the preference agreements established in the MERCOSUR[13], which had the effect of specializing the industry in the production of a reduced number of parts in a large scale.[14]

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[12] Kosacoff, Bernardo et al., 1993, p. 49.

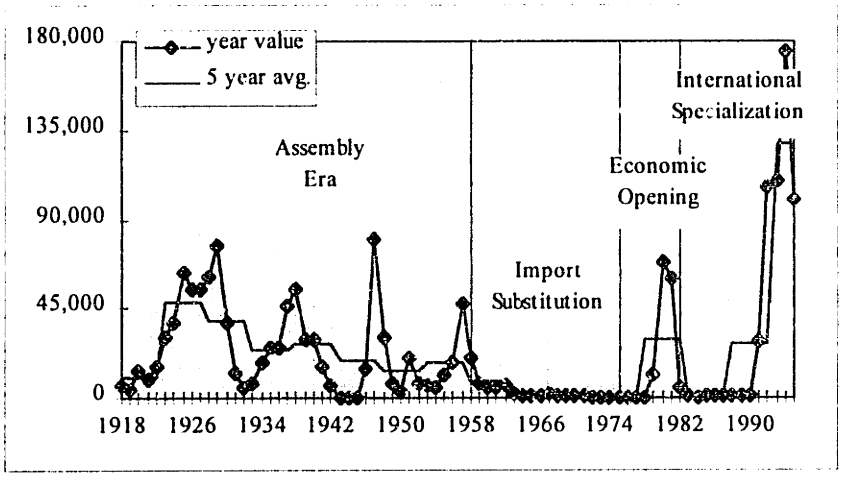
[13] MERCOSUR is the name of the common market including Brazil, Argentina, Uruguay and Paraguay.

[14] Kosacoff, Bernardo et al., 1993, p. 49.

The stabilization of the economy and subsequent economic growth had a dramatic impact on the car industry, which had been basically oriented to the local market. As shown in Figures 8 and 9, although imports rose significantly, vehicle production also increased, from 100,000 units in 1990 to around 300,000 in 1995.

Figure 8

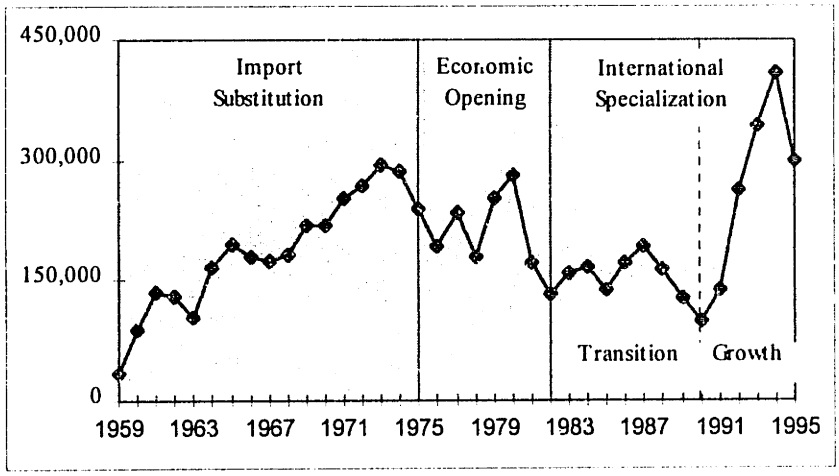
Motor Vehicle Imports in Argentina, 1918 - 1995



Source: Adefa Annual Reports, various years.

Figure 9

Motor Vehicle Production in Argentina, 1959 - 1995

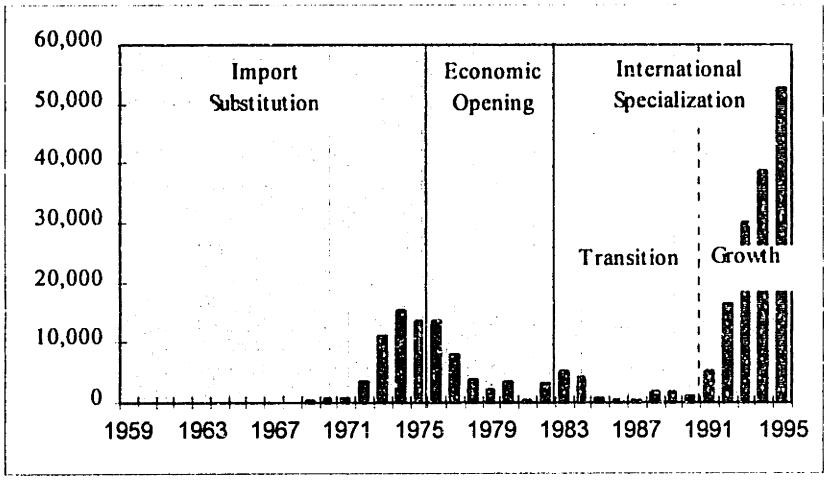


Source: Adefa Annual Reports, various years.

However, the main difference in this period in contrast with the Economic Opening of 1975-1982 had to do with exports. Figures 10 and 11 show the increase in exports over the last period.

Figure 10

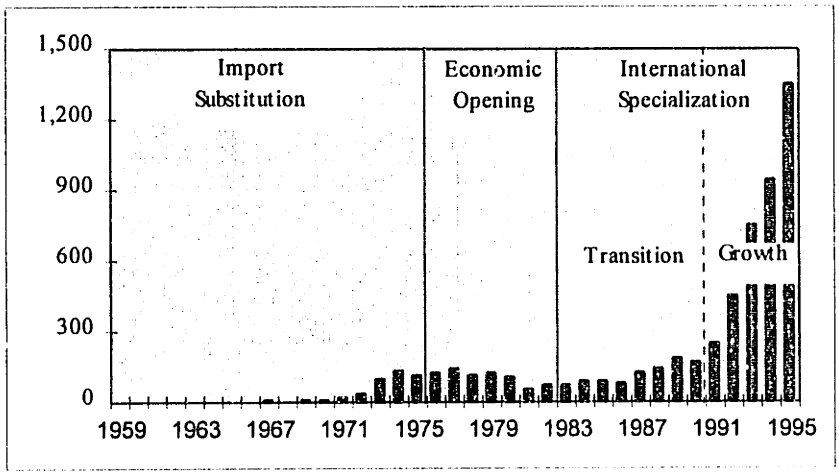
Argentina Motor Vehicle Exports 1959 - 1995 (units)



Source: Adefa Annual Reports, various years.

Figure 11

Argentina Motor Vehicle and Part Exports 1959 - 1995 (thousand of dollars)



Source: Adefa Annual Reports, various years.

c. The Industry Today

As shown in Table 5, in 1994 the Argentine automotive sector was made up of nine companies that manufactured passenger (cars and pick-ups) and commercial (trucks and buses) vehicles. However, the sector was dominated by only three companies: Autolatina[15] (formerly Ford and Volkswagen), Sevel (formerly Fiat and Peugeot) and Ciadea (formerly Renault).

Table 5

Vehicle Production in Argentina by Firm and Type, 1994

	Passenger Cars		Commercial Vehicles		Total Vehicles	
Company	units	share	units	share	units	share
Sevel	178,536	45.4	0	0.0	178,536	43.7
Autolatina	105,613	26.9	2,257	14.5	107,870	26.4
Ciadea	106,549	27.1	0	0.0	106,549	26.0
General Motors (1)	2,510	0.6	0	0.0	2,510	0.6
Mercedes Benz (2)	0	0.0	8,054	51.7	8,054	2.0
Scania (3)	0	0.0	2,092	13.5	2,092	0.5
Fiat Iveco (4)	0	0.0	1,948	12.5	1,948	0.5
El Detalle (5)	0	0.0	985	6.3	985	0.2
Decaroli (6)	0	0.0	233	1.5	233	0.1
Total	393,208	100.0	15,569	100.0	408,777	100.0

Source: Adefa Report, January 1996

Notes: (1): Pick-ups only
(2): 60% buses, 40% trucks
(3): 10% buses, 90% trucks
(4): Trucks only
(5): Buses only
(6): Buses only

[15] In 1996 Autolatina announced that the company would again split into Ford and Volkswagen.

Although nine companies were operating in 1994, there was pronounced specialization among them: three companies (Sevel, Autolatina and Ciadea) accounted for 99% of car production, two companies (Mercedes Benz and El Detalle) had 93% of bus production, and three companies (Mercedes Benz, Autolatina and Fiat Iveco) produced 80% of all trucks.

The industry today operates under the following regulatory framework:

- Law 21932/79 (Law of the Reconversion of the Automotive Industry)
- Decree 2677/91 (prescribing some rules of the former law)
- Protocol 21 (agreement on trade between Brazil and Argentina)

This regulatory framework partially protects the local industry from foreign competition through import quotas and tariffs. Independent dealers have to pay a combined tariff of 30% over the CIF price on imports while the automotive manufacturers are allowed to import vehicles duty-free if they compensate each dollar of import with a dollar of export. Exports and imports are defined as finished or unfinished vehicles and parts. In order to promote investment, the government also allowed up to 30% of the value of capital expenditures to be included as exports.

CHAPTER III

STAMPING OPERATIONS AND SUPPLIER RELATIONSHIPS IN THE ARGENTINE AUTOMOTIVE INDUSTRY

3.1. Terminal - Supplier Relations in the Assembly Era

The idea of establishing assembly plants in Latin America began with the realization that important savings could be realized through importing semi-knocked down (SKD) or completely-knock down (CKD) kits to the region rather than completely built up (CBU) vehicles.

During the inter-war period, the plants established in Latin America essentially worked assembling imported kits. In theory, they were free to replace imported parts by locally produced ones if prices were more advantageous. However, the parent companies always found ways to ensure that this was rarely the case.[16]

Parent companies were also interested in lengthening the production runs for major parts and components produced in the United States from which they could benefit by economies of scale. Thus, local assembly plants represented an attractive way to secure a significant market for the parts and components they produced. The local subsidiaries received no incentive to develop local suppliers but were considered an outlet for parts produced by the parent company.

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[16] Jenkins, Rhys O., 1987, p. 18.

The first locally manufactured parts to be incorporated into assembled cars were such things as batteries and tires the production of which had already been developed to meet the demand for replacements. In Argentina growing vehicle use created a demand for replacement tires which led to tire production being established in 1930.[17] The same pattern was followed in other Latin American countries such as Mexico, which started tire manufacturing in 1933, Uruguay in 1936, and Brazil in 1939, followed by others in the 1940s.

Other parts that required minimal investment, such as shock absorbers, small stamped pieces, and electrical parts were supplied locally and in many cases produced by existing manufacturers.

Incorporating these items permitted the industry to achieve about 20% local content of parts at this stage of the industry development. Add to this an estimated 15% for assembly costs, and the total local content was about 35%.

Further local integration would have involved the engine and transmission, which would raise local content to 75%. Finally, local stamping of the major body parts would have brought the industry into the final stage of development with an almost entirely domestically produced vehicle.[18]

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[17] The first tire companies established in Argentina were Pirelli (Italy) and Goodyear (U.S.) in 1930, followed by Firestone (1931).

[18] Baranson (1969, p. 31). Jenkins (1987, p. 71) uses the following figures: assembly, 10%; easily supplied parts, 25%; engines and transmission, 25%; stamping, 30%. These figures would be different today because of the incorporation of accessories such as air conditioning, stereos and other optional features and the reduction in costs of other major components such as body stampings, engines and transmissions due to technology evolution.

3.2. Large-Scale Manufacturing and Vertical Integration

When Decree 3,693 was approved in 1959, the main multinational automotive firms that were operating in Argentina had two alternatives: to install manufacturing facilities or leave the country.

The situation in Argentina at the time was very different from the situation in the U.S at the turn of the century, when the industry began to develop. In the U.S., early cars could be easily assembled from components developed for other purposes, such as bicycle wheels, or from variations on known products, such as the horse carriage. Therefore, automobile companies in the U.S. began as assemblers rather than manufacturers.[19]

In contrast, automotive manufacturers in Argentina experienced great difficulty obtaining adequate supplies of parts and components from the local market.[20] Therefore, the local industry became more vertically integrated than its parent company in the home country. Not only did all the local car manufacturers produce their own stamping and engines, as in other countries, but in some cases they produced their own forging (Fiat, IKA), castings (IKA, Ford), axles (Fiat, Ford, G.M., Peugeot, Citroen), transmissions (Fiat, IKA, Peugeot, Chrysler) and suspensions (Fiat, IKA, Ford, G.M., Peugeot).[21]

Sourcing strategies varied from country to country in Latin American during the development of the auto industry in the 1960s. In Argentina and Brazil, where high local

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[19] Langlois, Richard N. and Robertson , P.L., 1989, p. 366.

[20] Baranson, Jack, 1969, p. 48.

[21] Kronish, Rich et al., 1984, p. 49.

content was required, auto companies adopted a high vertical integration strategy and bought large amount of parts and raw materials locally. At the opposite extreme, in countries like Chile, Colombia, Peru, Uruguay, and Venezuela, terminal companies set up assembly plants and then imported most of the parts and components needed for the assembly line. An intermediate strategy was adopted in Mexico, where the terminal firm was not only an assembler but also set up an engine plant although it did not engage in major stamping.[22] Table 6 shows the value source as a percentage of the value output in different Latin American countries in 1970.

Table 6

Value Source as Percentage of Value Output, 1970

	Value Added by Terminals	Local Purchases	Imports
Argentina	45.0	51.0	4.0
Brazil	40.6	55.4	4.0
Mexico	27.7	44.3	28.0
Peru	28.6	24.1	47.3
Venezuela (1977)	17.0	33.0	50.0

Source: Jenkins,1987, p. 72.

With the relaxation of restrictions on local content, the industry, which became highly locally integrated during the 1970s, shifted a large proportion of its purchases of parts and components to the parent companies. Figure 12 shows these shifts toward foreign sourcing that occurred in the early 1980s and in the 1990s.

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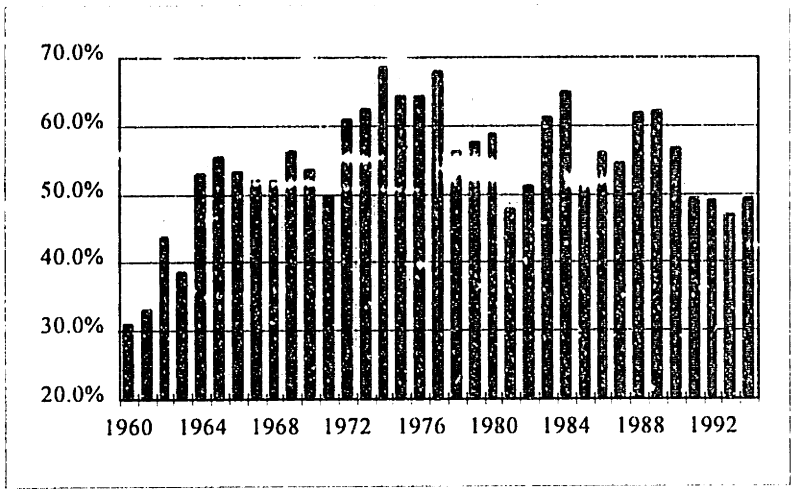
[22] Jenkins, Rhys O., 1987, p. 71.

Figure 12

Local Sourcing of Parts and Components, 1960 - 1994

(as a percentage of the total value of the vehicle)



Source: Adefa, Annual Report 1994 (pp. 8-9).

Note: A proportion of the local sourcing corresponds to purchasing from local subsidiaries. Also, imports by auto part companies are considered as local.

In addition, in 1980 imports of parts and components reached $314 million or $1,080 per vehicle produced and in 1994 $1,513 million or $3,700 per vehicle. These figures were $71.9 million or $327 per vehicle in 1970.[23]

[23] 1970 and 1980 data from Nofal, 1989, pp. 142-143); 1994 data from the author's own calculations based on INDEC, chapters 84, 85 and 87.

3.3. The Structure of the Auto Parts Sector in Argentina

Despite the high level of vertical integration in the industry, a relatively complete range of suppliers developed in Argentina, some of them subsidiaries of multinational companies. The tire sector accounted for almost one-quarter of sales in the auto parts sector, and companies which manufactured complete systems such as engines and transmissions accounted for another quarter.[24]

The parts industry has always had a large number of firms but a relatively small number are responsible for most of the sales. In 1972, for example, 75 firms accounted for two-thirds of the sales, and another 900 firms accounted for the remainder.[25]

With regard to stamping operations, the terminal industry outsourced only parts that were technologically less complex and where it was possible to achieve certain economies of scale, such parts as wheels, fuel tanks and exhaust systems. The major body parts, which are tied to large-scale models due to high cost and model specificity of the dies, have been retained by automakers. As a result, only 11% of auto parts companies' sales were stamping[26] even though stamping operations account for something like 30% of the value of the car.

Also, small firms tended to be more concentrated in the replacement market, while large firms tended to sell mainly to terminals.

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[24] Sourrouille, Juan V., 1980, pp. 157-158.

[25] Sourrouille, Juan V., 1980, p. 156.

[26] Sourrouille, Juan V., 1980, p. 159.

Table 7

Sales Distribution in the Auto Parts Industry - 1972

	Terminals	Replacement
Up to 10 workers	27.0	73.0
11 - 50 workers	48.7	51.3
51 - 100 workers	63.0	37.0
101 - 300 workers	73.2	26.8
> 300 workers	65.4	34.6

Source: Sourrouille, 1980, table 25, p. 164.

3.4. The Linkage Between the Steel and Automotive Industries

Today steel is the most important material used in the manufacturing of vehicles. As shown in Table 8, steel accounts for almost 60% of the weight of a typical North American produced passenger car.

Table 8

Typical North American Produced Passenger Car

Material	Weight (pounds)
Steel	1709
Cast iron	430
Plastic	243
Aluminium	174
Rubber	133
Glass	88
Other metals	115

Source: WARD'S Automotive Yearbook, 1995, p. 27.

Evidence suggests that steel will not decrease in importance in the next decade. For example, The Delphi VII Report[27] forecasted, in the six-year period from 1992 to 1998, a total decrease of 1% in the use of steel for the typical North American car under a scenario of no change in the Corporate Average Fuel Economy (CAFE) standards. However, in the last five years the use of steel increased 3% (from 1,716 pounds in 1990 to 1,767 pounds in 1995).[28]

Since the early development of the automotive industry around the world, there has been a close linkage between the automotive and steel industries. In the U.S., for example, the vehicle industry became concentrated in Michigan, Ohio and Indiana -- in relatively close proximity to the steel industry.

If we look at the most important motor vehicle manufacturers around the world we will find that they are also the most important steel manufacturers. Figure 13 shows the relationship between vehicle and steel production in the biggest producer countries of the world.

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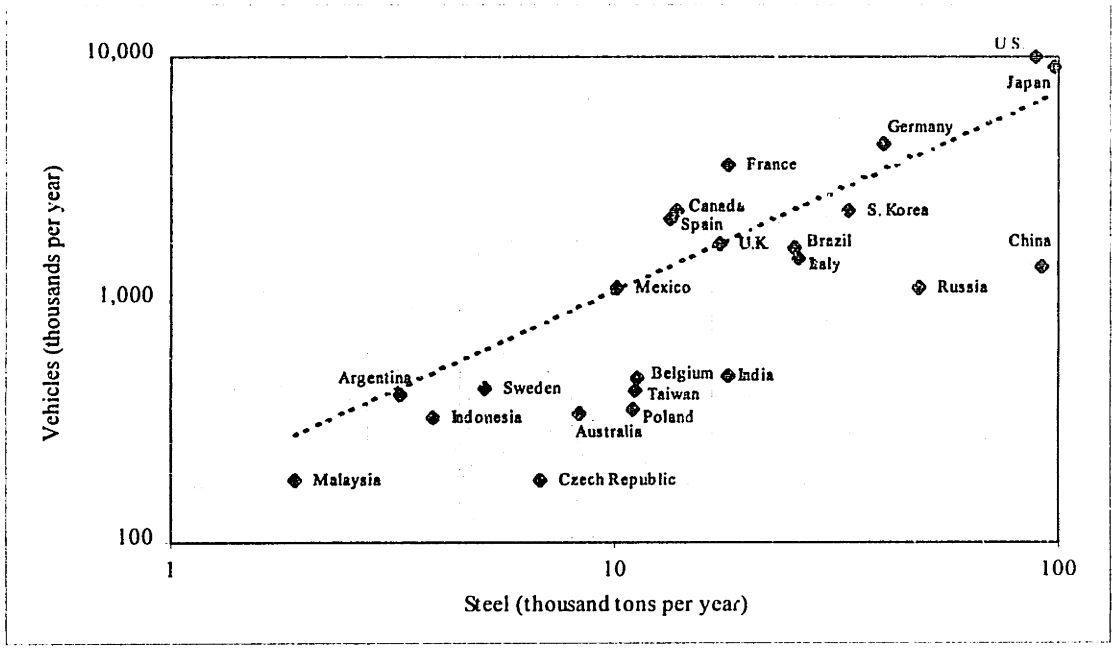
[27] The Delphi Report is a detailed analysis of forecasts by three separate panels (Technology, Marketing and Materials) of automotive industry executives and experts, conducted by the University of Michigan.

[28] WARD'S Automotive Yearbook 1995, p. 27.

Figure 13

Vehicles and Steel Production in Selected Countries, 1994



Source: American Iron and Steel Institute 1994; American Automobile Manufacturers Association 1995.

Note: The linear regression represented by the straight line appears to be moved up due to the effect of using logarithmic scale.

This pattern is true not only across countries, but across regions. For example, Table 9 shows the distribution of motor vehicle and steel production within the U.S.

Table 9

Vehicle and steel production within the U.S., 1994

Area	Steel production		Vehicle production	
	tons	%	units	%
Great Lakes (1)	62,588	62.2%	6,383,001	52.1%
South of Great Lakes (2)	11,868	11.8%	2,456,032	20.1%
South East (3)	7,550	7.5%	852,166	7.0%
West (4)	5,798	5.8%	396,266	3.2%
North East (5)	5,516	5.5%	1,124,170	9.2%
Central (6)	7,318	7.3%	1,036,506	8.5%
Total U.S.	100,638	100.0%	12,248,141	100.0%

Source: American Iron and Steel Institute 1994; American Automobile Manufacturers Association 1995.

Note: (1): IN, OH, PA, MI and IL
(2): AL, TN, KY, MO and AR
(3): VA, WV, GA, FL, NC, SC and LA
(4): CO, UT, WA, OR and CA
(5): RI, CT, NJ, NY, DE and MD
(6): TX, MN, WI, MO, OK, NE and IA

The proximity issue is not exclusive to the steel industry, but also applies to other tier-one suppliers. Many proponents believe that lean manufacturing functions most effectively when the supplier and customer are in reasonable close proximity.[29]

3.5. Stamping Operations in Argentina

As explained in Section 3.4., the terminal industry used to do most of the stamping in-house and outsourced only less-complex parts. As a result, only 11% of the sales of the auto parts sector in 1972 came from stamping companies, while approximately 30% of the value of the vehicle was made up of stamping.

[29] Klier, Thomas H., 1995.

With the relaxation of restrictions on local content, the same shift from local parts and component occurred in stamped parts. Table 10 shows the content of local stamped part in Argentine cars (defined as the purchase of steel from local companies and imported) by the terminal industry.

Table 10

Stamping Operation in the Argentine Automotive Industry

(cars only) (1978 - 1995)

Year	Steel consumption (1) (thousand of tons)	Car production (2) (thousand of units)	Stamping level (3) (kilograms per car)
1978	63	160	394
1979	106	233	455
1980	104	262	397
1981	44	162	269
1982	36	126	287
1983	53	153	347
1984	49	158	313
1985	38	129	295
1986	63	161	388
1988	61	183	331
1988	58	156	374
1989	48	122	396
1990	40	95	418
1991	49	133	372
1992	79	252	312
1993	73	331	222
1994	97	393	248
1995	68	274	249

Sources: (1): Siderar (includes local and import purchases of car manufacturers)

(2): Adefa Annual Report, several years

(3): (1) / (2)

Comparing the data in Table 10 and Figure 12, it can be seen that when the industry shifted toward imported parts (e.g., 1981-82, 1993-94), a drastic reduction occurred in local stamping. If the data in Figure 12 is analzyed, it is apparent that local content of parts and components during the period 1978-1994 was 55%, on average, with a standard deviation of 5.6% (10% of the average). During the shift toward imports in 1981-82 and 1993-94, the local part content decreased to 50 and 47%, respectively, that is, a 9% and 13% decrease from the 55% average for the whole period.

When we analyze the data in Table 10, is it apprent that the local stamping content for the same period 1978-1994 was 337 kilograms per car on average with a standard deviation of 67 kilograms (20% of the average). During the two times when shifts to imports occurred, local stamping content was 18% and 30% lower than the average for the whole period. In other words, local stamping content for the period 1981-82 was 278 kilograms and 236 kilograms for the period 1993-94. From this data, it can be concluded that when the terminal industry reduced local content in its production, steel stamping was the sector where this reduction was the most drastic.

The same scenario appears in Table 11 with regard to imports of parts and components in the terminal industry. In 1994, the trade balance of car bodies was negative in $285 million, and represented 34% of the trade deficit of the parts and component sector.

Table 11

Imports, Exports and Trade Balance of Parts and Components in the Argentine Automotive Industry, 1994

($ millions)

Description	Imports	Exports	Balance
Bodies	349.6	64.3	(285)
Engine parts	220.0	30.0	(190)
Engines (compression system)	77.7	50.9	(27)
Electric systems for ignition	119.8	10.2	(110)
Brakes and their parts	67.9	17.3	(61)
Carrier axles and their parts	61.5	28.3	(33)
Steering columns, wheels and systems	55.2	17.4	(38)
Axles with differential	28.9	2.6	(26)
Tires	39.5	5.7	(34)
Windshield wipers and lighting systems	175.1	48.0	(127)
Bumpers and their parts	31.7	0.4	(31)
Locking systems	34.0	6.8	(27)
Shock absorbers	18.5	3.1	(15)
Wheels and their parts	13.2	53.8	41
Inner tubes	15.9	0.4	(16)
Chassis with engine	23.4	5.3	(18)
Engines (spark system)	5.8	1.2	(5)
Transmission cases	25.0	86.2	63
Others	150.3	235.8	86
Total parts and components	1,513.0	669,7	(843)

Source: INDEC, Bulletin of Foreign Trade.

The rationale behind such investment decisions by the terminal companies was to loosen bottlenecks in such areas as painting and assembling, and to take advantage of the lack of government control over the compensated trade balance regime.

The priority given to assembly operations is confirmed by the fact that between 1992 and 1994, in that portion of what the Argentine Automotive Manufacturer Association (ADEFA) reported as local manufacturing, actually 60% was CKD imported from Brazil.[30]

In 1995, the stamping capacity of Argentine terminal firms was about 130,000 tons[31], the equivalent of manufacturing less than 300,000 vehicles. Not only was stamping capacity scarce, but it was also old-fashioned: most of the press shops were set up in the 1960s.

3.6. An Example of the Automotive-Steel Industry Relationship: The Ford - PS contract

The requirement of minimum local content was a good protection for local suppliers. However, the car manufacturers could choose to import steel parts instead of tires or engines, so it was important to the local steel companies to convince the automakers to produce the steel parts locally.

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[30] The author's calculations based on Adefa Annual Reports and Anfavea (Brazilian Automotive Manufacturer Association) Annual Reports.

[31] Ford: 50,000 tons, Sevel: 50,000 tons, CIADEA: 30,000 tons (the author's estimations).

Providing quality steel at reasonable prices and delivery was not enough. During conversations with Ford Argentina, Propulsora Siderurgica (PS), a local private steel company and the most important steel supplier to the automotive industry in Argentina, decided to finance the purchase of dies to stamp the doors of the Ford Sierra model. In an environment of price controls, high inflation, and economic stagnation, the contract was a win-win deal for both parties.

In the contract, PS granted Ford the amount of money needed to build the dies. This amount was estimated at $4 million. The money could only be used in the construction of the dies, and would be paid back in five years without interest, although the principal would be adjusted with the inflation rate.

In the same contract, PS gave Ford a discount on its steel purchases whenever Ford surpassed an established share of consumption in its purchases. This discount would be considered as a credit in favor of Ford and would be deducted from the principal. The contract, signed in October 1983, foresaw the construction of the dies during 1984 and the payback in 10 periods beginning in October 1983 and ending in September 1988. The dies would become the property of Ford. The contract also allowed Ford to transfer part of the output risk to Propulsora, which decided to share that risk in exchange of Ford decision for local production of the Sierra model.

Although Ford could have ended the contract before the fifth year without any penalty, it decided to continue to the end due to favorable conditions of purchase. During the contract, Ford purchased about 90% of its flat steel from PS. Although the original

idea was to extend a similar practice to other stamped parts, it proved to be impossible due to the stagnation of the automotive market from 1987 to 1990.

Another interesting agreement was made between PS and Renault in 1986. Under that agreement, Renault, which had been purchasing only a few items of standard size steel sheets, closed down its blanking operations and began purchasing blanks from PS's service center. The agreement included a fixed price for the blanks, the establishment of PS steel storage in Renault facilities to guarantee just-in-time delivery, and the development of electronic communication between both companies.

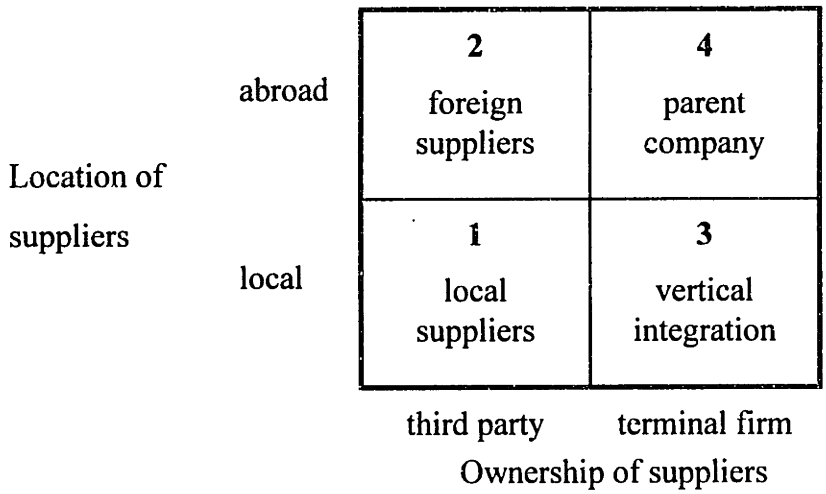
CHAPTER IV

A CONCEPTUAL FRAMEWORK

The sourcing structure in Argentina involves two dimensions: where the components are produced (e.g., in Argentina, elsewhere in the region such as Brazil, or in some other location in the world), and whether they are produced by the terminal firm or outsourced. Figure 14 shows both dimensions.

Figure 14

Sourcing Structure Dimensions



Since the two dimensions are interdependent, policies seeking to influence the location of value added must also take into account the nature of relationships between terminal suppliers and other firms.

In this chapter I will first review the traditional models of supplier relationships and then I will develop a framework that addresses the localization and ownership dimensions simultaneously.

4.1. Traditional Models of Supplier Relations

a. Make versus Buy

The degree of vertical integration has been a major concern when considering business strategy. Many writers argue that the patterns of vertical integration in an industry reflect a minimizing of the sum of production and transaction costs between firms.[32]

The asset specificity version of transaction cost theory has been the dominant issue in the study of vertical integration, and the automotive industry is a clear example.[33]

Since the beginning of mass production in the automotive industry in the 1900s, manufacturers have faced sets of polar options: make or buy, in-house or outsource, vertical integrate or market transaction.

Each set of alternatives seems to have different benefits and risks. On the one hand, vertical integration has been traditionally supported from the physical integration of processes (for example, the steel industry). However, although this

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[32] Williamson, Oliver E., 1985.

[33] Langlois Richard N. and Paul L Robertson, 1989.

consideration explains the need for a close location, it does not explain why common ownership is needed. Other benefits result from asset specificity of the investments: vertical integration avoids opportunistic behaviors between companies (hold-up).

On the other hand, vertical integration creates new administrative costs, cuts flexibility, and increases complexity.

Spot transactions have the benefit of choosing from the cheapest source, usually increase competition and therefore efficiency, and can give the supplier economies of scale. However, suppliers feel little commitment toward their customers and tend not to invest in technology adoption.[34]

Table 12 summarizes the main factors that should be taken into account when deciding whether to vertically integrate.

Table 12

Factors in Determining Vertical Integration vs. Market Transaction Options

Factor	Make	Buy
Asset specificity	high	low
Difficulty of monitoring contracts	high	low
Transactions costs	high	low
Scale similarity of the stages to integrate	high	low
Risk of appropriability	high	low

[34] There is evidence that arm's length relationships between supplier and customer are a significant barrier to computer numerical control adoption (Helper, Susan , 1995).

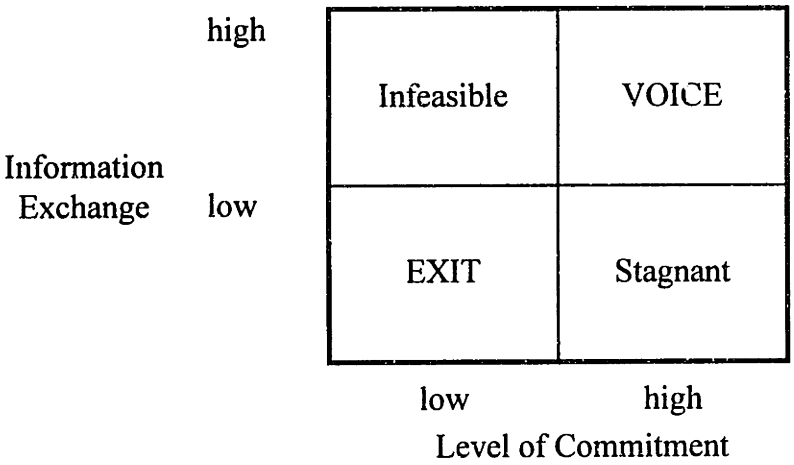
b. The "Exit - Voice" Model

This framework analyzes vertical integration based on problem-solving mechanisms rather than on financial arrangements. In this model, two types of strategies exist in a buyer-supplier relationship: the "exit" strategy, when the buyer's response to a specific problem is to change supplier, and the "voice" strategy, when the buyer's response is to remain with the supplier until the problem is solved. [35]

These two strategies are shown in Figure 15 along a two-dimensional analysis: one related to the flow of information, and to the level of commitment between the parties.

Figure 15

"Exit - Voice" Model



[35] Helper, Susan, 1989.

This framework is very useful in analyzing the recent move in the U.S. automotive industry toward a new supplier system, where contracts with suppliers are increasing in length and automotive firms are reducing their commitment with their own subsidiaries.

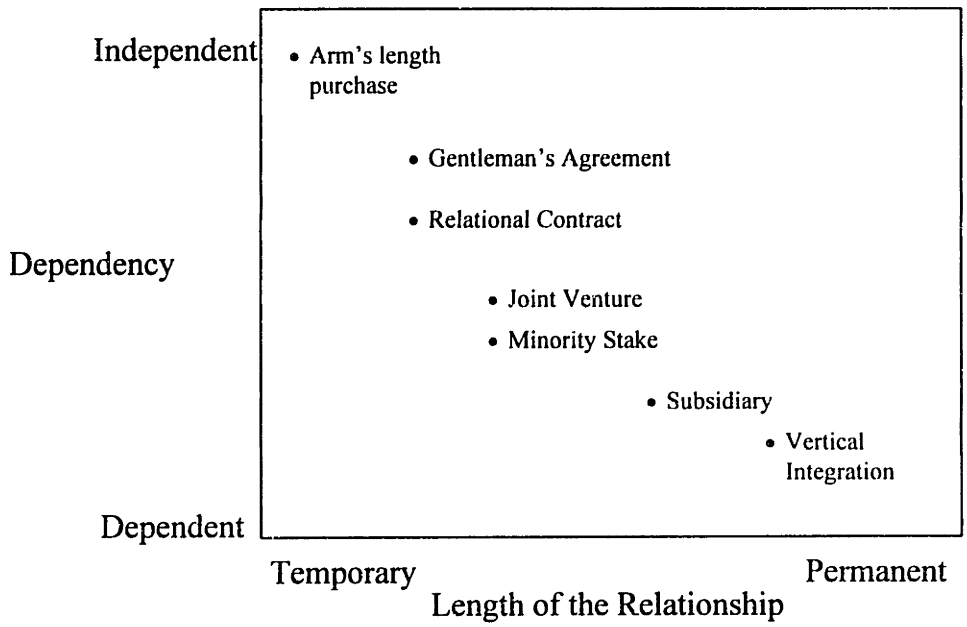
However, when choosing a supplier strategy, the automaker faces a tradeoff between promoting technical progress and maintaining its bargaining power.

c. Different Types of Vertical Relationships

As explained earlier, the make versus buy strategies have different advantages. In order to take advantage of the benefits of both approaches in relationships, firms have developed new kinds of relationships. Figure 16 shows a range of different vertical relationships.

Figure 16

Different Types of Vertical Relationships



The ability of joint ventures and other interdependent business agreements to offer flexibility of market transactions while avoiding transaction costs has resulted in a trend toward outsourcing throughout most industries in Western Europe and North America.[36]

Toyota is a good example of this trend. The company today holds 22% of Nippondenso (a former subsidiary), which makes electrical components; 14% of Toyota Gosei (another former subsidiary), which makes seats and wiring systems; 12% of Aishin Seiki, which makes metal engine parts; and 19% of Koito, which makes a variety of parts. These firms also have substantial cross-holdings between the companies.[37]

4.2. The "Make-Buy" Decision: Vertical Integration in the Argentine Automotive Industry

Traditional analysis of vertical integration has typically been focused on the "make-buy" problem.[38] Under that analysis, companies have two alternatives: produce components in-house, or buy them in the market.

This kind of analysis is more appropriate to U.S. industries (and is reflected in the thesis bibliography). However, in the Argentine automotive industry, companies have

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[36] Grant, Robert M., 1995.

[37] Womack James P. et al., 1990.

[38] Williamson, Oliver E., 1985; Williamson, Oliver E. and Sidney G. Winter, 1993.

three alternatives: produce in-house, buy in the local market, or import from their parent companies. These distinctions are important because, although producing in-house or importing from the parent company could be considered as insourcing, from the point of view of the legislation (and therefore the incentives) both in-house production and buying locally are considered local sources.

An examination of the Argentine automotive industry suggests that no single element explains the historical patterns of location and internalization of steel stamping for the industry. Instead, a combination of factors, varying in importance over time, will explain these patterns.

a. The Effect of Local Incentives

As mentioned earlier, the initial moves to set up automotive plants in Argentina were undertaken mostly because of the savings available through assembly operations versus importing a completely built vehicle.

In 1959 the Argentine government decided to develop a national motor vehicle industry through the incorporation of foreign car manufacturers. The main incentives offered were a protected market, permission to freely withdraw profits, and tax concessions. The counterpart of the concessions was the requirement of high local content in the vehicles produced.

The behavior of subsidiaries located in Argentina was highly conditioned by the behavior of their parent companies. Although a large number of small metalmechanic plants were developed during the assembly era in order to supply

the replacement market, the subsidiaries did nothing to develop local suppliers, and the result of the local incentives was a high vertical integration of the automakers.

The framework presented in Figure 17 shows the various options for behavior among the subsidiaries as a result of the combination of incentives to use local parts (either insourced or outsouced) and the predominant policy of their parent companies.

Figure 17

Model of Strategic Options I: When to Produce In-house

Incentives to produce locally	outsource	vertical integrate
high	2 develop local suppliers	4 local vertical integration
low	1 local suppliers or parent suppliers	3 import parts from parent company

Parent policy

According to Figure 17, in Argentina the effect of local incentives seem to have moved companies from 3 to 4, while among Japanese transplants in the U.S. such companies have moved from 1 to 2.

b. Vertical Integration

When analyzing how to vertically integrate, two predominant issues arises: the specific assets needed for production, and the existence of a replacement market.

When the terminal industry set up in Argentina a small sector of parts companies already existed. This sector increased due to high vehicle use during the 1930s which created a demand for repair shops and a market for replacement parts. Because of that, the first locally manufactured parts to be incorporated were those that had already been developed to meet the demand for replacements, such as tires and batteries.

Other parts were supplied locally because little additional investment in existing plants was required. Examples of such parts are small stampings. As mentioned in Chapter 3.1, the incorporation of these locally manufactured items, together with the value added in the assembly process, accounted for about 35% of local content in vehicle manufacturing. Further local integration would have required the manufacture of engines and transmissions, which increases local content to about 75%. Finally, local stamping of the major body parts would had added even further local content.

Figure 18

Model of Strategic Options II: What to Produce In-house

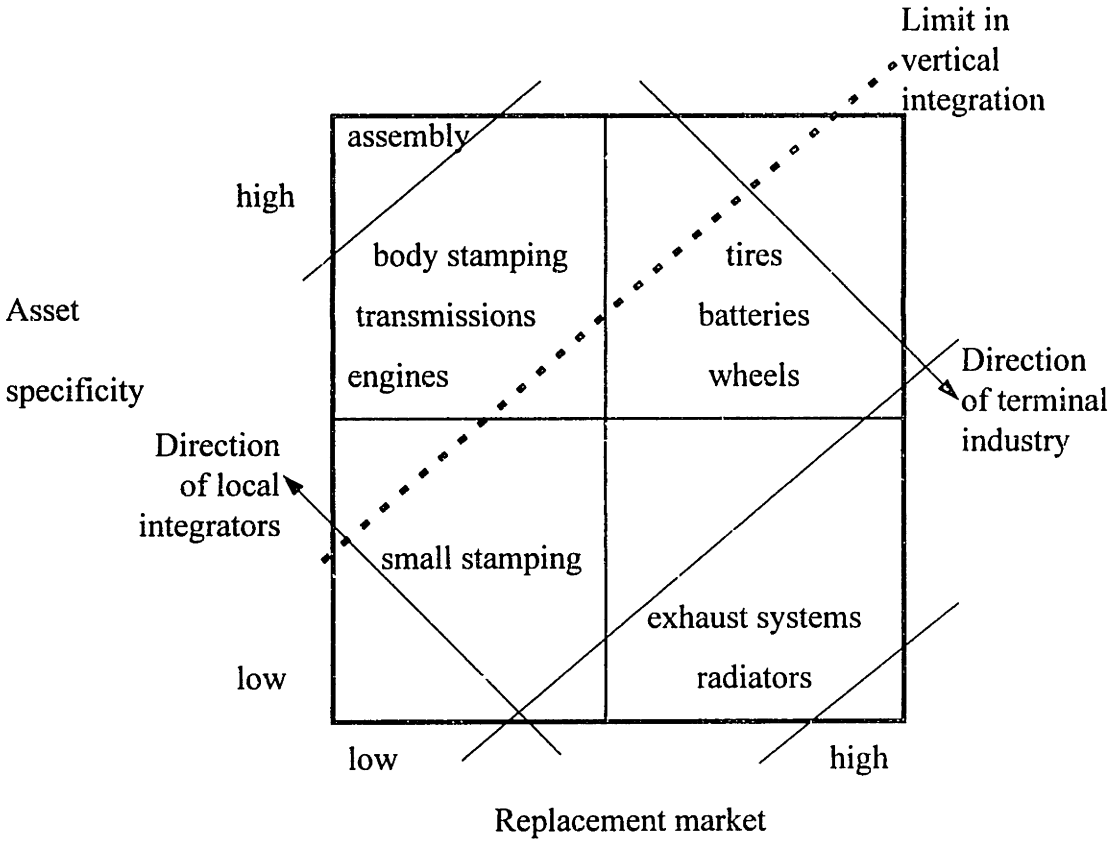


Figure 18 shows how the terminal firms and local integrators move in the market: terminal firms start in the upper left extreme of the chart where high asset specificity is required and low replacement market is available; local integrators started in the lower right extreme of the chart with opposite features.

The limit of the level of vertical integration is highly dependent on the elements discussed before.

c. Bargaining Power

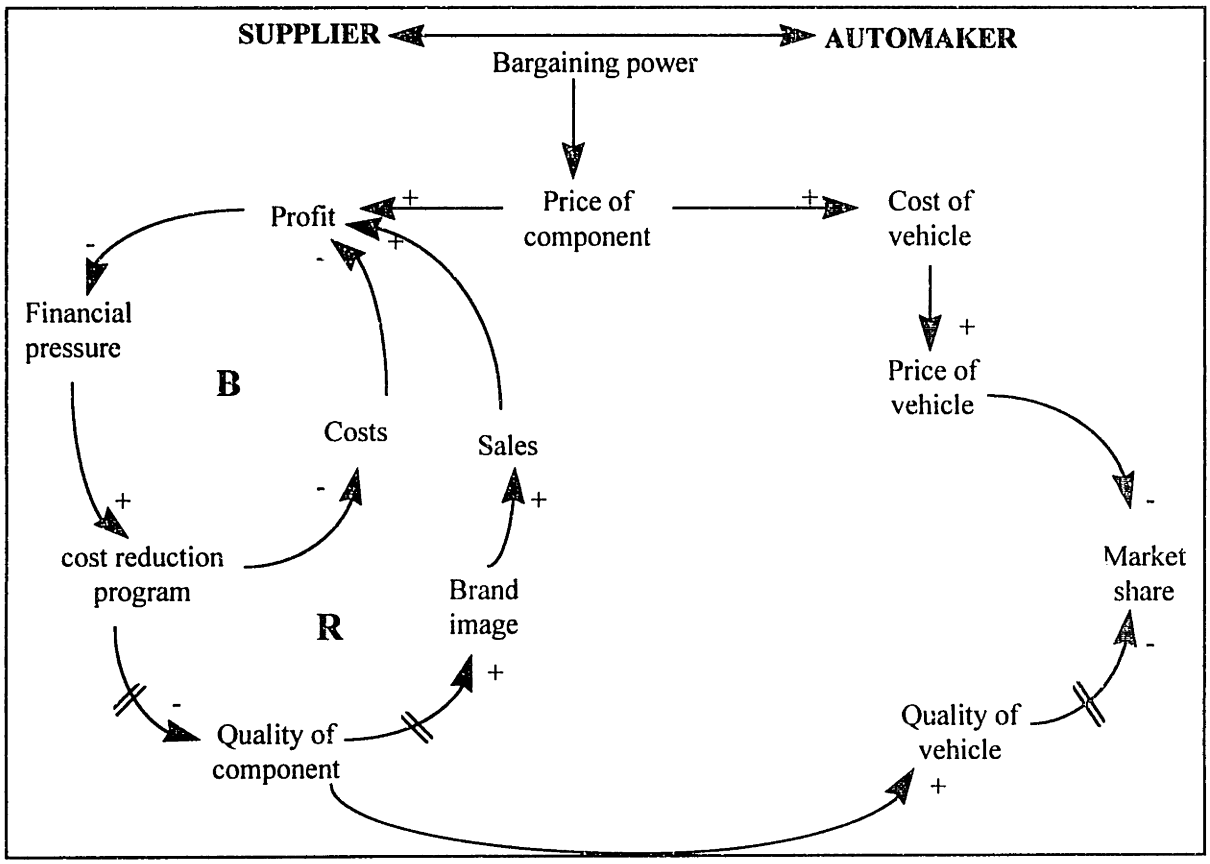
An additional element to take into account is related to the domination that characterizes the relationship between automaker and supplier. In his study of the Latin American automobile industry, Jenkins found that multinational companies which controlled the terminal industry in Latin America reproduced the relationships they enjoyed with their suppliers in their countries of origin. The most important elements that Jenkins considered in explaining the dominance of the terminal over its suppliers were the technological links established between the two types of firm, the financial links and ownership of suppliers, and the system of distribution of replacement parts.

The terminals derived two main advantages from their dominant relationships with their suppliers -- lower wages in the parts industry, and a lower profit margin in that industry.

Figure 19 illustrates a conceptual model of behavior using system dynamics mapping.

Figure 19

Model of Hold-up Behavior: The Seeds of Self Destruction



In the casual-loop diagram the polarity of a link is denoted by "+" or "-" denoting the same or positive relationship between variables (+) or an opposite or negative relationship between them (-).

Positive feedback loops are also called reinforcing loops and are denoted by "R", while negative feedback loops are called balancing loops and are denoted by "B".

The terminal firms can use their bargaining power to reduce the price of a specific component and therefore the cost of the vehicle. The price cut will put financial pressure on the supplier, which will look for a way to reduce its own costs so as to maintain its profits. This cost cut, which is profit maximizing in the short

term, will affect the quality and sales of both the component and the vehicle in the long term.

CHAPTER V

VARIATIONS IN SUPPLIER LINKAGES ACROSS LOCATIONS

In the following chapter I will examine variations in supplier linkages across locations.

As we can see, the issues of being a follower country, state interventions, and macroeconomic aspects had a big influence in shaping the Argentine automotive industry and its supplier relationships. However, understanding supplier relations in different countries is useful for projecting future supplier relationships in the Argentine car industry.

5.1. UNITED STATES

a. Supplier Relationships

In the early years of the U.S. automotive industry, all carmakers began as assemblers rather than manufacturers, taking advantage of external economies that flowed from suppliers. Years later and with the development of mass production, the industry started to vertically integrate.

The Ford factory at Highland Park, Michigan, built in 1909, represented an explicit commitment to build more of each car in-house. *Ford Times* claimed that "in this plant everything from screws to upholstery that enters into Ford cars will be manufactured".[39]

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[39] Williams, Karen et al., 1993.

The early leader in vertical integration, Ford deintegrated after World War II to about 50%. Today U.S. automakers have adopted varying degrees of vertical integration, ranging from about 30% in-house at Chrysler to about 70% at General Motors.

The different kinds of commitments with their suppliers is shown in the 1994 annual reports of the three companies. Chrysler strategy emphasizes supplier relations, as mentioned in its annual report:

> *"Previous methods of working with suppliers often included demands for costs cuts, which generated little loyalty, or a "lowest-bidder-wins" approach, which inhibited log-term relationships. ..... At Chrysler, we are creating relationships with our supplier that provide closeness without control. We call this approach our "Extended Enterprise". .... Three years ago, changes in our relations with suppliers began to take form through our Supplier Cost Reduction Effort, ... conceived as a communication program as well as saving program - a way for suppliers to help us eliminate waste in our process and theirs. ..... We are aiming for a total of 150 first-tier production suppliers. We have about 1,250 now, ..."*[40]

Ford Motor Company says very little about suppliers, its main focus being on their customer.

GM's annual report describes the Company Vision as follows:

> *"The northstar of world leadership guides GM in adding to stockholder value, building customer enthusiasm, strengthening its commitment to employees, and driving programs in the public interest".*[41]

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[40] Chrysler Annual Report, 1994.

[41] General Motors Annual Report, 1994.

In the GM annual report, suppliers are not considered in the Company Vision.

Stimulated by competition from Japanese carmakers, the U.S. automotive industry has been changing, looking for improvements in their supply chain since the mid-1980s.

Recent studies show that supplier/manufacturer links have been changing within the U.S. automotive industry, moving toward a more cooperative relationship. However, Japanese automakers still appear to rely more on informal trusting partnerships with their suppliers than Americans do.[42]

b. Stamping Operations

Stamping is one of the core processes that motor vehicle manufacturers usually want to keep in-house. Many reasons support this strategic decision: one is that the body of the vehicle is critical to all the other elements because it is related to most of the parts. Other reasons are styling and the specific assets involved in stamping. However, terminal firms in the U.S are moving toward outsourcing of their stamping operations, although different strategies are used by each company.

Ford, the leading U.S. company in stamping outsourcing, makes in-house most of the panels for its high-volume vehicles. It also outsources most of the parts of a specific vehicle to the same supplier in order to allow that supplier to control

[42] Grimm, Susan E., 1987; Takeishi, Akira 1990.

quality. Like Ford, Chrysler's strategy is to outsource lower volume parts for older vehicles and replace them with high-volume parts for new vehicles. General Motors is the more vertically integrated, as shown in Table 13.

Table 13

Vehicle Stamping Sourcing in the US

Firm	In-house	Outsourced
Chrysler	67%	33%
Ford	48%	54%
G.M.	82%	18%
Transplants	50%	50%

Source: The Harbour Report, 1995, pp. 42-43

Japanese transplants in the U.S. are similar to Ford in low vertically integrated stamping operations. One interesting example is NUMMI, the Toyota - G.M. joint venture, which makes 33% of its parts in-house. However, it also makes parts for Toyota Canada, which in turn makes parts for NUMMI. This system allows the trucks which carry the panels to travel both ways with a full load, and allows the company to avoid duplicating dies.

Regarding plant location, there is a trend toward facilities on-site at assembly plants, in contrast with the old-fashioned stand-alone facilities. Some of the reasons for this trend are to reduce shipping costs and damages incurred during shipping. Inventory reductions and fast feedback to the press shop area when

stamping-related quality problems are found in the assembly line, also contribute to cost reductions. Table 14 shows the location of stamping facilities in the U.S.

Table 14

Stamping Facilities in the US

Firm	On-site	Stand-alone	Total
Chrysler	4	3	7
Ford	2	7	9
GM	5	11	16
Transplants	12	-	12
Total	23	21	44

Source: The Harbour Report, 1995, pp. 41-42.

5.2. Japan

The American mass production system created a number of problems in the supply chain regarding the decision to make or buy. At Ford and GM, central engineering staff designed most of the 15,000 parts in the vehicle, and the competition among agents in search of the lowest cost blocked the flow of information horizontally between suppliers.

To counteract these and other problems Toyota began to establish a new approach to component supply known as lean manufacturing. The key elements of this approach are:

a. Functional Tiers

Suppliers are organized into functional tiers creating a pyramid structure with a high level of group interaction. First-tier suppliers are responsible for integral parts, and have a team of second-tier suppliers to provide individual parts. These companies may in turn have a third-tier supplier, and so on.

This supplier organization encourages the flow of information as well as a greater degree of collaboration between suppliers and the manufacturer.

Table 15

Cross-Regional Comparison: Supplier/Assembler Relations

Average for Each Region	Japan	U.S. Japanese	American	Europe
Supplier/Assembler Relations:				
No. of supplier per ass. Plant	170	238	509	442
Inventory level (days, for 8 parts)	0.2	1.6	2.9	2.0
Prop. of parts delivered JIT (%)	45.0	35.4	14.8	7.9
Prop. of parts single sourced (%)	12.1	98.0	69.3	32.9

Source: Womack James P. et al., 1990.

Most of the first-tier suppliers belong to Regional Associations (*Kyohokai* in Japanese) where they meet to share knowledge and experience, make long and stable relationships, and in many of them retain a minor fraction of the equity. Toyota spun off its in-house supply operations, retaining part ownership, and developed similar relationships with suppliers who had been independent. In

addition, Toyota often provides capital to finance new machinery and shares personnel with its suppliers.

In contrast with the traditional make-buy problem, supplier-customer relationships are managed as an exit-voice problem.[43]

b. Product Development

Another key element is that Japanese automakers share product development with their suppliers based on functional specifications provided by automakers (black-box parts). In contrast, U.S. automakers favor supplier production based on the automakers' own development (detailed-controlled parts).

Table 16

Cross-Regional Comparison: Supplier Role in Design

Average for Each Region	Japan	U.S. Japanese	American	Europe
Supplier involvement in Design:				
Eng. carried out by suppliers (% hs)	51	na	14	35
Supplier propriety parts (%)	8	na	3	7
Black box parts (%)	62	na	16	39
Assembler designed parts (%)	30	na	81	54

Source: Womack, James P. et al., 1990.

[43] Helper, Susan, 1991.

c. Coordination

A third key element is coordinating the flow of parts within the supply system on a day-to-day basis. This famous system, known as just-in-time (JIT) or Kanban, relies on strict discipline in manufacturing small lots.

Toyota's Kanban system consists of two main parts: just-in-time, which means the arrival of needed components in just the right quantities exactly when they are required at each assembly station, and *jidoka*, which allows workers to stop the production line when problems occur in order to solve them. This system has been applied not only inside the company but also with suppliers.[44]

JIT eliminates virtually all inventory and provides a quick feedback when a problem is detected.

d. Pricing

Another piece of lean manufacturing is that after the assemblers establishes a target price for the vehicle, then manufacturer and supplier work backward figuring how the vehicle should be made in order to achieve this target price while allowing a reasonable profit for both parties. Future savings can be obtained by incremental improvements (*kaizen*), redesign, or new equipment.

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[44] Udagawa, Masaru, 1995.

e. Geographic Spread

Another unique feature of lean manufacturing is its geographic structure. Some authors argue that the just-in-time delivery function is arranged more effectively when supplying and receiving plants are in reasonably close proximity. Shipping cost is reduced as well as damage in transit. Inventories can be reduced and feedback is almost instantaneous when quality problems occur.

In Japan, auto assembly and parts production are heavily concentrated in the industrial areas of Tokyo-Yokohama, the Nagoya region and Osaka. In that country 82% of the suppliers are located within a four-hour journey by truck from the assembly plant, while in the U.S., this figure is 35%.

Since the implementation of lean manufacturing in the U.S., supplier plants have frequently set up near assembly plants. Studies confirm a movement of supplier plants toward the Highway I-75/I-65 automotive corridor.[45] In addition, there is a trend among the "Big Three" toward using on-site stamping facilities (or what Chrysler calls satellite facilities) instead of the stand-alone facility used in the past. Of the 32 "Big Three" stamping facilities eleven (the newest) are on-site. All the stamping facilities of non-U.S. transplant companies are on-site.[46]

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[45] Klier, Thomas H., 1995.

[46] The Harbour Report, 1995.

A summary of the differences between U.S. and Japanese supplier practices in their automotive industries is shown in Table 17.

Table 17

Reported differences in U.S. - Japanese Supplier Management

Dimension	U.S.	Japanese
Number of suppliers	Many	Fewer
Integration/supplier types	Many in-house	Many affiliated
Length of relationships	Shorter	Longer
Length of contracts	Shorter	Longer
Length of part transactions	1 year	2 or 4 years
Selection criteria	Price	Quality, price, etc.
Role in development	Smaller	Larger
Pricing practices	Competitive bids	Target prices
Price changes	Upward	Downward
Information exchanges	Lower	Higher
Suggestions to suppliers	Few	Many

Source: Cusumano, Michael A. and Akira Takeishi, 1991.

f. Stamping Operations

Most of the features of the stamping operations in Japanese automarkers are aligned with the lean manufacturing paradigm. As an example of functional tiers, two automakers, Isuzu and Nissan, are the leading shareholders of Press Kogyo, a major metal stamping company.[47] With regard to the organization of the stamping

[47] Altshuler, Alan, 1984, p. 147.

operation, the pattern of supply is in-house or in close collaboration with suppliers, while the pattern of product location is at point of final assembly.

CHAPTER VI

A PROJECTION OF THE FUTURE RELATIONSHIP BETWEEN SUPPLIERS AND CUSTOMERS IN THE ARGENTINE AUTOMOTIVE INDUSTRY

6.1. The Argentine Automotive Industry Under a New Scenario: the Mercosur

Over the last few years, a number of automakers have announced plans to open production facilities in Argentina and Brazil. This has come about as a result of the growing appreciation of the market potential of the Mercosur (the Latin American common market comprised of Brazil, Argentina, Uruguay and Paraguay). In 1994 the size of its combined motor vehicle market was 2.0 million units (commercial vehicles and passenger cars).

Brazilian and Argentine motor vehicle and parts manufacturers have been integrating their manufacturing activities in the last few years, with the expectation that this process will benefit the manufacturers with economies of scale. There is also a trend toward producing fewer models but in greater numbers in the area, which will allow manufacturers to improve efficiency and reduce costs.

The Mercosur will promote the creation of further corporate alliances between companies in both countries, and also encourage setting up new facilities on order to allow

companies to operate in both sides of the market, taking advantage of the benefits of the Mercosur.[48]

In 1994 there were seven companies manufacturing cars in the area, and four of them controlled 90% of total production, as seen in Table 18.

Table 18

Vehicle Production in the Mercosur, 1994 (cars only)

	Argentina		Brazil		Mercosur	
Brand	Units 000	Share %	Units 000	Share %	Units 000	Share %
Fiat (*)	130	33	373	30	503	32
V.W.	59	15	436	35	495	30
G.M.	3	1	276	22	279	17
Ford	46	12	167	13	209	13
Renault	107	27	-	-	107	6
Peugeot (*)	48	12	-	-	48	3
Toyota	-	-	4	-	4	-
Total	393	100	1256	100	1648	100

(*) Fiat and Peugeot are manufactured in Argentina by Sevel under license.

Sources: Adefa and Anfavea

In order to take advantage of the benefits of the Mercosur it is expected that both Renault and Peugeot will install new facilities in Brazil, while Fiat (once the contract with Sevel expires) and G.M. will install their respective facilities in Argentina.

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[48] As reported in the International Trade Reported (Feb 28, 1996), investments already announced in the area since 1994 include: Ford, $1 billion in Argentina and $2.5 billion in Brazil (both through 1999); Volkswagen, $230 million in Argentina and $2 billion in Brazil; Renault, $500 million in Argentina (CIADEA) and $1 billion in Brazil; General Motors, $1 billion in Argentina and $2 billion in Brazil; and Toyota, $150 million in Argentina and $250 million in Brazil.

6.2. A New International Paradigm: Lean Manufacturing

As has happened in the past, it is expected that companies operating in Argentina will replicate their parent companies' policies. However, the globalization of the automotive industry and subsequent reduction of trade barriers are prompting companies to adopt similar strategies which are embedded in the lean manufacturing paradigm.

As explained in the previous chapters, this paradigm implies a new approach to the supplier-terminal relationship, specifically within the Latin American countries.

6.3. Future Prospects in Stamping Operations

As described earlier, there is a worldwide trend toward on-site facilities, outsourcing, and cooperation with suppliers in stamping operations.

In Argentina the stamping capacity of the automotive industry is not only scarce but old-fashioned. During the last four years the investment decisions among the terminal companies have been driven by the need to loosen bottlenecks such as painting and assembly. Moreover, government willingness to fulfill compensated trade balances has allowed the terminal firms to import parts and vehicles for further commercialization with little outside control, thereby generating a significant commercial deficit.

The worldwide trend mentioned above, combined with increasing integration with Brazil and an increase in government control with regard to the trade balance, have generated increased demand for new stamping capacity in the form of an independent company or integrator.

Because new stamping capacity represents a potential market for the steel industry, local steel companies should influence the location decisions of automotive stamping operations. Therefore, local steel companies should find an integrator responsible for stamping and subassembling parts and components, and develop mechanisms for sharing specific costs (e.g., dies) and for limiting potential opportunistic behavior (e.g., some type of pricing formula driven by world price levels).

In the following, I propose some recommendations for creating a mutually acceptable contract that avoids hold up for both steel and automotive industries and which promotes efficiency in their respective operations:

- Scale: the automaker involved should guarantee a minimum volume; if not, the integrator firm would have the right to produce stamping for other automakers.
- Location: in-site.
- Steel: integrator acquires steel.
- Quality: scheduled program of continuous improvements.
- Dies: property of automaker; integrator could be responsible for building or acquisition of dies, but the automaker should be the owner (e.g., Propulsora-Ford contract).
- Prices (steel and component): a mechanism should be devised for sharing specific costs, e.g., dies, and for limiting potential hold up by both terminal and steel companies because of their effective bargaining power (e.g., formula pricing driven by world price levels).

This arragement has the following advantages for all parties:

- For the automaker, it avoids the risk of volatile local demand and provides a source of local components to fulfill local content requirements.
- For the integrator, it is a genuine opportunity due to the fact that stamping is scarce in the country and there is a local automotive industry that needs parts.
- For the local steel company, it ensures local steel consumption.

These proposals are similar to what Ford is doing in the U.S. with The Budd Company, and what Volkswagen is doing in Spain with Gonvarri. Both stamping integrators, Budd and Gonvarri, are experts in stamping operations and enjoy a good relationship with steel and automotive companies.

6.4. Conclusions

In the last decade all the major Latin American economies have been moving away from the import substitution and state-controlled model that has prevailed since the 1950s. Argentina and its automotive industry are no exceptions.

I expect these dramatic changes will lead toward a rationalization process in which globalization or regionalization of production, marketing and technology transfer, new production and management methods, and a more collaborative relationship with suppliers will be required. Moreover, this rationalization will follow the restructuring process of the world automotive industry that began in Japan in the 1950s and it is still taking place in the U.S.

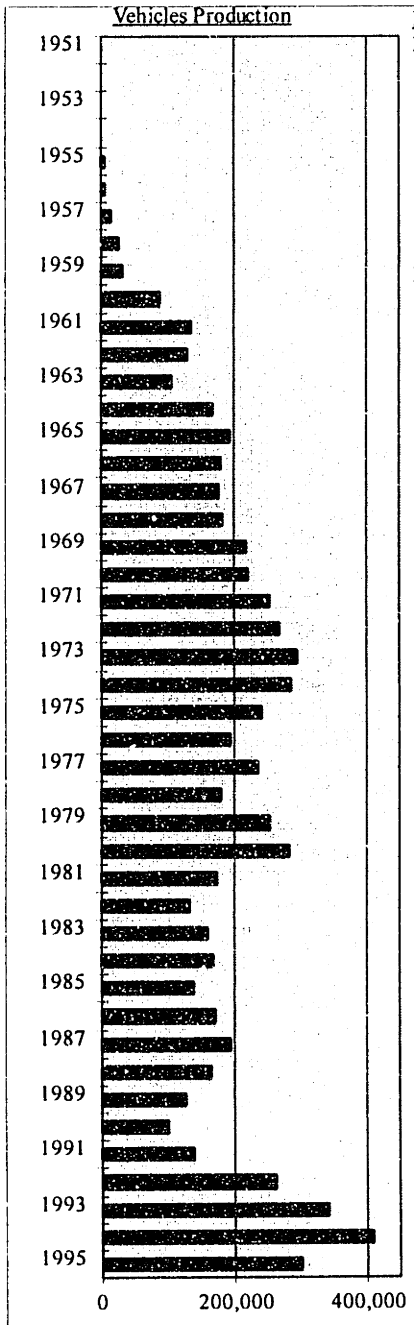
I expect this rationalization will have two main components: the first, which will require a large involvement of the automotive industry and its suppliers, is the adoption of the lean manufacturing system; the second, which will require the involvement of governments, is the integration of the countries within the region.

The coming years can bring a new period of growth for the regional automotive industry if companies adopt the appropriate manufacturing policies which will increase productivity, quality, and cooperation between supplier and terminal industries, and governments establish the correct economic policies that reduce levels of uncertainty, avoid uneven protection among sectors, and allow a real integration within the region to provide the industry with the necessary scale.

Regarding stamping operations, growth in the scale of the market, maintenance of some incentives on a regional basis, and the trend toward on-site stamping and outsourcing will create conditions that should lead to local stamping by local integrators.

Appendix A

Chronology of the Argentine Automotive Industry: 1951 - 1995.



Regulatory Framework	Industry Structure
Decree 25,056	Industrias Aeronauticas y Mecanicas del Estado (IAME) (commercial vehicles)
	Mercedes Benz (commercial vehicles)
	Industrias Kaiser Argentina (IKA)
Decree 3,693	23 proposals to set up manufacturing: Ford, GM, Fiat, Chrysler, Safrar (Peugeot), Citroen, Siam (BMC) and other 16 companies.
	IKA acquires Siam, Chrysler acquires IASA and other 7 companies go out of business
	Renault enters and acquires IKA
	IASF goes out of business
Law 19,135 "Ley de la Reconversion de la IndustriaAutomotriz"	
	Scania enters (commercial vehicles)
	GM leaves
Decree 21,932	Citroen leaves
	VW enters and acquires Chrysler
	IME leaves
	Fiat & Peugeot merge; Sevel takes over
	Decaroli and El Detalle enter (commercial vehicles)
	Ford and VW merge and form Autolatina
Protocol 21 Brazil-Argentina	
Mercosur Agreement	
Decree 2,677	Renault is sold to CIADEA
	GM comes back
	Autolatina splits in Ford & VW

Appendix B

Historic Review of the Regulatory Framework in the Argentine Automotive Industry: 1951 - 1995

1951 Decree 25,056	• The automotive industry is declared of national interest. • Granted exchange and import privileges for a period of 5 years.
1953 Law 14,222	• Foreign investment law. • Profit remittances limited to 8% of original investment.
1958 Law 14,780	• Foreign investment law. • Foreign capital guaranteed equal juridical treatment with national capital. • Unlimited profit remissions allowed.
1959 Decree 3,693	• Set the framework for organization of the automotive industry over a period of 5 years. • Permitted a different decreasing import content for type of vehicle over the next years. • Duty-free imports for machinery and equipment required and preferential duties on imports of parts and component

1961 Decree 6567	• Required a minimum investment of 200 million pesos by the end of 1961. • Permitted a higher import content for firms introducing a new model
1964 - 65 Decrees 7,711/64 and 1,188/65	• Established the compensated trade balance regime ("intercambio compensado") within other Latin American countries. The system consisted in preferential duties on imports when compensated with exports.
1971 Law 19,151 Law 19,135	• Foreign investment law. No fundamental changes. • Reorganization of the automotive industry. • The installation of new terminal firms was suspended until Dec 30 1980. • Required the firms before launching a new model to show a minimum production level. • Provided certain advantages for majority locally owned part suppliers. • Limited the royalty payments to a maximum of 2% of the total sales. • Established "positive lists", which meant the list of parts without local production that were allowed to import. • Export incentives for vehicles and parts which were free of royalty payments.

1979 Decree 21,932	• Allowed vehicle imports with decreasing tariffs, from 95% in 1979 to 45% in 1981. • Allowed an increasing import content up to 12% for cars and 25% for trucks in 1982. • The parts and components imported under the "intercambio compensado" regime were considered local (with regard to the local content). • The restriction on new models, and the promotion of the part sector introduced by law 19,135 were removed.
1982 Decrees 1,604, 1,605 and 1,606.	• Additional imports were authorized under the "intercambio compensado" regime. • Increased the permitted import content.
1985 International Agreement	• Brazil and Argentina established the Peace and Cooperation Zone in the South Atlantic.
1988 International Agreement	• Brazil and Argentina signed the Integration, Cooperation and Development Treaty. • The Protocol 21 about integration of the automotive industries in both countries is signed
1990 Decree 2,226	• 3 year framework (1991 - 1994). • Increasing import content

	• Established increasing "intercambio compensado" with all the countries. • Additional incentives for companies that reach the export / import relation required in excess. • Allowed imports of vehicles through a system of quotas.
1991 International Agreement Decree 2,677	• Brazil, Argentina, Uruguay and Paraguay signed the Asuncion Treaty, which established a schedule of goals to create a common market in the area, known as Mercosur (Common Market of the South Cone). • 8 years framework (1992 - 1999). • From year 2000 onward the industry will be ruled by GATT. • Motor vehicle manufacturers are allowed to import vehicles duty-free from Mercosur, or paying 2% tax from any other country. • Terminal industry is also allowed to import parts up to 40% the value of the cars, or 42% the value of trucks and buses. • Vehicle manufacturers have to export no less than the amount of imports. • The terminal industry should include as "export" up to 30% of the investment in new local equipment to manufacturing • A system of quotas is established.

Appendix C

Motor Vehicle Production by Firm in Argentina, 1959 - 1994

	1,959	1,960	1,961	1,962	1,963	1,964	1,965	1,966	1,967	1,968	1,969	1,970
Fiat (1975: IVECO, comm. veh. only)	0	4,272	11,339	14,185	18,544	23,397	28,868	36,303	40,911	41,280	49,492	50,707
IAFA (1964: SAFRAR -Peugeot-)	0	1,912	5,000	8,812	8,406	2,693	6,647	11,013	13,315	17,335	20,639	25,897
Sevel (since 1975, Fiat & Peugeot)	0	0	0	0	0	0	0	0	0	0	0	0
Ford	737	11,767	13,441	11,767	9,110	26,825	30,424	30,459	28,661	27,230	36,083	30,745
Chrysler (1979: VW)	0	4,330	7,382	10,028	8,258	10,484	16,163	14,376	12,776	12,380	17,858	14,046
Autolatina (since 1984, Ford & VW)	0	0	0	0	0	0	0	0	0	0	0	0
IKA (1967: Renault, 1992: CIADEA)	24,151	33,205	42,201	39,987	27,684	50,042	56,625	40,085	37,226	38,017	34,332	32,573
Siam di Tella (1965: acq. by IKA)	0	4,102	14,082	7,146	8,503	11,676	13,110	9,593	1,536			
General Motors	0	11,056	13,457	12,063	9,146	19,322	25,212	21,596	22,062	22,361	30,433	32,788
Mercedes Benz (comm. vehicles only)	804	2,566	3,700	2,387	1,648	2,222	3,075	2,403	3,091	4,127	5,762	7,274
Deutz (commercial vehicles only)	0	0	0	0	0	0	0	0	0	0	57	235
Scania (commercial vehicles only)	0	0	0	0	0	0	0	0	0	0	0	0
Decaroli (commercial vehicles only)	0	0	0	0	0	0	0	0	0	0	0	0
El Detalle (commercial vehicles only)	0	0	0	0	0	0	0	0	0	0	0	0
Citroen (1987: Sal-Lari reopen)	0	968	4,229	5,422	3,313	6,947	4,645	6,214	9,228	12,012	15,280	18,332
Metalmecanica	1,090	3,425	4,441	1,914	260	158	457	30	0	0	0	0
IAME (then DINFIA, then IME)	3,964	3,704	3,243	3,743	4,226	3,867	3,266	2,646	3,693	5,141	7,653	7,002
Ind. Aut. Santa Fe -IASF-	0	904	3,050	4,075	3,437	6.020	5,494	4,735	2,819	0	0	0
Isard -IASA- (1965: acq. by Chrysler)	1,624	3,940	5,170	5,601	2,267	2,368	539	0	0	0	0	0
Others	582	3,187	5,453	2,750	77	462	11	0	0	1,093	1,001	0
Total	32,952	89,338	136,188	129,880	104,899	166,483	194,536	179,453	175,318	180,976	218,590	219,599

Source: Adefa Annual Reports

(Appendix C continued)

	1,971	1,972	1,973	1,974	1,975	1,976	1,977	1,978	1,979	1,980	1,981	1,982
Fiat (1975: IVECO, comm. veh. only)	61,056	63,746	66,648	74,287	4,577	2,760	3,397	2,426	1,726	753	242	211
IAFA (1964: SAFRAR -Peugeot-)	28,578	24,092	29,102	28,271	0	0	0	0	0	0	0	0
Sevel (since 1975, Fiat & Peugeot)	0	0	0	0	75,165	57,805	64,610	45,733	62,993	65,789	27,213	29,796
Ford	44,490	50,502	62,374	53,938	38,085	33,954	56,795	50,287	86,320	112,592	75,566	50,390
Chrysler (1979: VW)	17,065	28,186	27,671	26,587	22,181	21,986	23,434	21,164	32,040	31,610	18,528	12,855
Autolatina (since 1984, Ford & VW)	0	0	0	0	0	0	0	0	0	0	0	0
IKA (1967: Renault, 1992: CIADEA)	38,694	40,466	46,128	39,724	38,096	30,896	34,744	28,886	41,221	58,304	44,422	34,278
Siam di Tella (1965: acq. by IKA)	0	0	0	0	0	0	0	0	0	0	0	0
General Motors	31,881	27,235	29,681	27,443	23,862	16,195	20,897	5,876	0	0		
Mercedes Benz (comm. vehicles only)	8,056	8,533	7,689	6,849	6,720	6,682	7,845	7,825	8,752	9,797	5,941	4,173
Deutz (commercial vehicles only)	394	344	397	364	197	245	80	89	147	119	58	26
Scania (commercial vehicles only)	0	0	0	0	0	0	474	436	623	788	393	388
Decaroli (commercial vehicles only)	0	0	0	0	0	0	0	0	0	0	0	0
El Detalle (commercial vehicles only)	0	0	0	0	0	0	0	0	0	0	0	0
Citroen (1987: Sal-Lari reopen)	15,823	18,198	17,489	18,344	18,653	15,839	14,044	8,226	10,497	0	0	0
Metalmecanica	0	0	0	0	0	0	0	0	0	0	0	0
IAME (then DINFIA, then IME)	7,200	7,291	6,563	10,505	12,500	7,155	9,036	8,212	8,898	2,041	0	0
Ind. Aut. Santa Fe -IASF-	0	0	0	0	0	0	0	0	0	0	0	0
Isard -IASA- (1965: acq. by Chrysler)	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0
Total	253,237	268,593	293,742	286,312	240,036	193,517	235,356	179,160	253,217	281,793	172,363	132,117

Source: Adefa Annual Reports

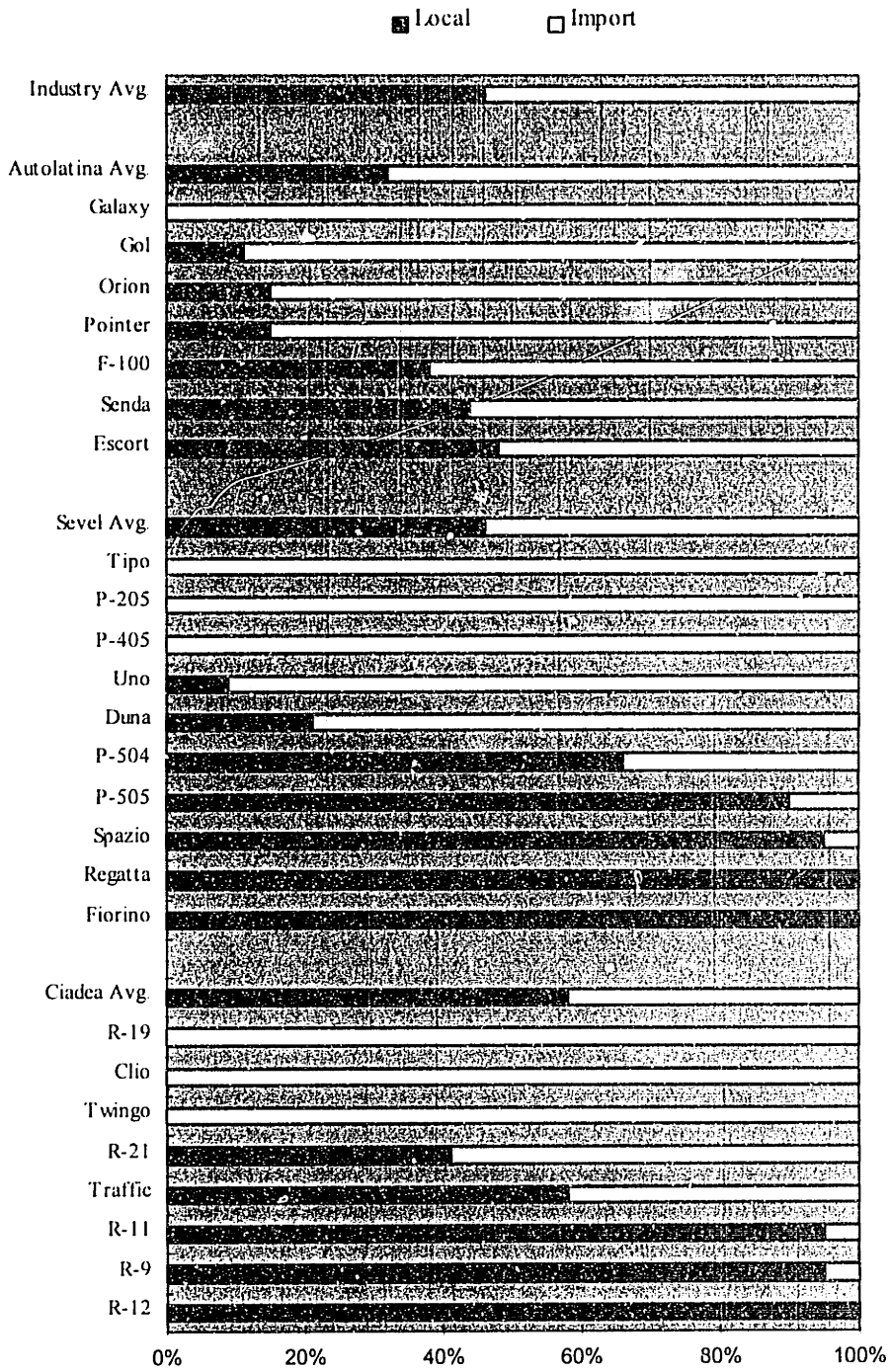
(Appendix C continued)

	1,983	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994
Fiat (1975: IVECO, comm. veh. only)	404	916	806	1,004	1,175	1,155	995	574	845	1,371	1,720	1,948
IAFA (1964: SAFRAR -Peugeot-)	0	0	0	0	0	0	0	0	0	0	0	0
Sevel (since 1975, Fiat & Peugeot)	39,136	42,924	41,831	59,313	72,226	62,289	50,740	41,307	64,791	119,447	150,131	173,536
Ford	56,047	0	0	0	0	0	0	0	0	0	0	0
Chrysler (1979: VW)	17,408	0	0	0	0	0	0	0	0	0	0	0
Autolatina (since 1984, Ford & VW)	0	75,051	49,500	56,025	53,248	47,708	34,474	27,458	33,999	64,351	87,966	107,870
IKA (1967: Renault, 1992: CIADEA)	41,603	43,165	41,294	48,180	57,193	45,886	37,083	26,696	34,752	69,112	94,367	106,549
Siam di Tella (1965: acq. by IKA)	0	0	0	0	0	0	0	0	0	0	0	0
General Motors	0	0	0	0	0	0	0	0	0	0	0	2,510
Mercedes Benz (comm. vehicles only)	3,851	4,281	3,344	4,958	5,525	4,191	3,087	2,759	3,249	4,484	5,106	8,054
Deutz (commercial vehicles only)	50	0	0	0	0	0	0	0	0	0	0	0
Scania (commercial vehicles only)	676	918	865	945	1,274	886	863	701	868	1,724	1,724	2,092
Decaroli (commercial vehicles only)	0	0	30	65	43	17	42	74	129	281	238	233
El Detalle (commercial vehicles only)	0	0	0	0	65	180	115	70	325	1,252	1,092	985
Citroen (1987: Sal-Lari reopen)	0	0	0	0	2,566	1,848	424	0	0	0	0	0
Metalmecanica	0	0	0	0	0	0	0	0	0	0	0	0
IAME (then DINFIA, then IME)	0	0	0	0	0	0	0	0	0	0	0	0
Ind. Aut. Santa Fe -IASF-	0	0	0	0	0	0	0	0	0	0	0	0
Isard -IASA- (1965: acq. by Chrysler)	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	68	5	0	0	0	0	0	0	0	0	0
Total	159,175	167,323	137,675	170,490	193,315	164,160	127,823	99,639	138,958	262,022	342,344	408,777

Source: Adefa Annual Reports

Appendix D

Breakdown of Local Steel Content in Argentine Cars - 1994



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