# INDUSTRIAL RESTRUCTURING AND INTER-FIRM RELATIONS IN BRAZIL: A STUDY OF THE AUTO-PARTS INDUSTRY IN THE 1990s

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# Industrial Restructuring and Inter-Firm Relations in Brazil: A Study of the Auto-Parts Industry in the 1990s*

In the last two decades, Latin American countries have witnessed profound changes in their traditional productive relations, which have been greatly affected by globalisation and the associated international restructuring process. At the core of these transformations is an intense process of labour reorganisation and an increase in productivity, affecting the volume and structure of employment, the level and hierarchy of skills and patterns of workforce management. It is important to understand the dynamics and the nature of these changes in order to understand the transformations they entail. The relations between work and education and the dynamics of productive restructuring in the region are particularly relevant in this context.

In Latin America these transformations have occurred at the same time as the replacement of the import substitution model. Since the 1980s new and important changes can be noted in inter-firm relations, in product and labour markets, in worker mobility and in skill requirements. At the same time, in a country like Brazil, some forms of flexible production are being established in a context of labour market deregulation and the atomisation of collective action. These processes have emphasised the need for a simultaneous analysis of what is going on both within and outside firms. The social construction of production networks and the new forms of institutional articulation are particularly relevant themes for social scientists (Sabel, 1986, 1993a, 1993b; Gereffi and Korzeniewicz, 1994; Gereffi, 1995; Doner (with Federic Deyo), 1996; Doner and Hershberg, 1996; Schmitz, 1989).

In Brazil, a significant amount of recent research has looked at how these changes are developing within the firms (intra-firm relations).[1] There is, however, much less research on the outsourcing of production activities and inter-firm relations. Since the mid-1980s, however, the externalisation of activities has been an important element in the 'rationalisation' strategies of Brazilian firms facing a crisis in the internal market and increasing international competition. A number of studies show that in order to face the economic crisis, many firms began to introduce new efficiency-oriented models and new goals and principles of organisation, where the externalisation of productive activities was an important

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[1] See Abramo (1990); Hirata (1992); Castro (1994); Castro and Leite (1994); and Abreu (1994) for recent analyses of Brazilian production.

issue. This process of restructuring is still ongoing and has been strengthened by the stabilisation of the economy in the mid-1990s.

This paper will look at the process of restructuring in the Brazilian auto-parts industry, using data collected in 53 auto-parts firms, located in three different regions of Brazil (see Tables 1-3): Campinas (São Paulo), Rio de Janeiro and Porto Alegre (Rio Grande do Sul). Data was collected between August 1996 and May 1997. In Campinas, the research studied a medium-sized firm producing brakes and ten of its suppliers (medium and small scale). In Rio Grande do Sul, the research gathered data on nine auto-parts firms and seven suppliers for three of those firms. In Rio de Janeiro, the research outline was different from the two other regions, since all 26 auto-parts firms in operation were interviewed.[2] Of these, however, only nine were direct suppliers to the automobile assemblers; three others supplied parts to other auto-parts firms and the rest worked with the after-sales market.

**Table 1 - Firms by Position in the Automotive Production Chain**

| Position | Number of Firms and (%) | | | |
|---|---|---|---|---|
| | **Campinas/SP** | **Rio Grande do Sul** | **Rio de Janeiro** | **Total** |
| First tier* | 3 (27.4) | 7 (43.8) | 10 (38.5) | 20 (37.7) |
| Second tier** | 8 (63.6) | 3 (18.7) | 3 (11.5) | 14 (26.4) |
| Third tier*** | - | 2 (12.5) | - | 2 (3.8) |
| After sales | - | 4 (25.0) | 13 (50.0) | 17 (32.1) |
| **Total** | **11 (100.0)** | **16 (100.0)** | **26 (100.0)** | **53 (100.0)** |

* First-tier firms sell directly to car assemblers. They may also sell to other auto-parts firms and to the after-sales market

** Second-tier firms sell mainly to other auto-parts producers

*** Third-tier firms sell to firms producing parts and components for auto-parts system producers

**Source**: Fieldwork (1996-97)

[2] The larger questionnaire regarding inter-firm relations was answered, however, by only 24 of the firms. Tables relating to this topic will, therefore, have only 24 firms as total.

**Table 2 - Year of Foundation**

| Years | Number of Firms and (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul | Rio de Janeiro | Total |
| Before 1950 | - | 1 (6.3) | 5 (19.2) | 6 (11.3) |
| 1950-79 | 4 (36.4) | 9 (56.2) | 17 (65.4) | 30 (56.6) |
| 1980s | 6 (54.5) | 5 (31.2) | 2 (7.8) | 13 (24.5) |
| 1990s | 1 (9.1) | 1 (6.3) | 1 (3.8) | 3 (5.7) |
| N/A | - | - | 1 (3.8) | 1 (1.9) |
| **Total** | **11 (100.0)** | **16 (100.0)** | **26 (100.0)** | **53 (100.0)** |

**Source:** Fieldwork (1996-97).

**Table 3 - Capital Property and Type of Company**

| Capital property and type of company | Number of Firms and (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul | Rio de Janeiro | Total |
| Multinational* | 1 (9.1) | 1 (6.3) | 6 (23.1) | 8 (15.1) |
| National | 10 (90.9) | 15 (93.7) | 20 (76.9) | 45 (84.9) |
| **Total** | **11 (100.0)** | **16 (100.0)** | **26 (100.0)** | **53 (100.0)** |
| *Sociedade Anônima* | - | 8 (50.0) | 8 (30.8) | 16 (30.2) |
| *Sociedade Limitada* | 11 (100.0) | 8 (50.0) | 18 (69.2) | 37 (69.8) |
| **Total** | **11 (100.0)** | **16 (100.0)** | **26 (100.0)** | **53 (100.0)** |

* The multinational firm in Campinas/SP is of US origin, the one in Rio Grande do Sul is a subsidiary firm of a German multinational and the firms at Rio de Janeiro are of US, French, German and Japanese origin.

**Source:** Fieldwork (1996-97).

**Table 4 - Sales (1996)**

| Sales | Number of Firms and (%) | | | |
|---|---|---|---|---|
| US$ thousand | Campinas/ SP | Rio Grande do Sul* | Rio de Janeiro | Total |
| Up to 110 | - | 2 (12.5) | - | **2 (3.8)** |
| 111-656 | 1 (9.1) | 1 (6.3) | 1 (3.8) | **3 (5.7)** |
| 657-2,000 | 3 (27.3) | 1 (6.3) | 4 (15.4) | **8 (15.1)** |
| 2,001-10,000 | 3 (27.3) | 3 (18.7) | 4 (15.4) | **10 (18.8)** |
| 10,001-25,000 | 1 (9.1) | 3 (18.7) | 2 (7.8) | **6 (11.3)** |
| 25,001-50,000 | 1 (9.1) | 1 (6.3) | 1 (3.8) | **3 (5.7)** |
| More than 50,000 | 1 (9.1) | 2 (12.5) | 1 (3.8) | **4 (7.5)** |
| N/A. | 1 (9.1) | 3 (18.7) | 13 (50.0) | **17 (32.1)** |
| **Total** | **11 (100.0)** | **16 (100.0)** | **26 (100.0)** | **53 (100.0)** |

* The figures are for 1995 in the case of some firms
**Source:** Fieldwork (1996-97).
N/A – Not available

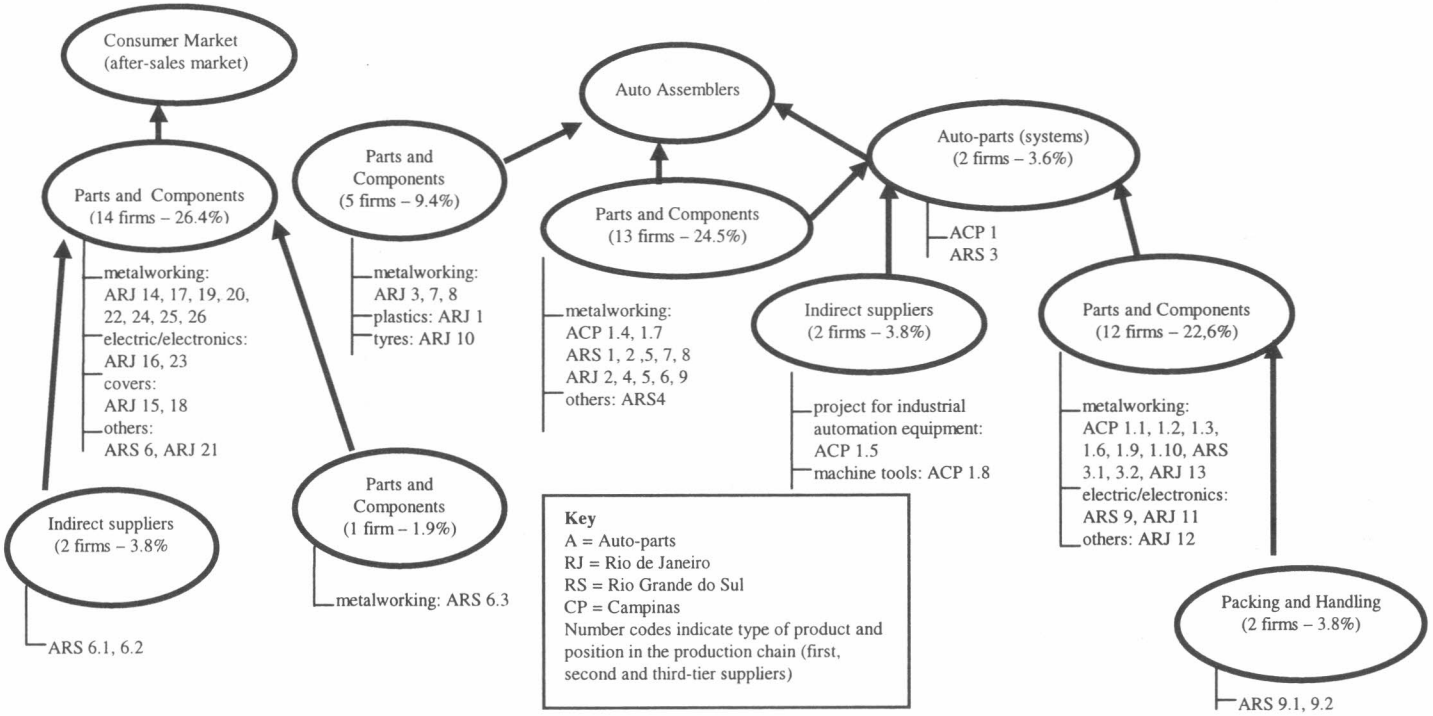
**Table 5 - Number of Workers (1996)**

| Number of Workers | Number of Firms and (%) | | | |
|---|---|---|---|---|
| | Campinas/ SP | Rio Grande do Sul | Rio de Janeiro | Total |
| No workers* | - | 2 (12.5) | - | **2 (3.8)** |
| 1- 0 | 3 (27.3) | 4 (25.0) | 4 (15.5) | **11 (20.8)** |
| 31 - 60 | 2 (18.2) | 1 (6.2) | 5 (19.2) | **8 (15.1)** |
| 61 - 125 | 1 (9.1) | 1 (6.2) | 4 (15.5) | **6 (11.3)** |
| 126 - 250 | 3 (27.3) | 2 (12.5) | 1 (3.8) | **6 (11.3)** |
| 251 - 500 | 2 (18.2) | 4 (25.0) | 7 (26.9) | **13 (24.5)** |
| 501 - 1000 | - | 1 (6.2) | 3 (11.5) | **4 (7.5)** |
| 1001 - 2000 | - | - | 1 (3.8) | **1 (1.9)** |
| 2001 - 4000 | - | 1 (6.2) | 1 (3.8) | **2 (3.8)** |
| More than 4001 | - | - | - | - |
| **Total** | **11 (100.0)** | **16 (100.0)** | **26 (100.0)** | **53 (100.0)** |

* This is a family firm with no hired workers.
**Source:** Fieldwork (1996-97).

Using the concept of a productive chain as a reference point, the research aimed to study not only the level of diffusion of technological and organisational innovations within the firms, but also how these changes affect the reallocation of activities along the production chain. In this sense, it was thought that the introduction of strategies of focused production and externalisation of activities to the top of the chain would affect the organisational structures of the chain as a whole. The main focus of the research was, therefore, inter-firm relations, but it also looked at the impact of these new strategies on local labour markets and local institutions.

## Figure 1 - Position of Auto-Parts Firms in the Automotive Production Chain



The central hypothesis of this paper is that the externalisation and/or internalisation of processes that are being implemented by the large client firms result in a major re-composition of industrial workers in those sectors. This in turn points to a substantial change in the job and work relations structures, creating new challenges for the social actors involved. The final objective of the research is, therefore, to understand the new industrial fabric that is being created by this profound restructuring process and its impact on the Brazilian working class.

## The Brazilian automotive industry

The automotive chain, and particularly the auto-parts industry, has been subject to an intense restructuring process in the last decade. This makes their study particularly important. The auto-parts industry – especially the leading firms in this sector – is critical to the understanding of the dynamics of technological innovation in the metal-mechanical complex (see Figure 1). This industry occupies a crucial position between, on the one hand, the large auto assemblers and, on the other, the large chemical, metallurgical and machine industries. Innovations in the auto-parts industry affect the industrial matrix both upstream and downstream.

In 1995 the automotive industry[3] was responsible for approximately 3.8 per cent of total Gross Domestic Product (GDP) and 12.9 per cent of industrial GDP in Brazil (Associação Nacional de Fabricantes de Veículos Automotores (ANFAVEA), 1996 and Sindicado Nacional da Indústria de Componentes para Veículos Automotores (SINDIPEÇAS), 1996). It generated a total of 5.4 million jobs directly and indirectly,[4] including 214,000 in the auto-parts sector and 115,000 in the auto assembly sector (ANFAVEA, 1996). In 1989, however, this same sector had been responsible for 7.1 per cent of total GDP and 21.6 per cent of industrial GDP, creating 5.6 million direct and indirect jobs, with 310,000 in the auto-parts industry and 143,000 in auto assembly. In absolute terms, sales grew from US$24.4 billion in 1989 to US$26 billion in 1995, with production soaring from 1.06 million cars in 1989 to 1.63 million in 1995, while direct employment fell from 453,000 in 1989 to 329,000 in 1995 (ANFAVEA, 1996).

In the past few years there has been an enormous productivity increase, with increases in investment and sales and a sharp decline in employment. This is due to an intense restructuring process, which occurred in a period of crisis and economic recession in the internal market associated with an increase in international competition, fostered by the gradual discarding of the import substitution policy. In the 1990s there has been a new phase of significant structural changes in the world automotive industry and in the place occupied by the Brazilian automotive sector in this restructuring process. In the previous decade, firms used exports as a way out

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[3] Defined as motor vehicles, motor-powered agricultural machines and auto-parts.

[4] The upstream and downstream links of the automotive industry involve more than 30 economic sectors: mining; steel; glass; tyres; chemical products; batteries; alcohol and petrol; transport services; sales; marketing, etc. The auto-parts industry is in a key position between the car assemblers and basic inputs industries.

of the crisis in the internal market. This was particularly true in the auto-parts industry. In the 1990s, by contrast, the opening was 'to the inside' (importing). The last few years have seen a sharp increase in the absolute and relative participation of foreign vehicles in the Brazilian consumer market. The constitution of regional blocs is also very significant, with MERCOSUL (Argentina, Brazil, Paraguay and Uruguay) increasing its share of the automotive market and redistributing industrial plants among those countries (Gitahy and Bresciani, 1997).

**Table 6 - Production, Employment, Sales, Investment, Imports, Exports and Productivity in the Brazilian Automotive Industry, 1970-95**[1]

| Year | Workforce (1000) | Production (1000 Units) | Cars/ Workers | Exports (1000 Units) | Exports/ Production (%) | Exports/ Sales (%) |
|---|---|---|---|---|---|---|
| 1970 | 65.9 | 416.1 | 6.3 | 0.4 | 0.09 | 0.1 |
| 1971 | 71.4 | 517.0 | 7.2 | 1.7 | 0.32 | 0.1 |
| 1972 | 80.4 | 622.2 | 7.7 | 13.5 | 2.09 | 0.5 |
| 1973 | 96.1 | 750.4 | 7.8 | 24.5 | 3.20 | 0.5 |
| 1974 | 104.1 | 905.9 | 8.7 | 64.7 | 7.07 | 1.4 |
| 1975 | 104.6 | 930.2 | 8.8 | 73.1 | 7.84 | 2.0 |
| 1976 | 112.4 | 986.6 | 8.8 | 80.4 | 8.11 | 2.3 |
| 1977 | 111.5 | 921.2 | 8.3 | 70.0 | 7.60 | 3.0 |
| 1978 | 123.9 | 1,064.0 | 8.6 | 96.2 | 9.02 | 3.4 |
| 1979 | 127.1 | 1,128.0 | 8.9 | 105.6 | 9.31 | 4.6 |
| 1980 | 133.7 | 1,165.2 | 8.7 | 157.1 | 13.47 | 7.0 |
| 1981 | 104.0 | 780.9 | 7.5 | 212.7 | 27.23 | 13.1 |
| 1982 | 107.1 | 859.3 | 8.0 | 173.4 | 20.17 | 8.4 |
| 1983 | 101.1 | 896.5 | 8.9 | 168.6 | 18.81 | 9.1 |
| 1984 | 107.4 | 864.7 | 8.0 | 196.5 | 22.72 | 11.2 |
| 1985 | 122.2 | 966.7 | 7.9 | 207.6 | 21.47 | 9.8 |
| 1986 | 129.2 | 1,056.3 | 8.2 | 183.3 | 17.30 | 9.5 |
| 1987 | 113.5 | 920.1 | 8.1 | 345.6 | 37.55 | 14.6 |
| 1988 | 113.0 | 1,068.8 | 9.5 | 320.5 | 29.98 | 13.8 |
| 1989 | 118.4 | 1,013.3 | 8.6 | 253.7 | 25.04 | 14.6 |
| 1990 | 117.4 | 914.5 | 7.8 | 187.3 | 20.48 | 14.5 |
| 1991 | 109.4 | 960.0 | 8.8 | 193.1 | 20.11 | 14.2 |
| 1992 | 105.7 | 1,073.9 | 10.2 | 341.9 | 31.80 | 18.0 |
| 1993 | 106.7 | 1,391.4 | 13.0 | 331.5 | 23.80 | 13.7 |
| 1994 | 107.1 | 1,581.4 | 14.8 | 377.6 | 23.87 | 11.4 |
| 1995 | 104.6 | 1.629.0 | 15.6 | 263.0 | 16.15 | 9.8 |

**Table 6 (Continued)**

| Year | Exports US$ Millions | Imports US$ Millions | Investment US$ Millions | Investment/ Sales (%) | Sales US$ Billions Net[2] | Sales/ Worker US$1000 |
|---|---|---|---|---|---|---|
| 1970 | 8.9 | 69.1 | N/A | N/A | 8.0 | 122.0 |
| 1971 | 12.5 | 83.2 | N/A | N/A | 9.4 | 131.6 |
| 1972 | 54.1 | 97.6 | N/A | N/A | 11.0 | 136.5 |
| 1973 | 63.0 | 207.5 | N/A | N/A | 12.8 | 133.5 |
| 1974 | 203.8 | 347.9 | N/A | N/A | 14.8 | 142.0 |
| 1975 | 334.1 | 302.4 | N/A | N/A | 16.6 | 158.5 |
| 1976 | 385.7 | 235.1 | N/A | N/A | 16.4 | 146.3 |
| 1977 | 490.3 | 226.3 | N/A | N/A | 16.4 | 147.0 |
| 1978 | 610.4 | 292. 9 | N/A | N/A | 18.0 | 145.3 |
| 1979 | 759.7 | 276.4 | N/A | N/A | 16.6 | 130.5 |
| 1980 | 1,101.2 | 524.2 | 488.9 | 3.1 | 15. 7 | 117.1 |
| 1981 | 1,566.4 | 468.7 | 644.8 | 5.3 | 12.0 | 115.4 |
| 1982 | 1,154.8 | 318.4 | 529.6 | 3.8 | 13.8 | 128.4 |
| 1983 | 1,187.1 | 367.7 | 372.9 | 2.8 | 13.0 | 128.8 |
| 1984 | 1,433.5 | 394.6 | 292.9 | 2.3 | 12.8 | 119.4 |
| 1985 | 1,603.7 | 435.5 | 477.9 | 2.9 | 16.3 | 133.2 |
| 1986 | 1,487. 6 | 656.2 | 525.8 | 3.3 | 15.6 | 120.8 |
| 1987 | 2,453.1 | 826.3 | 579.7 | 3.4 | 16.8 | 147.8 |
| 1988 | 2,617.7 | 695.6 | 572.4 | 3.0 | 18.9 | 167.6 |
| 1989 | 2,570.0 | 678.1 | 601.5 | 3.4 | 17.6 | 148.4 |
| 1990 | 1,897.5 | 733.1 | 789.8 | 6.0 | 13.1 | 111.6 |
| 1991 | 1,915.4 | 848.7 | 880.1 | 6.5 | 13.5 | 123.0 |
| 1992 | 3,012.2 | 1,078.8 | 908.2 | 5.4 | 16.7 | 158.2 |
| 1993 | 2,660.3 | 1,809.5 | 885.7 | 4.6 | 19.4 | 181.5 |
| 1994 | 2,684.9 | 2,550.5 | 1,195.0 | 5.0 | 23.5 | 219.7 |
| 1995 | 2,415.1 | 4,795.3 | 1,693.8 | 6.9 | 24.5 | 234.0 |

1. Cars, light commercial vehicles, trucks and buses
2. Sales after tax deductions. Real prices for 1995 converted to US$ using December exchange rate

N/A – Not available

**Source**: ANFAVEA (1996)

**Table 7 - Employment, Sales, Productivity, Investments, Exports, Imports and Idle Capacity in the Brazilian Auto-Parts Industry (1974-95)**

| Year | Workforce (1000) | Sales in US$ Billion Gross1 | Sales/ Worker (US$ 1000) | Exports Direct/Indirect (US$ Million) | Imports (Value in US$ Billion) |
|---|---|---|---|---|---|
| 1974 | 200.0 | 2.5 | 12.5 | 165 | N/A |
| 1975 | 230.0 | 2.7 | 11.7 | 248 | N/A |
| 1976 | 225.7 | 3.2 | 14.1 | 287 | N/A |
| 1977 | 235.0 | 3.3 | 14.2 | 490 | N/A |
| 1978 | 270.0 | 4.4 | 16.3 | 640 | N/A |
| 1979 | 273.0 | 4.8 | 17.9 | 718 | N/A |
| 1980 | 278.6 | 5.3 | 19.0 | 733 | N/A |
| 1981 | 198.4 | 4.3 | 21.9 | 825 | N/A |
| 1982 | 219.5 | 5.0 | 22.7 | 659 | N/A |
| 1983 | 211.0 | 3.7 | 17.8 | 799 | N/A |
| 1984 | 240.1 | 4.8 | 20.1 | 1265 | N/A |
| 1985 | 260.8 | 5.5 | 21.2 | 1397 | N/A |
| 1986 | 291.7 | 6.6 | 22.7 | 1402 | N/A |
| 1987 | 280.8 | 8.3 | 29.7 | 1697 | N/A |
| 1988 | 288.3 | 10.5 | 36.3 | 2081 | N/A |
| 1989 | 309.7 | 15.5 | 50.2 | 2120 | 0.7 |
| 1990 | 285.2 | 12.2 | 42.7 | 2127 | 0.8 |
| 1991 | 255.6 | 9.8 | 38.3 | 2048 | 0.8 |
| 1992 | 231.0 | 10.1 | 43.7 | 2312 | 1.0 |
| 1993 | 235.9 | 13.2 | 55.9 | 2665 | 1.5 |
| 1994 | 236.6 | 14.3 | 60.4 | 2985 | 2.0 |
| 1995 | 214.0 | 16.5 | 77.1 | 3300 | 2.8 |

**Table 7 (Continued)**

| Year | Exports/ Sales (%) | Investments (US$ Million) | Investment/ Sales(%) | Idle Capacity |
|---|---|---|---|---|
| 1974 | - | 574 | 22.9 | N/A |
| 1975 | - | 229 | 8.4 | N/A |
| 1976 | - | 290 | 9.1 | N/A |
| 1977 | 3.1 | 325 | 9.8 | N/A |
| 1978 | 3.7 | 227 | 5.1 | 16.5 |
| 1979 | 4.0 | 265 | 5.0 | 20.7 |
| 1980 | 5.8 | 284 | 5.3 | 20.8 |
| 1981 | 6.2 | 226 | 5.2 | 33.2 |
| 1982 | 6.7 | 271 | 5.4 | 29.4 |
| 1983 | 9.2 | 189 | 5.1 | 30.1 |
| 1984 | 15.0 | 232 | 4.8 | 22.3 |
| 1985 | 12.7 | 254 | 4.6 | 19.8 |
| 1986 | 13.4 | 430 | 6.5 | 15.7 |
| 1987 | 16.3 | 440 | 5.3 | 16.8 |
| 1988 | 13.1 | 628 | 5.9 | 17.0 |
| 1989 | 10.2 | 1061 | 6.8 | 17.8 |
| 1990 | 11.2 | 987 | 8.1 | 25.7 |
| 1991 | 13.5 | 764 | 7.7 | 26.9 |
| 1992 | 15.1 | 715 | 7.1 | 27.8 |
| 1993 | 15.7 | 702 | 5.3 | 19.8 |
| 1994 | 15.5 | 883 | 6.1 | 17.3 |
| 1995 | 17.0 | 1500 | 9.1 | 20.0 |

1 - Converted at average annual exchange rate

Source: SINDIPEÇAS, 1996

**Table 8 - Auto-Parts Production by Type of Market (% of Sales)**

| Year | Assemblers | After-Sales | Exports | Other Auto-Parts |
|---|---|---|---|---|
| 1977 | 72.8 | 18.5 | 3.1 | 5.6 |
| 1978 | 70.7 | 21.6 | 3.7 | 4.0 |
| 1979 | 71.2 | 19.5 | 4.0 | 5.3 |
| 1980 | 70.7 | 18.4 | 5.8 | 5.1 |
| 1981 | 65.0 | 21.6 | 6.2 | 6.7 |
| 1982 | 65.0 | 20.0 | 6.7 | 8.3 |
| 1983 | 62.8 | 22.7 | 9.2 | 5.3 |
| 1984 | 58.9 | 21.6 | 15.0 | 4.5 |
| 1985 | 60.3 | 22.5 | 12.7 | 4.5 |
| 1986 | 56.2 | 25.1 | 13.4 | 5.3 |
| 1987 | 51.3 | 27.2 | 16.3 | 5.2 |
| 1988 | 60.3 | 21.3 | 13.1 | 5.3 |
| 1989 | 59.7 | 24.8 | 10.2 | 5.3 |
| 1990 | 57.7 | 26.0 | 11.2 | 5.2 |
| 1991 | 59.5 | 22.3 | 13.5 | 4.7 |
| 1992 | 60.1 | 20.3 | 15.1 | 4.5 |
| 1993 | 61.6 | 17.5 | 15.7 | 5.2 |
| 1994 | 60.4 | 19.3 | 15.5 | 4.8 |
| 1995 | 58.0 | 20.0 | 17.0 | 5.0 |

**Source:** SINDIPEÇAS, 1996

**Table 9 - Geographical Distribution of the Brazilian Auto-Parts Firms by Number of Industrial Units and Employment in July 1990 and July 1995 (%)**

| | SP/Capital | | SP/ABCD | | Other SP | | SP/Interior | | Other States | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 1990 | 1995 | 1990 | 1995 | 1990 | 1995 | 1990 | 1995 |
| Industrial Units | 38.8 | 33.6 | 18.9 | 18.2 | 14.8 | 15.9 | 16.8 | 19.0 | 10.7 | 13.3 |
| Employment | 29.3 | 22.6 | 15.5 | 16.9 | 19.5 | 18.4 | 24.1 | 25.7 | 11.6 | 16.7 |

**Industrial Units**: 549 in 1990 and 548 in 1995
**Employment:** 285,200 in 1990 and 214,000 in 1995
**Source:** SINDIPEÇAS, 1991 and 1996
**Note:** SP = São Paulo
ABCD = Greater São Paulo

**Table 10 - Auto-Parts Exports by Region and Main Countries (%)**

| Region/Country | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|
| North America* | 61.8 | 67.0 | 65.9 | 62.4 | 62.2 | 61.3 | 53.8 | 49.2 | 50.3 | 48.9 |
| USA | 57.9 | 64.2 | 62.8 | 59.5 | 56.6 | 51.1 | 43.4 | 37.7 | 40.6 | 40.5 |
| Mexico | 3.6 | N/A | N/A | N/A | 5.0 | 9.3 | 9.8 | 11.0 | 9.3 | 8.0 |
| Europe | 21.2 | 17.5 | 16.8 | 18.8 | 22.7 | 22.3 | 24.4 | 20.2 | 14.1 | 15.0 |
| Germany | 4.7 | 4.3 | 3.8 | 5.1 | 6.6 | 8.4 | 9.2 | 9.2 | 7.2 | 7.1 |
| UK | N/A | 5.3 | 6.1 | 7.6 | 8.0 | 6.2 | 6.9 | 6.0 | 3.2 | 2.4 |
| Italy | 11.6 | 5.7 | 4.8 | 2.9 | 3.5 | N/A | N/A | N/A | N/A | 2.5 |
| South America | 8.0 | 9.8 | 10.4 | 10.8 | 7.0 | 8.4 | 14.1 | 24.8 | 29.6 | 30.2 |
| Argentina | 3.2 | 4.6 | 4.8 | 4.3 | N/A | 3.7 | 7.5 | 18.0 | 22.2 | 23.3 |
| Asia | 4.9 | 3.3 | 4.0 | 4.9 | 5.6 | 5.6 | 4.8 | 3.1 | 3.4 | 3.6 |
| Africa | 3.3 | 1.7 | 2.1 | 2.3 | 1.8 | 1.7 | 2.2 | 1.9 | 1.8 | 1.6 |
| Central America and Caribbean | 0.8 | 0.7 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | 0.7 |
| **Exports in US$ billions** | **1.39** | **1.40** | **1.67** | **2.08** | **2.12** | **2.12** | **2.04** | **2.31** | **2.66** | **2.98** |

**Source:** SINDIPEÇAS, 1996
* - North America – USA, Canada and Mexico.
N/A - Not available

The most important trends over the decade for the automotive production chain in Brazil are as follows:

1. Economic stability associated with a policy of attracting new investment and the pressure to restructure as a strategy for facing new international and national competition has resulted in increased investment, associated with a strong movement towards relocation of the industrial plants in the automotive production chain. In a context of increased production, sales and investment, with a fall in employment (see Tables 6 and 7), the location of new plants and the closing of old ones has generated intense disputes and growing antagonism between different unions.

2. The intensification of competition, both within Brazil and internationally, has led to a strong movement towards concentration in the auto-parts sector, with joint ventures, acquisitions and the closing of firms (see Tables 8 and 9).

3. There has been a significant increase in imports, especially direct imports by assemblers, which exceeded exports in 1995 (see Tables 6 and 7).

4. The MERCOSUL countries have become more important as markets for auto-parts exports (see Table 10).

## The auto-parts industry in the three regions

The three regions have very different industrial histories and this is reflected in the profile of the auto-parts industry in each one of them. The auto-parts industry in Rio de Janeiro is characteristic, in many ways, of an old and decadent sector. It was an important player in the constitutive period of the Brazilian automotive industry in the 1950s and 1960s. One of the first automotive plants, the Fábrica Nacional de Motores, was in Rio, and this had a key role in the institutionalisation of the industry (Ramalho, 1989). The closure of this plant in later years diminished the importance of this sector in the region. The data gathered for this research shows that one of the firms now in operation was created in 1890, but the majority were created between 1959 and 1980 (see Table 2). Of the 26 auto-parts firms visited, more than half sell in the after-sales market and only nine have direct links with the assembly plants in São Paulo. The Rio de Janeiro auto-parts industry, however, is facing very important changes, with the installation of several assembly plants in the region itself or in bordering regions such as the Volkswagen and Peugeot plant at Resende and the Mercedes Benz plant in the south of Minas Gerais.

The metalworking industry of Rio Grande do Sul was by origin closely related to agricultural production and the firms had different phases of adaptation to the different industrialisation periods. The switch to auto-parts started in the 1950s and 1960s. The nine client firms studied were created between 1887 and 1976, while the seven suppliers were created between 1968 and 1993, five of them in the 1980s.

The region of Campinas, São Paulo, on the other hand, has a very dynamic industrial sector, which grew steadily even during the 1980s – the 'lost decade' for most of Brazilian industry. Metalworking industries have a long tradition in the region, dating back to the 1930s, when the main national machine-tool firms were created. Other national and multinational groups installed plants in the Campinas region in different phases of the import substitution process, among them leading auto-parts firms such as Bosch (1958), Clark (1959) and Varga (1945).[5] A large transportation, services and educational infrastructure supports this dense economic fabric.[6] Campinas also has a privileged location, close to the main industrial centres of the country. It is in this sort of structure, more linked to the ideal of an industrial zone than to that of an industrial district, that one sees the formation of different types of cooperation networks linking groups of firms and different technological institutions and services in many areas.[7] This process has been fostered by the geographical location of universities and other institutions (Ruas et al, 1994), as well as by the action of local level administration.

The small and medium-sized firms studied in Campinas were created between 1951 and 1991. They have gone through different phases, associated first with the industrial expansion of the late 1960s, then with the economic crisis and the

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[5] Several multinational auto-parts firms came to Brazil following their client firms.

[6] The Campinas region has several universities, many technological research centres and an important network of technical schools.

[7] See Gitahy, Rabelo and Costa, 1988; Rabelo, 1989; Gitahy, Rabelo and Costa, 1990; Gitahy and Rabelo, 1991; Gitahy, Rabelo and Costa, 1992; Ruas, Gitahy, Rabelo and Antunes, 1994.

'defensive' restructuring of the 1980s, and finally with the intensified externalisation of activities by the large firms from the early 1990s. It should borne in mind that the vertical integration of the large firms ended in the 1980s, promoting the creation of small firms by former workers with or without the help of their erstwhile bosses.

The great majority of the owners of the small and medium-sized firms created in Campinas up until the mid-1980s consisted of workers trained in the professional training system (SENAI and technical schools).[8] Many of the owners, such as Robert Bosch, had also worked in large firms in the region and this stimulated the creation of several small firms. It is important to place this in the context of networks of innovation, i.e. of the conditions formed by these institutions in the constitution of a type of 'industrial culture' that stimulates the interest in 'one's own business' and investment in technological innovation.

## Productive restructuring in the automotive chain

The Brazilian automobile industry started as an international industry. Multinationals were given special incentives to install plants in Brazil, as part of the import substitution policy then prevailing in the country. From the multinationals' point of view, this fitted the new 'international division of labour', and access to the large and unexplored internal market in Brazil was an important consideration.[9] This industry had a steady growth until 1980, based on a protected and expanding internal market. In the early 1980s this situation changed, with several years of crisis and recession, which led to a 30 per cent reduction in production and employment. The early 1980s were also years of important changes in the industry worldwide, with the Japanese entering the US and European markets. All these factors led to the beginning of a restructuring process, with the eventual abandonment of the import substitution policy.

In the mid-1980s, the response to the crisis was an increase in exports, mainly to Europe and the United States. This in turn led to what has been called a defensive restructuring of the leading firms.[10] Increasing exports as a compensation for recession in the internal market was helped by export incentive policies put in practice at that time. This in turn led to a concern with quality,[11] although changes

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[8] SENAI – Serviço Nacional de Aprendizagem Industrial (National System of Industrial Learning). One such example is provided by a graduate of the Escola Profissional Ferroviaria (Railway Professional School), closed in 1968, who stated 'the great encouragement (to create my firm) was the Railway Professional School, which had a very strong syllabus, even Latin, several foreign languages and eight hours of schooling a day, both practical and theoretical'.

[9] The international literature shows that during this period there was a strong restructuring of the world industry with a 'new international division of labour'. Several of the large car manufacturers from Europe and the United States installed plants in Brazil in the late 1950s and were followed by their main auto-parts suppliers (Gitahy and Bresciani, 1997).

[10] Brazilian literature defines a 'defensive restructuring' as when no new plants or equipment/machinery are involved, but rather changes in organisational and management aspects of existing plants. This restructuring was strongly influenced by the Japanese model of 'lean production'.

[11] From 1992 ISO 9000 was a requirement for the European market.

were introduced only partially and more through reorganisation than through large investments in new machinery.

The economic crisis of 1990-92 and the opening up of the Brazilian economy intensified this restructuring process. With economic stability firms made new investments, new firms came to Brazil and there was a strong geographical reallocation of the automotive industry, previously highly concentrated in São Paulo.

The 53 firms studied occupied very different places in the automotive production chain (see Figure 1). It is therefore interesting to see that all firms visited were in the process of introducing some kind of technological and/or organisational innovation.[12] The reasons given for this were related to cost reduction and quality improvement, although the type of restructuring varied.

**Table 11 - Year Mentioned as the Beginning of Restructuring**

| Period | Number of Firms and (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul* | Rio de Janeiro | Total |
| Before 1985 | 1 (9.1) | - | - | 1 (2.2) |
| 1985-1990 | 2 (18.2) | - | 4 (15.4) | 6 (13.0) |
| 1991-1993 | 1 (9.1) | 3 (33.3) | 16 (61.5) | 20 (43.6) |
| 1994-1995 | 6 (54.5) | 3 (33.3) | - | 9 (19.6) |
| 1996-1997 | 1 (9.1) | - | 1 (3.8) | 2 (4.3) |
| N/A** | - | 3 (33.3) | 3 (11.5) | 6 (13.0) |
| No Restructuring | - | - | 2 (7.7) | 2 (4.3) |
| **Total** | **11 (100.0)** | **9 (100.0)** | **26 (100.0)** | **46 (100.0)** |

* Seven firms in Rio Grande do Sul had no data on restructuring

** There was no information on when restructuring was started, but restructuring was said to be in process

**Source:** Fieldwork (1996-97).

In Rio de Janeiro, 1992 seems have been a critical year for the introduction of changes and the types of changes introduced were related to the links each firm had with the auto-assemblers (see Table 11). Ten of the 26 firms studied had direct links with assemblers, supplying parts to several of the Brazilian auto-assemblers in São Paulo (VW, Ford) and Minas Gerais (Fiat). At least five of these firms did, however, sell their products to the after-sales markets as well as to other auto-parts firms. At the time of the research, there were no firms producing auto-parts systems – all the firms in Rio de Janeiro produced single components. One of the nine leading firms could be called a global firm, since 70 per cent of its production was sold abroad, the remainder directly to auto-assemblers. It also had a global sourcing buying policy, with several European and US suppliers. Only three were second-tier

[12] Some tables are based on data for 51 firms, since two did not answer the longer questionnaire on innovations and inter-firm relations.

firms (see Table 1), supplying other auto-parts enterprises. All the others sold directly to the after-sales market. There was no regional specialisation, with a wide range of products being made, all single components, with little value added to the final product.

In Porto Alegre all nine client firms also pointed to the early 1990s (1991-94) as the beginning of restructuring (see Table 11). The research also looked at a small number of suppliers, and second- and third-tier firms. In Campinas, the production chain studied was that of a brake system for cars and lorries. The client firm had gone through a partial restructuring in the mid-1980s, but by the early 1990s had intensified this process. In the medium and small-scale firms at the second- and third-tier levels, partial restructuring took place with many new machines being bought, followed by some reorganisation. It seems that these smaller firms were going through the same processes larger firms had gone through in the 1980s. Again the reasons given by client firms for intensifying their restructuring process were linked to international and national competition, and pressures from the auto assemblers in Brazil, which were themselves subject to the same pressures.

It is clear that in Campinas the externalisation of production activities was something that had been going on since the beginning of the 1980s, at least in the larger firms. In the 1990s, this movement intensified in a more structured and systematic way, in a very different context – not of crisis, but rather of industrial growth. In this second phase, the externalisation of activities is clearly associated with policies of focusing, development and reduction of suppliers, and with quality enhancement. This was also true of the larger firms in Rio Grande do Sul. In the Rio de Janeiro auto-parts sector, however, the outsourcing of productive activities was much less frequent. This might be explained by the lower density of the industrial fabric at the state level.

## Inter-firm relations

One of the consequences of the restructuring process for companies in the auto-parts sector is the shift in the relationships between client firms and suppliers (vertical relationships). It is possible to identify some trends in the reorganisation of these relationships between the firms in the three regions:

1. Intensification in the trend towards outsourcing/internalising activities (auxiliary and productive) at all levels of the production chain, which implies a redefinition of the division of work among companies.

2. Tremendous pressure from client firms to formalise quality systems offered by their suppliers, reflected in regular audits and assessments and, more recently, in the demand for ISO 9000 certification.[13]

3. Growing demands for flexibility, meaning the capacity to cope promptly with frequent alterations in the scheduling of customer orders.

[13] ISO 9000 is an international system for the certification of firms, attesting to levels of quality in many aspects, such as management, production, etc.

In the first place one must stress that the movement towards externalisation and/or internalisation of activities and the resulting redefinition of the division of labour among firms in the auto-parts industry is extremely complex, heterogeneous and dynamic.[14] What we are seeing now is the result of a restructuring process that started among the large auto-parts firms in the 1980s. This has been accentuated in this decade, with flexibilisation, cost reduction and focusing being closely related to quality improvement.

As previous research has shown, however, this is a process of trial and error (Gitahy, 1994) and the introduction of these measures will depend on specific conditions. Their diffusion along the production chain is very dissimilar. This research provided some information on how, and to what degree, these processes are disseminated along the chain in the three regions.

The first finding is that outsourcing such activities as restaurant facilities and cleaning is very widespread. In all three regions and at all firm sizes, including the very small ones, these services were being externalised. The research also shows productive activities being externalised, but this is more diversified among the different firms and seems to depend on a variety of factors, some of which are outside the direct control of the individual firm. Regional differences seem to be particularly important in this matter.

It seems in fact that productive outsourcing affects two different types of activities:

1. Activities related to labour-intensive products or processes, which can be located outside the firm without affecting the production flow.
2. Activities related to more complex products or processes, in those densely industrialised regions that are capable of absorbing those activities with efficiency and reliability.

Some variables seem to be particularly important in defining which production activities are outsourced, and to whom. The type of product and/or process involved in outsourcing is a key variable for defining what is outsourced, and cost-cutting considerations are vital in this decision. On the one hand, labour-intensive processes for which location outside the company does not affect the production flow (such as assembly tasks and machining simple parts) are very frequently outsourced. For more complex products and/or processes, on the other hand, it depends on the availability of an industrial network that is sufficiently reliable and efficient in the region where the company is located.

In turn, the definition of to whom these outsourced production activities are assigned depends on variables relating to the nature of the relationships between the client firm and the supplier, and their intensity:

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[14] Programmes transferring activities that were formerly carried out by the employees of a specific company to outside agencies, meaning companies or institutions that operate either within (internalisation) or outside (externalisation) the premises of the company, are known as outsourced activities. This term is currently used by those involved in the outsourcing processes for activities, and describes a broad range of combinations and possibilities.

a) The track record of the relationship between the client firm and the supplier – that is, past experience, which determines levels of mutual trust.

b) The importance of the client firm to the supplier and *vice-versa*.

c) The combination of size (scale and investment capacity) and competence (technical capacity) of both client firms and suppliers.

In the Campinas region, the client firm increased its outsourcing of activities during the 1990s.[15] The outsourcing processes for direct and indirect production activities, as well as auxiliary aspects, have been the result of focusing in the company's core business, associated with cost-cutting policies. With regard to outsourcing production activities, the firm had gradually shut down in-house machine tooling. Instead it outsourced this to large suppliers, making good use of the highly developed regional industrial network, particularly to outsource more complex activities such as machine tooling.[16] On the other hand, the outsourcing of production activities does not seem to have been adopted by the suppliers visited, revealing that this trend has not yet spread throughout the rest of the production chain analysed in the region. Furthermore, this same client firm had internalised some production activities, through the acquisition of new equipment that allowed large-scale in-house production at lower costs than outside production, as well as the possibility of tightening controls over production flows. It also internalised some of its services, prompted by the lack of organisation and commitment of sub-contracted companies.

In Rio Grande do Sul, the externalisation/internalisation of production and service activities seems to be clearly associated with policies stressing a tighter focus on the core businesses of the client firms and the development and reduction of the number of suppliers.[17] This process is viewed by the firms visited in the region as crucial in responding to market instability, acting as a shield offering protection against peaks and troughs in demand, particularly for firms that supply the auto-assemblers directly. One of these enterprises is noteworthy for outsourcing production activities that are typically labour-intensive, supplying equipment to women homeworkers, who are recruited in the neighbourhood on a daily basis.[18] Another company outsourced a complex activity (tool-shop) that was then brought back in-house for reasons fundamentally related to production costs.[19] This example

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[15] The ACPI company outsourced 40-60% of its production activities, including smelting, aluminium injection and die-stamping, together with part of the machining and tool-shop activities, maintaining only the support tool-shop in-house.

[16] This trend did not appear in the samples from Rio Grande do Sul and Rio de Janeiro.

[17] However, in some cases the reduction in the number of suppliers displays a certain rigidity due to the nature of the assets used. For example, one of the companies visited, although it was a traditional supplier of the client firm, could not meet its requirements in regard to certain orders due to the size of the principal item of equipment (a furnace), which was incompatible with the products ordered.

[18] The ARS9 company outsourced packing activities and a process involving the introduction of small metal wires into plastic tubes, as well as welding, which was handled at the homes of the outsourced workers with machinery loaned by the client firm. There was no formal agreement.

[19] The ARS5 company tried to outsource its tool-shop activities but gave up as it did not note any cost

of an about-turn in the outsourcing trend of a complex activity may reflect the less intensive development of the industrial network in the region in question, compared to that of the Campinas area.

In Rio de Janeiro, few companies in the sample (three first-tier suppliers and three suppliers to the after-sales market) had externalised production activities. Those activities that were externalised were typically labour intensive: two companies in this group used homeworkers for simple operations.[20] However, several did outsource services such as administrative work, as well as canteen services, guards and maintenance.[21] This shows that the region is still at an earlier stage in the outsourcing process characteristic of the auto-parts sector.

Another widespread trend identified in the reorganisation of the relationships between client firms and suppliers is the tremendous pressure from client firms to formalise product quality from suppliers. This marks a clear-cut trend reflecting rising demands to introduce documentation and procedures related to production quality, parallel to rising pressures to trim costs. These demands are reflected in regular assessments and audits by the client firms and, to an increasing extent, pressures to obtain ISO 9000 certification. This type of assessment guides the selection of those to be maintained or eliminated by client firm in order to reduce the overall number of suppliers.

This process could be detected in the companies studied in the three regions, but with varying characteristics and intensity. In general, this initially involved a performance assessment of the supplier by the client firm, including regular assessments of the rejection rates for the product, prices and/or delivery periods, followed by visits by the client firm to the supplier in order to authorise supplies with 'guaranteed quality', resulting in the elimination of on-receipt controls at the client firm. This 'guaranteed quality' is generally followed by audits of the supplier quality system carried out by the client firms, covering additional information and more frequent visits to rank the suppliers. At a later stage, the client firm may require ISO 9000 certification, which in principle eliminates the need for them to audit their suppliers, as the certificatory agency carries out regular audits.

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advantage, and managers became apprehensive about their dependence on their suppliers for an item so crucial to the company's production line.

[20] Company ARJ15 outsourced piecework for stitching and finishing seat covers, and company ARJ23 outsourced the placement of small screws and bolts, and pre-assembly work.

[21] There have been cases of reversals in the outsourcing of production and auxiliary activities by companies in the region. One of the companies in the sample (ARJ16) outsourced the assembly of its product to some workers, but gave up on this initiative as idle areas were noted within its plant that did not justify the maintenance of outsourced assembly activities. Another company (ARJ24) had a brief trial of outsourcing its accounting activities, which were also brought back into the company.

**Table 12 - Auditing and/or Evaluation of Suppliers by Client Firms**

| Type of Auditing/Evaluation | Number of Firms and (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul | Rio de Janeiro | Total |
| Firms certified by ISO 9000 norms | 5 (45.4) | 8 (50.0) | 9 (37.5) | 22 (43.1) |
| No more auditing by clients after being certified | 1 (9.1) | - | 1 (4.2) | 2 (3.9) |
| Quality system of supplier audited by client firm | 9 (81.8) | 1 (6.3) | 8 (33.3) | 18 (35.3) |
| Total quality guaranteed | 2 (18.2) | 1[2] (6.3) | - | 3 (5.9) |
| Evaluation of supplier performance by client firm at client plant[1] | 3 (27.3) | - | 5 (20.8) | 8 (15.7) |
| Not applicable/no answer | - | 15 (93.7) | 12 (50.0) | 27 (52.9) |
| **Total number of firms** | **11** | **16** | **24** | **51** |

1. Evaluation of supplier performance includes periodical evaluation of product rejections, of price and delivery standards.
2. Client firm accepts 'total quality guaranteed' from only one of its suppliers.

NB Answers are not exclusive. Firms could indicate more than one option.

In the sample, 22 firms (43.1 per cent of the total) had already been certified (see Table 12). The requirement of certification was more frequent among firms higher in the production chain. Of all the companies certified, 16 were first-tier suppliers (of 20 in the sample) and six were second-tier suppliers (of the 14 in the sample), while no third-line or after-sales market suppliers had been certified. In only two companies (3.9 per cent) did this certification result in the elimination of audits. Moreover, the quality systems of 18 companies in the sample (35.3 per cent) were audited by client firms, three companies in the sample (5.9 per cent) provided supplies with guaranteed quality and the performance of eight companies (15.7 per cent) was assessed at the client firms, mainly through calculation and monitoring of rejection rates for their products.

A larger proportion of certified firms were found in Rio Grande do Sul and in the Campinas region. In Campinas, this requirement is also having a marked effect at other levels of the chain, reaching small and medium-sized enterprises. According to the interviewees, this mainly affected direct suppliers, though it is expected to an increasing extent by indirect suppliers. This region also featured a proportionately larger number of companies audited by their client firms, as well as suppliers offering guaranteed quality and supplier performance assessments through rejection rates at client firms. Rio de Janeiro listed the lowest proportion of certified companies (six first-tier suppliers and three second-tier suppliers) despite posting the largest absolute figures. There was also a large proportion of companies among those that replied to this question that had not undergone any audit/assessment process by their client firms (45.8 per cent of the companies in the regional sample).

## Table 13 - Inter-Firm Relations

| Client/Supplier Integration | Number of Firms and (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul | Rio de Janeiro | Total |
| **Product/Process Development** | | | | |
| Simple sales order | 1 (9.1) | 1 (6.3) | 17 (70.8) | 19 (37.3) |
| Specification by client | 8 (72.7) | 5 (31.2) | 5 (20.8) | 18 (35.3) |
| Joint product development | 3 (27.3) | - | 4 (16.7) | 7 (13.7) |
| Joint process development | 1 (9.1) | - | - | 1 (2.0) |
| Joint product and process development. | 1 (9.1) | 3 (18.7) | 5 (20.8) | 9 (17.6) |
| N/A | - | 7 (43.8) | 2 (8.3) | 9 (17.6) |
| **Forms of Help** | | | | |
| Formal help for a TQC programme | 1 (9.1) | - | 1 (4.2) | 2 (3.9) |
| Informal help for a TQC programme | 7 (63.6) | - | 4 (16.7) | 11 (21.6) |
| Courses and training for TQC | 4 (36.4) | 1 (6.3) | 4 (16.7) | 9 (17.6) |
| Use of laboratories | - | - | 1 (4.2) | 1 (2.0) |
| Help for organisation of production | 4 (36.4) | 4 (25.0) | 1 (4.2) | 9 (17.6) |
| Transportation of parts and products | 4 (36.4) | - | - | 4 (7.8) |
| Joint input buying | 1 (9.1) | - | - | 1 (2.0) |
| Anticipation of payment | 4 (36.4) | - | - | 4 (7.8) |
| No assistance whatsoever | - | - | 13 (54.2) | 13 (25.5) |
| N/A | 1 (9.1) | 11 (68.8) | 2 (8.3) | 14 (27.5) |
| **Delivery Frequency** | | | | |
| Daily | 4 (36.4) | - | 2 (8.3) | 6 (11.8) |
| Weekly | 5 (45.4) | - | 9 (37.5) | 14 (27.5) |
| Monthly | 5 (45.5) | - | 3 (12.5) | 8 (15.7) |
| According to orders | 2 (18.2) | - | 8 (33.3) | 10 (19.6) |
| N/A | - | 16 (100.0) | 4 (16.7) | 20 (39.2) |
| ***Just-in-time/Kanban*** | | | | |
| In operation | 5 (45.4) | 2 (12.5) | 2 (8.3) | 10 (19.6) |
| Planned | - | 1 (6.3) | - | 1 (2.0) |
| *No JIT/Kanban* | 4 (36.4) | 9 (56.3) | 6 (25.0) | 21 (41.2) |
| Not applicable | 1 (9.1) | - | 12 (50.0) | 13 (25.5) |
| N/A | 1 (9.1) | 4 (25.0) | 4 (16.7) | 9 (17.6) |
| **Total** | **11** | **16** | **24** | **51** |

N/A – Not available

TQC – Total Quality Control, a management system aiming at total quality in production.

*JIT – Just-in-Time*, a management system created in the Japanese car industry to adjust input demands and production, reducing stocks and costs of production. It can be used within the firm (internal *just-in-time*) or between client firms and suppliers (external *just-in-time*).

*Kanban* is a control system using cards to manage *just-in-time* production. Production and inputs are organised through cards containing information on each part being produced (name, code, number of pieces and where in the production line it is used).

NB Answers are not exclusive. Firms could indicate more than one option.

The strategies for reducing the number of suppliers (based on criteria related to quality performance, price and delivery periods) are shaped by the idea of establishing a more cooperative type of relationship with certain selected suppliers. This cooperation could take several different forms:

a) Formal or informal support for implementing quality systems in sub-contracted companies.

b) Support for the organisation of production.

c) Joint development of products and/or production processes.

d) Reaching longer-duration procurement agreements (see Table 13).

However, it should be stressed that the companies surveyed in the three regions generally made it clear that the assistance offered by the supplier development programmes of the client firms did not reach the levels required, meaning that although demands are stringent there is little effective assistance.

In the Campinas region, most of the companies considered (two first-tier and six second-tier suppliers) stated that they received some formal or informal support from a client firm towards implementing their quality systems.[22] Only one of the suppliers in the sample stated that it did not receive assistance in quality matters from its client firms, not even informal help. Some companies mentioned other types of assistance offered by some of their client firms, with the most frequent being the joint development of products and/or processes (all the first-tier and two second-tier suppliers). [23] Training for quality (one first-tier and three second-tier suppliers), support for the organisation of production and transportation of parts and products (two first-tier and two second-tier suppliers) and advances on payment (one first-tier and three second-tier suppliers) were also important. However, a frequent complaint among the supplier companies in the region was that high levels of demand had no counterpart in assistance offered by the client firm. They claimed that they were in a fragile position in the production chain, under pressure from major suppliers and client firms.

In Rio Grande do Sul, the relationship between the client firms in the sample and their outsourced suppliers was also marked by the uneven levels of demand imposed by the former on the latter and the respective support for undertaking modernisation processes and boosting productivity. Half the companies did not respond to the question on the forms of assistance offered by the principal client firms. However, some companies (one second-tier supplier, two third-line suppliers

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[22] For example, company ACP1.1 was offered courses on quality by a producer of headlights and tail-lights, which also made its staff available to exchange information on quality. Company ACP1.7 was formally assisted with the implementation of its quality programme through the efforts of technical staff seconded by a client firm. Company ACP1.9 was loaned material from client firm ACP1 to organise a statistical process control course; and the owner of company ACP1.10 took part in statistical process control and certification courses at UNICAMP through a partnership between this university, the client firm ACP1 and the Small Business Bureau (SEBRAE).

[23] This type of joint development seems to be more frequent with first-line suppliers, due to their proximity to their client firms.

and one spares-market supplier) admitted that they received support in organising production from some client firms, while one company in this same group (the spares-market supplier) stated that it received support from one of its client firms for quality training. Additionally, three first-tier suppliers admitted that they had developed a product and/or process jointly with some client firms.[24] The other supplier companies (due to the simplicity of the process in question, i.e. assembly) and client firms (due to the nature of the activities undertaken, i.e. mature or exclusive technologies) did not stress joint activities for developing products or processes to any great extent. A few cases warrant special attention, when support from client firms in practice means that the outsourced facilities represent an extension of the production plant of the client firm, or where the process was completely shut down and transferred to the premises of the supplier.[25]

Finally, in Rio de Janeiro, half the companies (one first-tier supplier, one second-tier supplier and ten spares-market suppliers) stated that they did not receive any type of support from their client firms, while the other spares suppliers did not reply to this question. The remainder of the companies mentioned the joint development of products and/or processes (seven first-tier and two second-tier suppliers); support for the implementation of quality systems (three first-tier and two second-tier suppliers); training for quality (four first-tier suppliers); and the organisation of production (one first-tier supplier). It thus seems that the companies in this region are less protected in terms of assistance supplied by their client firms, although they are also under unceasing pressure to enhance quality, cut costs and be more flexible, particularly because this sample included a large number of spares-market suppliers, in addition to first-tier suppliers manufacturing discrete products sold directly to the main assemblers. This places them in a relatively fragile position in the production chain, caught between the major suppliers of raw materials and other basic input goods, and the major auto-assemblers as client firms. [26]

The third trend noted in the reorganisation of relationships between client firms and suppliers is the rising demand for flexibility from suppliers resulting from frequent changes in the production scheduling of the client firm companies, meaning sudden cancellations, postponements or increases in client firm orders due to market instability. The demand for greater flexibility becomes clear on analysing the measures adopted by both suppliers and client firms, based on situations of non-compliance with the 'contract' by the other party involved.[27]

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[24] A common element among them is the fact that they have the technological and managerial skills that empower them to develop customised products without adversely affecting their competitive excellence indicators.

[25] Under these circumstances, the assistance may be temporary, continuing only as long the relationship between the companies remains in effect, and does not constitute a sufficient base for the future independent development of the supplier.

[26] A position fairly similar to that of the small and medium-sized companies studied in the Campinas region.

[27] In most cases, particularly with regard to small and medium-sized companies, the 'contracts' are in fact purchase orders, associated with some type of informal agreement (which may be written, but has no legal value as a document). The informal agreement seems to have proliferated, involving tighter limits on negotiations.

In the Campinas region and Rio de Janeiro, the principal measure adopted by the suppliers in the sample when faced with problems caused by changes in the procurement schedules of client firms is to negotiate an adequate solution, in order to avoid any risk of losing the client firm.[28] Some companies specifically declared that they do their utmost to meet unexpected orders promptly from their main client firms. In turn, in Rio de Janeiro, the threat of reduction, or the actual reduction in orders/payments is the measure that client firms stated they adopt most frequently when faced with problems from suppliers. In the Campinas region, the main step taken by the client firm when faced with quality problems in products supplied is to order that the job be redone. However, these client firms may even change suppliers following problems with quality. This demonstrates the rising demand for quality and flexibility in supplies from client firms, and a constant concern with trimming costs and prices. This means that suppliers who are clearly more flexible will tend to deal better with the situation.

Suppliers that do not wish to lose client firms must necessarily be prepared to cope promptly with alterations in production scheduling. This type of demand has led to the introduction of the *just-in-time/Kanban* systems in the companies sampled in the three regions (all the direct suppliers). However, despite the fact that the demands of the *just-in-time/Kanban* systems between the supplier companies in the sample and some of their principal client firms seems to indicate greater inter-dependence and fine-tuning among the parties involved, when the *just-in-time/Kanban* systems are lacking or have been only partially introduced by the suppliers, this may also result in lower stocks for client firms, which are transferred to the supplier, together with their concomitant costs.

The dissemination process of *just-in-time/Kanban* systems seems to be more intensive in the Campinas region. The company which heads up the production chain analysed in the region (ACP1) has an internal and external *just-in-time/Kanban* system implemented with client firms and with some suppliers. Some suppliers in the sample have also used the new techniques for organising and controlling production: five companies stated that they had already introduced external *just-in-time/Kanban* systems with some of their client firms.[29]

In Rio Grande do Sul, only three companies (two first-tier suppliers and one second-tier supplier) had already implemented, or were implementing, external *just-in-time/Kanban* systems with at least one of their client firms. Additionally, just one first-tier company stated that it is introducing a *just-in-time/Kanban* system in-house. However, in a broader sense, it may be stated that all the companies interviewed in the region are introducing various types of innovation in order to enhance their flexibility. For example, companies are developing multi-function skills for their workers and gradually expanding the scope of these activities to

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[28] Only half of the companies in Rio de Janeiro answered the question on broken contracts, while companies in Rio Grande do Sul did not supply any information on this topic, but other information obtained in the interviews indicated that the trends noted in the other companies analysed may be extrapolated to the remainder.

[29] It is important to recall that the external *just-in-time/Kanban* system does not apply to the case of an industrial automation design company and certain types of services and/or products supplied, such as tools.

include quality control and maintenance tasks. One supplier company even maintains a typical *Kanban* relationship with one of its client firms (with a small in-house inventory, a cellular organisation, automated machinery and a multi-function workforce, maintaining flexibility and managing to supply the client firm at frequent intervals through a simple swap of containers).

In Rio de Janeiro, the differences are due to the position of the firms in the production chain. Only two first-tier suppliers had already implemented external *just-in-time/Kanban* systems with at least one client firm, while the second-tier suppliers did not have external *just-in-time/Kanban* systems with client firms. The use of this system does not apply to the spares-market suppliers. In turn, only five firms had already implemented in-house *just-in-time/Kanban* systems in all or some phases of the production process (three first-tier and one second-tier supplier and one after-sales company).

The client firms seem to be interested only in maintaining suppliers that can offer high quality products at low prices, with sufficient flexibility to keep pace with variations in demand, due to the instability of the final market. This has altered the nature of the agreements, which now include scheduling for the targets to be met in all three aspects.

## Labour, skills and relationships with trade unions

There are two types of movement affecting the structure of employment and the hierarchy of skills:

1. Changes in the division and content of work within companies, redefining profiles for worker skills and boosting productivity (reduction in job volume).
2. Changes in the division of work among companies, with a consequent reorganisation of the job structure in the production chain.

The pressures for lower costs paired with enhanced quality and flexibility have intensified the restructuring of companies at all levels of the chain studied in the three regions, resulting in innovations in the organisation of production and work as well as in management policies.

The drive to reorganise production and work in the companies is characterised by the introduction of various types of innovation:

a) Higher investment in production process automation, mainly through the acquisition of new and more flexible equipment.

b) Alterations in the layout of the plants, with the introduction of mini-plants and production cells.

c) Alterations in job specifications, stressing multi-function skills.

d) Adoption of new production control and planning techniques, as well as quality control in order to obtain ISO 9000 certification (*JIT/Kanban*, statistical process control).

In turn, these innovations pave the way for a new definition of the division and content of work by expanding the duties and responsibilities of workers in the production sector through the transfer of activities related to the formalisation of quality and maintenance tasks.

One of the ways that companies in the three regions are coping with the countless pressures distributed throughout the production chains to which they belong has been to invest in automation in order to boost production capacity, cut costs and enhance quality (see Table 14).[30] The use of microelectronic production equipment features in 25 companies in the sample (49 per cent of the total), and is proportionally more frequent in companies in the Campinas region (the three first-tier and six second-line suppliers), [31] followed by firms in Rio Grande do Sul (four first-tier suppliers, two second-tier suppliers and one spares-market supplier)[32] and Rio de Janeiro (two first-tier suppliers, two second-tier suppliers and five spares-market suppliers). [33]

Alterations in layout, including mini-plants and cellularisation as well as multi-function work-posts, are important characteristics of the drive towards the reorganisation of production and work within the companies striving to meet new quality requirements and achieve greater flexibility. Although most of the companies in the sample (47.1 per cent) still have a functional and/or linear layout, a smaller number of enterprises (23.5 per cent) are adopting cellularisation (see Table 14). Some companies from the total sample (31.4 per cent), particularly those in the Campinas region (see Table 14), have already introduced broad-ranging definitions of their work-posts, targeting multi-functional skills.[34]

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[30] In some cases, investments in automation derive from the outsourcing processes of a client firm. One of the plants of a company analysed in the Campinas region (ACP1.3), for example, increased the number of items of equipment from 20 to 90 when a large company in a white line home appliances production chain outsourced its machining activities, but the supplier was cut off after three months and this supplier currently has a large idle capacity.

[31] One of the first-tier companies that heads up the production chain in the Campinas region (ACP.1) returned to investing in automation from 1995 onwards through the purchase of new numerically controlled machine tools (NCMT), computerisation and training programmes, to a total of US$2 million in 1995-96.

[32] Five companies in Rio Grande do Sul stated that they do not use such equipment (31.2% of the regional sample) while four companies did not respond to this question (25% of the regional total).

[33] Ten companies in Rio de Janeiro did not respond to the question on the use of microelectronic equipment (41.7% of the regional sample).

[34] It should be noted that seven companies already have multi-function teams (13.7%) and four suppliers use group work (7.8%).

## Table 14 - Innovations Introduced by the Firms[1]

| Number of Firms and (%) | | | | |
|---|---|---|---|---|
| | **Campinas/SP** | **Rio Grande do Sul** | **Rio de Janeiro** | **Total** |
| **Innovations in Management Policy** | | | | |
| Focusing - products and/or clients | 3 (27.3) | 12 (75.0) | 7 (29.2) | 22 (43.1) |
| Integration/horizontalisation | 3 (27.3) | 6 (37.5) | 9 (37.5) | 18 (35.3) |
| Reduction of hierarchical levels | 1 (9.1) | 6 (37.5) | 7 (29.2) | 14 (27.4) |
| Reduction of workforce | 2 (18.2) | 11 (68.7) | 13 (54.2) | 26 (51.0) |
| Standardisation of quality controls | 10 (90.9) | 11 (68.7) | 16 (66.7) | 37 (72.5) |
| ISO 9000 | 5 (45.5) | 8 (50.0) | 9 (37.5) | 22 (43.1) |
| Training programmes | 8 (72.7) | 10 (62.5) | 21 (87.5) | 39 (76.5) |
| Involvement programmes | 4 (36.4) | 6 (37.5) | 11 (45.8) | 21 (41.2) |
| Changes in job and wage structure | 1 (9.1) | 3 (18.7) | 2 (8.3) | 6 (11.8) |
| Participation in results | 2 (18.2) | 2 (12.5) | 2 (8.3) | 6 (11.8) |
| **Innovations in Production** | | | | |
| Cellular layout | 2 (18.2) | 6 (37.5) | 4 (16.7) | 12 (23.5) |
| Flexible equipment | 9 (81.8) | 7 (43.8) | 11 (45.8) | 27 (52.9) |
| Total quality control | 8 (72.7) | 6 (37.5) | 10 (41.6) | 24 (47.0) |
| *JIT/Kanban* internal | 7 (63.6) | 1 (6.3) | 5 (20.8) | 13 (25.5) |
| *JIT/Kanban* external | 6 (54.5) | 4 (25.0) | 2 (8.3) | 12 (23.5) |
| **Innovations in the Organisation of Work** | | | | |
| Multitask individual posts | 7 (63.6) | 5 (31.2) | 4 (16.7) | 16 (31.4) |
| Multifunctional groups | 1 (9.1) | 4 (25.0) | 2 (8.3) | 7 (13.7) |
| Quality control by production workers[2] | 7 (63.6) | 10 (62.5) | 13 (54.2) | 30 (58.8) |
| Maintenance by production workers[3] | 9 (81.8) | 10 (62.5) | 7 (29.2) | 26 (51.0) |
| New multifunctional careers | 1 (9.1) | - | - | 1 (2.0) |
| Incentive bonus | - | 4 (25.0) | 2 (8.3) | 6 (11.8) |
| **Innovations in Inter-Firm Relations** | | | | |
| Programmes of evaluation and/or development of suppliers | 10 (90.9) | 10 (62.5) | - | 20 (39.2 |
| Outsourcing of productive activities (by client firms)[4] | 1 (9.1) | 5 (31.2) | 6 (25.0) | 12 (23.5) |
| Reception of outsourced production activities (suppliers) [4] | 10 (90.9) | 7 (43.8) | - | 17 (33.3) |
| Outsourcing of services (clients and suppliers)[5] | 3 (27.3) | 7 (43.8) | 9 (37.5) | 19 (37.2) |
| **Total** | **11** | **16** | **24** | **51** |

1 - Answers are not exclusive. Firms could indicate more than one option
2 - Such as visual inspection, measurements, self-regulation
3 - Such as lubrication, periodical cleaning, checking as part of maintenance programme
4 - Partial or total outsourcing of activities presupposes that these were previously produced inside the firm. Direct production activities add value to the product. Indirect production activities do not add value to the product but are essential to its production (machine-tooling, maintenance)
5 - Services may include restaurants, cleaning, security, transportation of workers or products, medical assistance, recruitment or selection of workers, accountancy, marketing and sales

**Source:** Fieldwork (1996-97)

In proportional terms, the Rio de Janeiro sample presents the largest number of companies with linear layout (58.3 per cent of the regional sample). Examples of cellular layouts in companies in this region are restricted to the first-tier suppliers. In turn, the largest relative number of companies that are adopting cellularisation (including linear and cellular layout combinations) is found in Rio Grande do Sul (37.5 per cent of regional sample),[35] while only in the Campinas region are companies found with a totally cellular layout (18.2 per cent of the regional sample – see Table 14).[36] It should be stressed that some of the first-tier companies in the Campinas region and Rio de Janeiro are introducing changes in order to adopt a totally cellular layout (7.8 per cent of the total sample).

Finally, the reorganisation of production and labour in the companies includes, in most cases, the use of production control and planning techniques, such as *Kanban* and statistical process control. The gradual spread of the implementation of *just-in-time/Kanban* systems between supplier and client firms (external), considered as part of a trend seeking greater flexibility in client firm services and found in only some companies in the samples from each region,[37] does not seem to be accompanied by the implementation of in-house *Kanban*. Half the companies in the sample had not yet implemented in-house *just-in-time/Kanban* systems, without even mentioning some of the suppliers for whom the use of this production control and planning technique makes no sense.

The use of in-house *just-in-time/Kanban* systems was more widespread in the sample from the Campinas region (the three first-tier suppliers and four second-tier suppliers), while it was still negligible in the other regions (one supplier in Rio Grande do Sul and five suppliers in Rio de Janeiro, mainly first-tier).

A few companies are simultaneously adopting in-house and external *just-in-time/Kanban* systems (two first-tier suppliers in Campinas and one in Rio Grande do Sul). The existence of the *just-in-time/Kanban* systems between the supplier companies in the sample and some of their principal client firms – together with the lack, or partial implementation, of in-house *just-in-time/Kanban* systems by the suppliers – may result in lower inventories for client firms, as they are transferred to suppliers, together with the related costs. This means that there is still some way to go in order to achieve greater flexibility in client firm services, with fairer distribution of costs and benefits among the agents involved in supply relationships.

In turn, the adoption of statistical process control, or some adapted form of this technique, is found to a far greater extent among companies in the three regions. In most cases, statistical process control is used at only some phase(s) of the production process(es), and may even be implemented solely at production

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[35] It should be noted that the cellularisation of the layout is certainly not applicable to the case of two third-tier companies in the Rio Grande do Sul sample, which use women working at home.

[36] The ACP1 company has had a cellular layout since the end of the past decade, but it is only recently that its suppliers are starting to introduce cellularisation. This type of layout is not applicable to one of its suppliers analysed (ACP1.5), which organises its production benches in accordance with the industrial automation equipment being assembled at the time.

[37] For further details on the adoption of external *just-in-time/Kanban* systems, read the section on inter-firm relationships.

bottlenecks. It should be stressed that 24 companies in the sample had already implemented, or were implementing, statistical process control at the time of the survey (47 per cent).

The Campinas region seems to account for the largest relative number of companies adopting this innovation. One of the consequences of the reorganisation of labour and production processes within the companies is that, as already shown, this includes greater automation of production processes, alterations to the layouts of plants and work posts, and the adoption of production control and planning techniques, meaning expansion of the duties and responsibilities assigned to workers on the production line. These duties and responsibilities may well include activities related to quality, including visual inspections, measurements or metering, and completing statistical process control sheets, as well as maintenance-related activities such as checking some requirement that forms part of a maintenance programme for machinery and equipment, lubrication and oil-changes, and/or scheduled cleaning of machinery.

A large proportion of the companies in the three regions indicated that their production-line workers carried out tasks linked to quality (58.8 per cent of the total sample) and maintenance (51.0 per cent of the total sample – see Table 14). These innovations imply the establishment of a new worker profile, with a better education, the ability to work in groups and greater commitment to corporate objectives. Known as the multi-functional worker, this concept is prompting alterations in human resource management policies. Consequently, an increase in educational requirements was noted in the selection and recruitment criteria (54.9 per cent of all the companies required primary schooling); the organisation of training programmes (in 76.5 per cent of the companies); the introduction of participatory programmes (41.2 per cent of the companies); the introduction of new job and wage structures (11.8 per cent of the companies); and profit-sharing programmes (11.8 per cent of the companies).

An analysis of the selection criteria for production-line workers adopted by the companies in the sample for each region allows an assessment of the relative importance of educational levels (or schooling) as criteria in hiring decisions.[38] In the Campinas region, educational levels, training and professional experience were considered the most important criteria by most of the companies. The requirement/preference for higher educational levels (schooling) at the time of hiring was mentioned by many of the companies, showing that they are gradually opting for workers with at least primary education completed. The selection tests used by companies generally include an interview with the candidate, mainly in order to study some of their personal characteristics, but may also include psycho-technical testing, or a theoretical and/or practical test, to check the knowledge and/or skills of the worker. Age was also considered important by some companies, which generally do not hire women for heavier work and prefer younger people if they stress schooling, or older people if they assign more value to experience for working on the production line. It should also be stressed that gender criteria drew the largest number of replies in the 'not important' category.

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[38] It was not possible to draw up a specific table for the Rio Grande do Sul sample, due to the lack of information on the selection criteria adopted by companies in the region.

In the Rio de Janeiro region, the selection criteria considered most important by the companies in the sample were educational level, selection tests and personal characteristics, which drew the largest number of replies in the sum of the 'very important' and 'important' categories.[39] The requirement for higher educational levels and the selection tests were stressed by half the total number of companies in the sample, who preferred workers who had at least completed primary education. It should be noted that some first-tier companies in the region already require employees with a high school diploma. Personal characteristics were stressed by 14 companies as 'important' in the decision to hire production-line workers. Age and gender were considered as 'not important' by most of the companies that responded to the question.

Educational levels are increasingly taken into account by the companies in the region, showing the rising demand for schooling when hiring workers, and this is reflected in the composition of the workforce of this sector. This trend had repercussions throughout the production chains studied, with small and medium-sized companies to an increasing extent requiring that their workers have completed primary school.

As noted by Gitahy and Bresciani (1997), the organisation of production and work has taken on a new logic which incorporates self-regulation mechanisms to ensure the feasibility of reducing the number of hierarchical levels (reducing the number of bosses) and increasing the independence of workers in terms of conducting production processes. As a result, companies become more dependent on their employees. Their success depends on the motivation and commitment of participants to the competitiveness targets of the company and the quality programmes, as well as the new routines, introduced. Within this context, the need arises not only for training programmes, but also for the adoption of different types of participatory systems, designed to motivate and/or involve the employees as a group. This includes the dissemination of information on the company's performance, rewards for good ideas brought in through suggestion plans, the introduction of multi-function careers and profit-sharing schemes.

The implementation of quality programmes and new types of labour management has been accompanied by training programmes organised not only by the companies themselves, but also by various other kinds of institutions (see Table 15). The courses organised by technical schools and/or vocational training centres (used by 62.7 per cent of the companies in the sample) constitute an important part of the training of industrial workers, as do courses organised through agreements with primary and secondary schools (35.3 per cent of the companies). The role of the universities should be stressed in the advanced training of professionals (used by 25.5 per cent of the companies), mainly technicians and managers who frequently take graduate or university extension courses. Additionally, some mention must be made of the courses organised by other client firm or supplier companies (used by 41.2 per cent of the sample) and various associations and/or consulting firms (used by 37.2 per cent of the sample).

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[39] It should be noted that only 15 companies (out of a total 24) replied to the question on selection criteria for their employees in the Rio de Janeiro region.

The content of the courses (see Table 16) offered by the various institutions is fairly varied, including technical/operating courses (53.8 per cent), specific courses for maintenance (34.6 per cent), courses related to quality tools and systems (30.8 per cent), courses related to the 5S programme (a management system aimed at constant improvement, 23.1 per cent) and behavioural courses aimed to enhance motivation for quality and productivity (23.1 per cent). One should also note the primary and secondary school catch-up courses (36.5 per cent) and the environmental protection courses offered by three companies in the sample.

**Table 15 - Training Programmes Offered to Workers**

| Organised by: | Number of Firms (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul | Rio de Janeiro | Total |
| Client firms | 6 (54.5) | 2 (12.5) | 12 (50.0) | 20 (39.2) |
| The firm with support of other institutions | 3 (27.3) | 1 (6.3) | - | 4 (7.8) |
| Official training centres (SENAI, SEBRAE, etc.) | 4 (36.4) | 9 (56.2) | 19 (79.2) | 32 (62.7) |
| In conjunction with primary and secondary schools | 1 (9.1) | 4 (25.0) | 13 (54.2) | 18 (35.3) |
| Universities | - | 6 (37.5) | 7 (29.2) | 13 (25.5) |
| Other firms (clients or suppliers) | 5 (45.4) | 7 (43.8) | 9 (37.5) | 21 (41.2) |
| Associations or consultancies | 4 (36.4) | 5 (31.2) | 10 (41.6) | 19 (37.2) |
| Initiative of workers, but paid by the firm | 2 (18.2) | - | 7 (29.2) | 9 (17.6) |
| No training | 3 (27.3) | 5 (31.2) | 3 (12.5) | 11 (21.6) |
| No answer | - | 1 (11.1) | - | 1 (2.0) |
| **Total of firms** | **11** | **9** | **24** | **51** |

NB Answers are not exclusive. Firms could indicate more than one option
SENAI – Serviço Nacional de Aprendizagem Indústrial
SEBRAE - Serviço Brasileiro de Micro e Pequenas Empresas
**Source**: Fieldwork (1996-97).

**Table 16 - Content of Training Programmes for Workers**

| Type of Course | Number of Firms (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul | Rio de Janeiro | Total |
| *'Supletivos'*(primary and secondary diplomas) | 3 (27.3) | 1 (6.3) | 15 (60.0) | 19 (36.5) |
| Mathematics (basic) | 1 (9.1) | 5 (31.2) | - | 6 (11.5) |
| Safety at work | 1 (9.1) | - | 3 (12.0) | 4 (7.7) |
| Technical/operational[1] | 3 (27.3) | 7 (43.8) | 18 (72.0) | 28 (53.8) |
| Maintenance[2] | 1 (9.1) | 6 (37.5) | 11 (44.0) | 18 (34.6) |
| *Kanban* | 1 (9.1) | - | 1 (4.0) | 2 (3.8) |
| 5S Programme[3] | 2 (18.2) | 6 37.5) | 4 (16.0) | 12 (23.1) |
| Courses related to improving quality | 6 (54.5) | 8 (50.0) | 2 (8.0) | 16 (30.8) |
| Motivation for quality and productivity | 1 (9.1) | 8 (50.0) | 3 (12.0) | 12 (23.1) |
| Environmental protection | - | 1 (6.3) | 2 (8.0) | 3 (5.8) |
| No courses offered | 3 (27.3) | 5 (31.2) | 5 (20.0) | 13 (25.0) |
| No answer | - | 2 (12.5) | - | 2 (3.8) |
| **Number of firms** | **11** | **16** | **25** | **52** |

1. Includes measurement control, design, meteorology, numerical control, etc.
2. Courses for maintenance workers or machine operators
3. A management system aimed at constant improvement

NB Answers are not exclusive. Firms could indicate more than one option

**Source**: Fieldwork (1996-97).

The reorganisation of work within companies associated with new selection criteria is reflected in changes in the composition of the workforce in the companies in the three regions: in 49 per cent of the companies in the sample, over 50 per cent of their employees had completed primary school, while this figure was over 70 per cent for 27.4 per cent of the companies.[40] The Campinas region warrants particular attention due to a larger proportion of employees with higher educational levels, compared to the other regions analysed.[41]

With regard to the composition of the labour force by gender, the predominance of a male labour force was noted in the samples from the three regions. Although most jobs in the metal-mechanics industry are traditionally filled by men, among the companies supplying information on gender, 26 (51 per cent) were found to employ less than ten per cent women, 12 companies (23.5 per cent) employed 11-30 per cent women and only six companies (11.8 per cent) employed over 30 per cent women. A larger presence of women was noted on the production lines of companies handling assembly and packaging activities, as well as those of a vehicle upholstery manufacturer.

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40 Some companies indicated growing demands for high school diplomas.

41 Note that 50% of the companies in Rio Grande do Sul did not respond to the question on schooling levels.

In most of the companies studied, a trend was noted towards lower job volumes, while revenue rose (in step with the general trend towards boosting productivity in the auto-parts industry). Higher productivity is associated with the spread of technological and organisational innovations, as well as the trend towards externalisation/internalisation of activities, prompting a redefinition of the division of work along the production chains. Twelve companies had outsourced production activities (23.5 per cent) and 17 companies had received externalised production activities (33.3 per cent). This trend is reflected in the distribution of jobs among the various types of companies and in the working conditions, resulting in a wide variety of arrangements and experiences.[42]

Despite the new duties and responsibilities assigned to workers and the demands for better education when selecting staff, there does not seem to be any great reciprocal improvement received by the workers in terms of wages and/or benefits offered by the companies, particularly the smaller enterprises. Wages do not seem to be keeping pace with rising productivity, and there are still few benefits offered, with this situation being shored up by widespread unemployment in association with pressure to cut costs.

Only six companies from the total number in the sample (11.8 per cent) revealed that they had adopted a higher base-wage (over four times the minimum wage), while 17 companies (33.3 per cent) were in the intermediate range (two to four times the minimum wage) and 16 companies (31.4 per cent) were in the lower range (up to twice the minimum wage). Wage variations seem to be associated with the type of product and process, and/or size of the companies, and/or differences in the regional market. Labour-intensive companies that need few skills tend to adopt lower base-wages, while larger companies in terms of both revenue and staff numbers tend to offer higher base-wages. Furthermore, it should be stressed that the Campinas/São Paulo and Rio Grande do Sul regions offer higher wages, particularly as the companies in the Rio de Janeiro sample consist of a large number of spares manufacturers.

The benefits offered by many of the companies in the sample included: medical aid scheme, either in-house or through agreements (58.8 per cent of the total number of companies), transportation supplied by the company or travel vouchers (52.9 per cent), meals or meal vouchers (51.0 per cent) and baskets of staple foodstuffs (37.7 per cent). However, some minor differences were noted in the benefits granted by the companies in the three regions analysed. Financial assistance through advances, loans or housing credits featured in five companies in Campinas/São Paulo (45.4 per cent of the regional sample), but was little used by companies in the other regions. The distribution of rewards based on productivity and revenue were noted in three companies in Rio Grande do Sul (18.7 per cent of the regional sample), a benefit that did not exist or was negligible in the other regional samples. In turn, dental aid seemed to be an important benefit in the Rio de

[42] In managing outsourcing processes, some companies have used different ways to circumvent Brazilian labour laws, or have even ignored them. The use of these devices is based on relationships of trust between the parties involved, without which these practices would not be feasible. The savings sought in this way have not always produced satisfactory results, prompting some companies to reabsorb activities that had been outsourced.

Janeiro sample (54.2 per cent of the companies), but was negligible in the other regions. Finally, medication and funeral allowances, as well as day-care centres or child-care allowances featured only in companies in Rio de Janeiro.

There also seemed to be significant differences in the benefits offered by the small/medium-sized and large companies. Most of the small/medium-sized companies offered only the more common benefits listed above.[43] However, larger companies managed to offer other benefits such as retirement plans and/or life assurance schemes (only for some jobs), profit-sharing,[44] rewards based on production results and revenue, and study grants.

The links between pressures to cut costs, formalisation of quality, enhanced productivity and greater flexibility for deliveries have triggered appreciable transformations in the division of work, both within the companies (through the reorganisation of the work process, parallel to investments in equipment and organisational innovations), as well as between companies (the trend towards internalisation/externalisation of activities). This process has significant consequences, not only for job structures, but also for workforce profiles, ushering in alterations to the structure and hierarchical levels of skills. If, on the one hand, higher productivity is associated with the introduction of technological and organisational innovations, on the other hand these innovations have resulted in more intensive work and higher educational demands, within a context in which the labour market is extremely unfavourable to the workers.

The quest for greater commitment from the workforce has paved the way for major changes in human resource management in the three regions, with a markedly limited presence of trade unions in the companies. In the Campinas region, the presence of trade unions seems significant only in the large companies. In the small and medium-sized companies trade unionisation seems to be limited or even non-existent.[45] In several firms in the region, the owners and/or managers consider the relationships with the trade unions to be good, insofar as they do not interfere with the life of the company, a phenomenon that was also noted in Rio de Janeiro. Thus, corporate attempts to establish good relationships with employees do not seem to include trade unions. Various examples of participatory programmes in the three regions reflect the quest for alternative ways of achieving direct contact with workers, avoiding intermediaries.

The restructuring process intensified two trends noted in the course of this study: on the one hand, the externalisation/internalisation of activities associated with the process of focusing on core businesses and, on the other, the reduction in the number of suppliers, associated with intense pressure to formalise quality, enhance flexibility and cut costs. This means that, from the standpoint of vertical inter-firm relationships, major changes have been introduced in the division of work

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[43] Some small/medium-sized companies also managed to supply financial assistance through advances and loans to workers, as well as legal, social and dental aid.

[44] Profit-sharing programmes should be stressed as an important way of seeking greater commitment among workers.

[45] Many of the interviewees did not reply to questions on relationships with trade unions as they were totally unaware of them, indicating a low level of visibility on their part.

between firms and in the nature of the relationships between client firms and suppliers. In order to survive within this context, companies have invested heavily not only in machinery and equipment, but also in quality programmes and schemes for retraining their workers.

This situation has increased the relationships of the companies with a number of institutions in the regions analysed in order to increase the possibilities of access to resources and know-how that cannot be found in-house. This means that the companies have sought to participate and build up relationships with various types of institutions, partly in order to mobilise funding, ensure access to up-to-date information and resolve urgent problems, but also because these forms of relationships/participation are of vital importance for the dissemination of knowledge on the correct forms of organisation and the subsequent legitimisation and institutionalisation of new practices.[46] Trade unions and employer associations, consulting firms, the vocational training system, technical schools, universities and financing agencies are examples of institutions that play a vital role in the links that constitute what could be called communications networks.

**Table 17 - Training Institutions Used by Firms**

| Institutions | Number of firms (%) | | | |
|---|---|---|---|---|
| | Campinas/SP | Rio Grande do Sul | Rio de Janeiro | Total |
| SENAI | 8 (72.7) | 9 (56.2) | 13 (54.2) | 30 (58.8) |
| SESI | - | - | 3 (12.5) | 3 (5.9) |
| SENAC | - | 4 (25.0) | 1 (4.2) | 5 (9.8) |
| Technical Schools | - | 6 (37.5) | - | 6 (11.8) |
| '*Supletivos*' | 1 (9.1) | 1 (6.3) | 1 (4.2) | 3 (5.9) |
| Universities | 1 (9.1) | 7 (43.8) | 2 (8.3) | 10 (19.6) |
| SEBRAE | 2 (18.2) | 1 (6.3) | 5 (20.8) | 8 (15.7) |
| Consultancies | 4 (36.4) | 5 (31.2) | 2 (8.3) | 11 (21.6) |
| Financing Institutions | 1 (9.1) | 1 (6.3) | - | 2 (3.9) |
| Other Firms | 2 (18.2) | 7 (43.8) | - | 9 (17.6) |
| Unions (workers or firms) | 2 (18.2) | 7 (43.8) | - | 9 (17.6) |
| Do not use any | - | 2 (12.5) | 9 (37.5) | 11 (21.6) |
| No answer | - | 2 (12.5) | - | 2 (3.9) |
| **Total number of firms** | **11** | **16** | **24** | **51** |

SENAI – Serviço Nacional de Aprendizagem Indústrial
SESI – Seviço Social da Indústria
SENAC – Serviço Nacional de Aprendizagem Comercial
SEBRAE – Serviço Brasileiro de Micro e Pequenas Empresas

**Source**: Fieldwork (1996-97)

[46] It should be stressed that a company benefits from communications networks when it makes ongoing investments in the capacities of its members, as they need to acknowledge its relevance and know how to use outside information.

With regard to horizontal relationships, most of the companies in the sample belong to state federations of industries [47] and/or some other type of employer association,[48] revealing the existence of cooperation, even to a limited extent, among companies in the same field. However, it is important to note that the size and the interests of the affiliated companies differ greatly, and some companies complain about the very limited roles assigned to small and medium-sized enterprises within this type of institution. Moreover, few companies stated that they actually used the services of the employer associations.[49]

With regard to relationships with institutions in the educational system, 30 companies (58.8 per cent of the total) assigned an important role to the National Industrial Apprenticeship Service (SENAI), either in training apprentices or for the courses offered through its mobile units. Some companies stressed the importance of technical schools (six companies or 11.8 per cent of the sample), as they supply on-the-job trainees with agreements covering the participation of their employees in their regular courses. Relationships with universities were emphasised by ten companies (19.6 per cent of the total), mentioning particularly the São Carlos Federal University (UFSCar), São Paulo University (USP) in São Carlos, the Campinas State University (UNICAMP), the Rio Grande do Sul Federal University (UFRGS) and the Rio de Janeiro Federal University (COPPE/UFRJ). The companies stated that they used the universities and specialist courses mainly for the recruitment and training of engineers.[50] This highlights the increased interaction between companies and universities – particularly those ranked higher at the regional and nationwide levels – which are relatively close in physical terms. The distance between these two types of institutions seems to be shrinking, as fresh

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[47] Six companies in the Campinas/São Paulo region belong to the São Paulo State Federation of Industries (FIESP) and 19 companies in Rio de Janeiro belong to the Rio de Janeiro State Federation of Industries (FIRJAN). It was not possible to determine which companies in Rio Grande do Sul belonged to the Rio Grande do Sul State Federation of Industries (FIRGS).

[48] Two companies in the Campinas/São Paulo region and ten companies in Rio de Janeiro belong to the National Automotive Parts Industry Association (SINDIPEÇAS), while one company in the first region and nine in the second region belong to other employer associations, such as the Association of Machinery and Equipment Manufacturers (SINDIMAQ); the Plastics Industry Association; the Smelters Association; the Foundry Association (SINDUSFUN); Rio de Janeiro State Metal-Mechanics Industry Association (SIMMERJ); the Metallurgical Industries Association; Brazilian Electrical and Electronic Industry Association (ABINEE); and the Brazilian Foundry Industry Association (ABIFA). It was not possible to determine which companies in Rio Grande do Sul might belong to other employer associations.

[49] Only two companies in the Campinas/São Paulo region and seven companies in Rio Grande do Sul stated that they made use of the services offered by an employer association, equivalent to 17.6% of the total number of companies in the sample.

[50] The companies in the Campinas region mentioned a number of different relationships with local universities. One of the companies in the regional sample particularly mentioned the use of courses offered by the Regional Quality Group (GREDEQ) at UFSCar, and hired lecturers from this university to help with the implementation of the corporate quality system. One of the suppliers mentioned participation in certification courses offered by UNICAMP, together with the Brazilian Small Business Bureau (SEBRAE), but complained about high costs. Finally, the interviewees at another company revealed the wish to use the UNICAMP Technology Centre, but indicated some difficulties arising from the priority given by the centre to university jobs.

contacts are built up between them.

It is important to mention the role of consulting firms and other companies (competitors and/or suppliers of machinery and equipment) with regard to the training programmes and certification processes of the companies in the sample. The use of consulting firms was mentioned by 11 companies (21.6 per cent of the total), where these were hired for specific activities, including training staff and certification. The most common complaint from the companies was the high cost of consulting fees, particularly when certification processes were involved. Support received from other companies was mentioned by nine of the companies in the sample (17.6 per cent of the total), which generally involved signing a variety of agreements with competitors,[51] or taking courses offered by machinery and equipment suppliers.

It is thus possible to conclude that cooperation initiatives between various types of institutions have become extremely important for the survival and growth of some companies, contributing equally to their adaptation to the new demands related to product quality and labour force skills. This indicates a reconfiguration of institutional relationships. Thus, it is possible to state that the relationships between these companies and a number of different types of institutions are playing an increasingly important role in the survival and development of a more competitive industrial network in the regions studied. Within this new scenario, the responsibility and importance of the institutions in the educational system have become increasingly vital for the social and economic development of the various regions.

[51] In the Campinas region, one company stressed an agreement reached with a competitor for the assembly of industrial automation equipment (where the company simply designed the equipment), as well as a deal with a company in the electronics field whereby they agreed to transfer the design and assembly of the mechanical part of the equipment in exchange for the sale of electronic components to the first company.

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