Chapter 3 Mergers and Acquisitions and Changes in Industrial Concentration in Brazilian Mining and Manufacturing Industries: 1996-2000

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I. Introduction

This paper aims at studying the role played by Mergers and Acquisitions (M&A) on changes in market concentration that took place in Brazilian manufacturing and mining industries between 1996 and 2000. More specifically, the paper attempts to: assess changes in average market concentration from 1996 and 2000; and determine the importance of M&A in explaining changes in concentration.

During the 90's, the Brazilian economy went through profound changes in ownership structures. Mostly, these changes were the result of the privatization of formerly state-owned enterprises and of the opening of the economy to competition. According to Thomson Financial Securities Data, 582 companies went through ownership changes in the 90's. These companies represented about one-quarter of the value added in the manufacturing and mining industries and ten percent of the employment. Furthermore, ownership changes have affected most sectors in manufacturing and mining industries. In the 90's 86 of the 106 three-digit sectors in manufacturing had at least one company transacted. These figures go down to 68 sectors when data is limited to 1997-1999 years. Motor vehicles' parts and accessories (45 transactions), integrated primary metals (33), other food products (30) and organic chemicals (30) were the sectors with more frequent transactions.

The literature on industrial organization has stressed the importance of M&A in the determination of market structures. Actually, the whole idea that M&A transactions provoke concentration was considered far from challenging. In fact, the capacity to capture changes in concentration emerging from M&A is a criterion to assess the adequacy of concentration indexes. Therefore, the debate focused on the assessment of

the level of impact on concentration changes. Hannah and Kay (1977) have shown that M&A were the driving force of industrial concentration in British industries from the beginning of the century to the 60's. Muller (1976) has obtained similar results in the analysis of a few industries in Germany. Pryor (2001, 2002) has argued that M&A are the main explanation for the increase in industrial concentration in US industries from the 80's to 1997. Nissan (1997, 1998) has followed similar steps explaining the increase in aggregate concentration. In both cases (Nissan 1997,1998 and Pryor 2001,2002), authors have stressed the importance of changes in antitrust legislation to explain the increase in concentration.

However, the impact of M&A transactions on concentration may vary according to the type of transation taking place, the firms involved and the dynamic effects of concentration:

(i) Transactions may involve mergers of firms in the same industry. In this case, adequate concentration indexes should capture the increase in concentration;

(ii) Transactions may involve conglomerate mergers. These situations should imply increase in aggregate concentration but be neutral in respect to sectoral concentration;

(iii) Acquiring firms may be new entrants into the industry. Once more, these transactions should be neutral in respect to sectoral concentration;

(iv) Acquired firms may be spin-offs from bigger companies and acquiring firms may be fringe companies. In this case, M&A transactions may have negative effect on concentration; and

(v) Furthermore, dynamic effects may change the static results. Transactions may be followed by divestments, closures and losses of competitiveness and therefore have negative dynamic consequences over concentration levels. On the other hand, they may be accompanied by addition in productive capacity and thus they will deepen changes in concentration.

The work of Liebeskind, Opler and Hatfield (1996) attempts to cope with some of these effects. Using more appropriate data for US industry in the 80's, they classify organizational changes according to changes in the status of industry establishment and changes in the status of industry incumbent firms. They conclude that concentration

effects of industry restructuring are positive only when incumbent firms add capacity to the industry.

M&A transactions in Brazil during the 90's have many features stressed in the above paragraphs. As has been shown in Rocha and Kupfer (2002), one of the most important characteristics of the M&A wave of the 90's, in Brazil, was the major participation of multinational enterprises. In fact, 218 out of the 292 transactions that took place between 1997 and 1999 had multinational companies as acquirers. As a consequence, Rocha and Kupfer (2002) working with very high levels of aggregation – they divided the manufacturing and mining industries into three sectors named as commodities, traditional manufacturing and technology intensive industries – have found that during the 1990-1996 period there was a reduction in concentration in all sectors. From 1997 to 1999 the trend is unclear. They have found a slight increase in the concentration ratios of traditional manufacturing and commodities industries while the technology intensive industry presented a small decrease in concentration.

However, the high level of sectoral aggregation and the limited scope of the company sample used to calculate the level of concentration in Rocha and Kupfer (2002) suggest that a deeper investigation is necessary in order to capture the adequate direction of concentration indexes and the influence of M&A transactions in the process. This paper will attempt to add information on these features, measuring industrial concentration in specific markets and estimating the relevance of M&A transactions in structural changes. The next section will show the data set used in the paper, determine its main virtues and limitations and define the methodology used in the analysis. Section three presents the main empirical results of the analysis, comments on possible biases and speculates on possible sources of explanation of the results. The concluding section discusses the direction of the main conclusions obtained from the analysis carried out in this paper and suggests some possible extensions of this work.

II. Methodology

2.1 Database

This paper uses three data sources:

(i) Annual Industrial Survey – Companies (PIA), published by Instituto Brasileiro de Geografia e Estatística (IBGE) for the years 1996 and 2000. PIA has supplied data on sales, employment, number of companies and four, eight and twelve firms concentration ratio;

(ii) Technology Innovation Survey 2000 (PINTEC), also published by IBGE. This survey has supplied data on number of innovating firms, number of firms executing product innovations, R&D expense levels for 2000;

(iii) Thomson Financial Securities Data provided information on ownership changes from 1990 to 1999.

2.2 The Period

The paper analyzes concentration changes from 1996 to 2000. The choice of this period limits the analysis in two aspects:

(i) Five year periods may be short to capture structural changes; and

(ii) The M&A wave began in the early 90's. The coverage of the whole period would have been more adequate.

However, there are good reasons to make this choice. First, there are data limitations. Though Thomson Financial provides M&A information for the whole decade, the use of information from PIA for the early 90's may be inadequate. The sample of firms and sectoral classification used in PIA changed in 1995. Therefore, estimates of sales and employment follow different methodology. Furthermore, the number of transactions that took place between 1997 and 1999 are far from irrelevant. Table 1 shows that 292 out of 582 transactions took place in the 1997-1999 period.

2.3 Transactions

The paper takes into account only those transactions that involved the exchange of over 50% of stock. This includes 71% of the transactions that took place between 1990 and 1999 and 75% of the transactions that occurred between 1997 and 1999 (see table 1). The

reason of this choice was to avoid including transactions that did not involve strategic control of the acquired company. For instance, some Brazilian banks have bought minor participations in company's share in order to diversify their portfolio or to have access to internal information, however, no attempt is made by these banks to control the market behavior of these companies neither do they have control over capital accumulation capabilities.

The ideal way to measure the direct effect of M&A on concentration would be to calculate the concentration index before the transaction then to add sales of the acquired firm to the sales of the acquiring firm and finally to recalculate the concentration index. This procedure was used by (Hannah and Kay 1977). The most important shortcoming of this method is the lack of ability to capture indirect effects, such as the addition of productive capacity, closure of plants, etc.

An alternative way to approach the problem would be to measure concentration levels in the beginning and the end of the period. Afterwards, one would calculate the size of the transaction phenomena by adding sales of acquired companies in a specific type of transaction and dividing the result by sector's sales and then to control for strategic variables that may affect firms' competitiveness and concentration levels. This procedure was adopted in Liebeskind, Opler and Hatfield (1996).

However, in order to follow either procedure one should have access to adequate data. In the case of this paper, a number of obstacles have been found that make impossible to follow either approaches:

(i) In order to obtain information on individual firm size from IBGE, one should have access to firm's fiscal codes. This procedure was attempted with a rate of success of only 50% of the acquired companies;

(ii) IBGE does not provide information at the company level. Therefore, sales of acquired companies would only be provided whenever over three companies would be transacted. This would require the use of a very high level of aggregation, which would be inadequate; and

(iii) Other data sources did not show higher success rate.[1]

[1] We have tried capturing information from Gazeta Mercantil – Anuário da Gazeta Mercantil, for many years.

Therefore, the only reliable information is the number of transactions. However, the use of the number of transactions as indicator for intensity of M&A faces a major shortcoming. Transactions involving very large companies and small companies are equally considered. However, they play very different roles in respect to market concentration. One way to overcome this deficiency would be to weigh the number of transactions using the value of each transaction. However, Thomson Financial provides information for less than half of the transactions. This paper has chosen to use a dummy variable that takes value 1 in all sectors where at least one transaction has been identified. In this sense the coefficient will be capturing the aggregate impact of all transactions that took place in that sector.

2.4 Market Definition

The use of official statistical sources limits the choices one can make with respect to market definition. Usually, national standard classifications follow the criterion of similarity at the production side and do not consider demand substitution as a key variable. The CNAE[2] (Classificação Nacional de Atividades Econômicas) is no exception. The CNAE has been in use by IBGE since 1995 and it was elaborated in order to adequate Brazilian sect oral classification to the ISIC.

The CNAE allows sect oral classifications at the two, three and four digit levels. This paper uses the three-digit CNAE classification. At this level of aggregation, the CNAE is divided into 106 sectors. For two sectors – natural gas exploration and fabrication of nuclear material – the PIA does not provide information due to the small number of firms in activity in these sectors. This choice takes into account two key arguments:

(i) The level of diversification of Brazilian companies is quite low. According to IBGE, in 1994, about 2% of companies in manufacturing had activities in more than one three-digit sector. This group of companies was responsible for 18% of total sales. If the paper took into account lower levels of aggregation

[2] The CNAE can be viewed at http://www2.ibge.gov.br/pub.

the risk of considering a sales outside its original sector would increase, though it would be more closely related to the relevant market; and

(ii) The number of companies in some four-digit sectors would be small. This could create obstacles for IBGE to reveal concentration ratios in some cases.

An additional limitation of this study is the failure to account for the external sector. Exports and imports are not considered in the elaboration of concentration ratio. This can lead to two kinds of miscalculations:

(i) The failure to add imports to the denominator of concentration ratios would imply the overestimation of concentration; and

(ii) If imports are mainly derived from subsidiaries of multinational enterprises that are also market leaders in Brazil, the bias can be reversed.

2.5 Concentration Indexes

The debate on the influence of M&A over concentration stresses the importance of biases created by wrong choices of concentration indexes.[3] Hay and Morris (1991) state that the choice of concentration indexes should obey some properties:

(i) If the size distribution of firms is maintained constant, the inclusion of an additional firm should decrease concentration;

(ii) Taking the number of firms as constant, an increase in the inequality of size distribution should augment concentration;

(iii) If the concentration curve of market A is higher than the concentration curve of market B in all points, then concentration indexes should reproduce the phenomenon; and

(iv) Mergers should increase concentration.

The choice of concentration indexes is nonetheless restrained by data availability. This work had access to concentration ratios. Concentration ratios are subjected to two main shortcomings:

[3] See Hannah and Kay 1981, Hart 1981 and Prais 1981.

(i) They analyze only one point in the concentration curve. In this sense the choice of the right point in the concentration curve would be crucial. For instance, an industry may have lower concentration than other industry according to the four firm concentration ratio;

(ii) However, it may have higher concentration at the eight firm concentration ratio. Which measure is more appropriate would depend on competition conditions of each industry; and

(iii) It does not take into account the number of firms in an industry. For instance a four firm concentration index will not capture changes in concentration by the entry of a new firm that does not belong to the CR4.

In order to overcome some of these problems, the paper uses three concentration ratios: four-firm (CR4), eight-firm (CR8) and twelve-firm (CR12). This option helps to attenuate some of the shortcomings of concentration ratios:

(i) It covers more than one point in the concentration curve; and

(ii) Lowers the probability that new entries won't be covered by the index.

2.6 Organization of the Results

The results of this paper are organized in two different parts. First, the paper makes an analysis ofthe evolution of concentration in the Brazilian manufacturing and mining industries and its relation with the occurrence of M&A transactions. Second, the paper uses a ordinary least square equation to control results for structural variables. The equation is represented by:

$$dCR_i = a + b_1 rgr + b_2 rentry + b_3 INTTEC + b_4 INOVPROD + b_5 F\ \&\ A + b_6 CR_i 1996 + b_7 DPROD + e$$

where

(i) dCR_i is the change in concentration ratio at the i^{th} firm level in the 1996/2000 period, obtained from PIA;

(ii) *rgr* is the rate of growth of the market sales, represented by the rate of change in the sector's share of total manufacturing and mining industry sales, between 1996 and 2000, supplied by PIA;

(iii) *rentry* is the rate of entry of new companies in the period, also obtained from PIA;

(iv) *inttec* is the industry's technology intensity, represented by the rate of R&D to total sales, for the year 2000, obtained from PINTEC 2000;

(v) *difprod* is a measure for product differentiation, represented by the number of companies that have performed product innovation, vis-à-vis the total number of companies in the industry, for the year 2000, obtained from PINTEC 2000;

(vi) *M&A* is a dummy for the occurrence of mergers and acquisition transactions; *Cri1996* is the concentration ratio at the i^{th} firm level for the year 1996, obtained from PIA; and

(vii) *Dprod* is the change in productivity, represented by the rate of change in labor productivity between 1996 and 2000.

The introduction of control variables follows the works of Pryor (1994) and Liebeskind, Opler and Hatfield (1996). The descriptive statistics for the variables and their Pearson correlation indexes can be seen at tables 2 and 3, respectively.

III. Results

3.1 Changes in Industrial Concentration

Table 4 provides information on weighted and arithmetic average for four, eight and twelve firm concentration ratios at the year 1996. By both criteria, the average CR4 of the manufacturing and mining industries is around 0,42. This is higher than the weighted average CR4 of the US manufacturing industry for at the ***four-digit***[4] level for 1992 and similar to the CR4 for 1997. The CR8 also has the same comparative terms.[5] Therefore, due to the differences in the aggregation level – ***three-digit*** for the Brazilian case and

[4] Resulting in three hundred and sixteen sectors.

[5] US comparative data obtained from Pryor (2002).

four-digit for the US – the Brazilian manufacturing and mining industries appear to be quite concentrated.

Table 4 has also information on changes of concentration ratios by three different criteria:

(i) The weighted average by the share of sales of each sector in 1996;

(ii) The weighted average by the share of sales of each sector in 2000; and

(iii) The arithmetic average.

Changes in the arithmetic average of concentration ratios are positive, though quite small, and do not appear to be statistically significantly different from zero. Changes according to weighted average are also positive and larger. This suggests that sectors with higher increases in concentration ratios have in average larger markets in terms of sales. Furthermore, changes in average concentration ratio are larger when they are weighed by 2000 sales than when they are weighed by 1996 sales. This may indicate that, in average, sectors with higher rates of growth had higher increase in their concentration level. In fact, table 3 shows that the rates of growth of revenue are positively and significantly correlated to changes in concentration ratios. It is also interesting to note that in absolute terms the greater change in concentration occurs at the eight-firm concentration ratio for all three averages. This may suggest that market shares of firms situated between the ninth and the twelfth rankings are being shrunk on behalf of the eight largest firms.

Pryor (2001, 2002) show a change in concentration ratios in the fifteen years period from 1982 to 1997 of about 5 percentage points. The maintenance of the trend verified for the Brazilian economy for the next ten years would point to a structural change similar to the one suffered by the US in the period evaluated by Pryor. This means that the continuation of this pattern of change would imply an enormous transformation in Brazilian market structure.

Changes in concentration ratios are far from uniform across sectors. Table 4 and table 3 shows that standard deviations of changes in concentration ratios are quite high. For instance, the minimum value of changes in CR4 is –0,40, in the case of Shipbuilding, and the maximum value is Office Machinery, which increased CR4 in 0,3763. Therefore, sectors are quite heterogeneous with respect to changes in concentration ratios. It would therefore be interesting to explain some of these differences.

Table 4 also shows the comparison of changes in concentration ratios of two sub-samples. One sub-sample is represented by those sectors that had at least one M&A transaction. The other sub-sample is represented by sectors without any transaction. For all concentration ratios, in the case of the former 68 sectors sub-sample, the arithmetic average is positive and statistically different from zero. For the sub-sample of sectors with no transaction, the arithmetic average is negative though not significantly different from zero. When the averages of the two sub-samples are compared, the difference is statistically significant at the 1% level for all concentration ratios. It seems thus that concentration may be explained by the occurrence of M&A transactions. In fact, the evidence suggests that *cæteris paribus* concentration would decrease if M&A transactions were absent. However, the presence of other variables affecting concentration as well, as can be exemplified by correlation indexes in table 3, recommends the introduction of controls.

3.2 M&A and Changes in Industrial Concentration

Table 5 shows three equations that present results of the test of the equation showed in subsection 2.6. Equation (1) has dcr4 as dependent variable, dcr8 is the dependent variable in equation (2), and dcr12 is the dependent variable in equation (3). Though R-square levels are not so high, F statistics is adequate.

The change in the productivity (DPROD) is the variable with the highest explanatory power in all three equations. The higher the rate of growth of productivity is, the higher the change in concentration ratios will be. It should also be stressed that as concentration ratios rise along the concentration curve, the coefficient for DPROD lowers and so does t-statistics. This may be indicating that companies with greater size are more likely to present increases in productivity and that this feature explains the gains of market share of leading companies. Furthermore, the evolution of the coefficient in the three equations suggests that the four leading companies squeeze the market shares of their immediate competitors, situated in positions from fifth to twelfth.

One can infer from this evidence that at least in the productive context there is a positive correlation between increase in concentration and efficiency. This result may have implications for antitrust policies. However, some doubts still hold with respect to allocative efficiency.

In order to address allocative efficiency, one should also evaluate changes in quantities and prices. It should be noted that the rate of growth of sales is positively correlated to changes in concentration (see table 3). This may be a consequence of changes in prices or quantities. On the other hand, in equation (1) through (3) the *rgr* changes sign though it is not significant. This is the result of the introduction of *dprod* variable. As it is shown in table 3, *dprod* and *rgr* are positively and significantly correlated.[6]

The second most significant variable in equation (1) is the concentration level. The negative correlation between concentration and changes in concentration is a well-known stylized fact (Liebeskind, Opler and Hatfield 1996). However, in table 5, as the concentration ratio moves along the concentration curve, the module of the coefficient for the concentration ratio in 1996 radically decreases and the variable loses significance. Therefore, the initial concentration ratio would be explaining changes in market share of companies situated in the upper rankings, but does not explain changes in the market share of companies located in the ninth through twelfth position in the sales rankings.

The dramatic decrease in the coefficient along the concentration curve may suggest that in less concentrated markets the four leading companies are increasing their market shares at the expense of companies situated in intermediary rankings. It should be made clear however that these changes may be a consequence of changes in the rankings and that such features are not object of this analysis.

The dummy for the occurrence of M&A transactions has the exact opposite behavior to the initial concentration ratio. The dummy is positive in all three equations but it is statistically significant only in equations (2) and (3). The coefficient increases along the concentration curve. This suggests that M&A transactions are a more important

[6] Therefore, contrary to Pryor (1994) and Liebeskind, Opler and Hatfield (1996), the rate of growth does not show significant correlation to changes in concentration.

explanatory variable for changes in the market share of companies positioned between the ninth and twelfth position than in explaining changes in CR4. Once more, the analysis does not address turnover in companies' rankings.

One should observe that there is a clear correlation between concentration ratios in 1996 and M&A. Table 3, shows that this correlation is significant at the 1% level for CR4 and at the 5% level for CR8 and CR12. In fact, if CR_i is excluded from equations (1) through (3), M&A becomes significant at the 5% level in all equations. One possible explanation for the lack of significance of M&A in equation (1) would then be that the expansion of top four firms are mainly conditioned by the level of concentration in markets. If levels of concentrations are sufficiently low, they expand their market shares through many ways. This could include M&A transactions but it would comprise expansion using internal resources as well. On the other hand, the expansion of market share of firms situated between the fifth and twelfth positions in sales rankings would be more likely whenever there was the possibility of acquisition of smaller firms.

The latter argument allows an important parallel with existing literature on other countries' experience. It suggests that it is not obvious that M&A transactions will have a concentrating effect on markets, as it is argued by Hannah and Kay (1977, 1981) and Hay and Morris (1991). On the contrary, it indicates that depending on firms involved in the transaction, market structures may be less affected by M&A transactions. The argument is close to Liebeskind, Opler and Hatfield (1996) that suggest that the M&A wave of the 80's in the US involved the acquisition of divisions or plants – spun-off by bigger firms – by smaller companies. In the Brazilian case, in the 90's, the M&A wave seems to be associated with the acquisition of smaller companies by firms of intermediary size.

Some questions still remain. First, turnover of firms in the sales ranking is not covered by the analysis. It should be interesting to verify if firms that are more M&A intensive strategies have increased their market shares vis-à-vis firms that have not acquired. Second, the analysis does not allow an understanding about size of acquired firms. This weakens some of the conclusions.

IV. Conclusion

This paper suggests four main conclusions with respect to the process of productive concentration of the manufacturing and mining industries in Brazil:

(i) The analyzed period has witnessed a small increase in average market concentration. All concentration indicators used in the paper confirm this tendency. This helps to clarify the rather blurred tendency presented in Rocha and Kupfer (2002);

(ii) However, as suggested in Rocha and Kupfer (2002), though average concentration increases, there is great dispersion of the results. Some sectors have negative changes in concentration, others have quite huge changes towards the increase of concentration.

(iii) The effect of M&A on concentration is far from striking. M&A seems to affect market shares of firms of intermediary size. The market shares of top four firms do not appear to be influenced by M&A transactions. This could be a consequence of some characteristics of the M&A wave presented in Rocha and Kupfer (2002), such as the strong participation of multinational enterprises that could be using acquisitions to enter the Brazilian market; and

(iv) Increases in concentration do not seem to be associated with loss of economic efficiency. Though the behavior of prices and quantities is not addressed in this paper, the paper shows some evidence that increases in concentration are positively correlated with productivity gains.

The results presented may also render some policy suggestions. More specifically, the paper indicates that there should not be special concern with efficiency losses caused by increases in concentration. However, the results do not allow general conclusions and due to the aggregated and unspecific character of the analysis, deeper analyses for specific cases are recommended.

Finally, the paper suggests some recommendations for future research:

(i) A detailed analysis of the effect of different modes of industrial restructuring on concentration in line with Liebeskind, Opler and Hatfield (1996) should be undertaken;

(ii) A more detailed analysis of the import structure of industries should be made in order to correct for possible biases due to the exclusion of foreign market from the concentration analysis. In this sense a study of the origin of imports and its association with subsidiaries of multinationals that are market leaders in Brazil would help to understand the direction of changes if imports were included into the analysis;

(iii) An analysis of impacts of concentration changes on profit margins would help to deepen knowledge about the effect of changes in concentration on efficiency; and

(iv) Some analysis about companies involved in transactions would help to understand the role played by M&A in firms' market shares.

References

Hannah, L. and Kay, J. *Concentration in Modern Industry*. The MacMillan Press, London, 1977.

_____ The Contribution of Mergers to Concentration Growth: A Reply to Professor Hart. *The Journal of Industrial Economics.* XXIX, 395-314, 1981.

Hart, P. The Contribution of Mergers on Industrial Concentration. *The Journal of Industrial Economics.* XXIX, 315-320, 1981.

Hay, D. and Morris, D. *Industrial Economics and Organization: Theory and Evidence*. Oxford, Oxford University Press, 1991.

IBGE Pesquisa de Inovação Tecnológica, 2000. Rio de Janeiro, IBGE, 2002.

IBGE *Pesquisa Industrial Anual, 1999*. Rio de Janeiro, IBGE, 2001.

IBGE *Pesquisa Industrial Anual, 2000*. Rio de Janeiro, IBGE, 2002.

Jacquemin, A. The New Industrial Organization: Market Forces and Strategic Behavior. Cambridge, The MIT Press, 1987.

Liebeskind, J. P. Opler, T. C. and Hatfield, D. Corporate Restructuring and the Consolidation of US Industry. *The Journal of Industrial Economics,* XLIV, 53-68, March, 1996.

Muller, J. The Impact of Mergers on Concentration: A Study of Eleven West German Industries. *The Journal of Industrial Economics*, XXV, 113-132, 1976.

Nissan, E. Effects of antitrust enforcement on aggregate concentration. *Journal of Economic Issues,* 25(2): 112-117, 1998.

_____ Measuring Trends in Sales Concentration in American Business. *Quarterly Journal of Business Economics,* 36(1): 17-31, 1997.

Prais, S. J. The Contribution of Mergers to Industrial Concentration: What Do We Know? *The Journal of Industrial Economics.* XXIX, 321-329, 1981.

Pryor, F. The Evolution of Competition in US Manufacturing. . *Review of Industrial Organization*, 9: 695-714, 1994.

_____ New Trends in US Concentration. *Review of Industrial Organization*, 18: 301-326, 2001.

_____ News from the Monopoly Front: Changes in Industrial Concentration, 1992-1997, *Review of Industrial Organization*, 20: 183-185, 2002.

Ravenscraft & Scherer (1987) – *Mergers, Sell-Offs, and Economic Efficiency*. Washington,D.C.: Brookings Institution.

Rocha, F. Iootty, M. e Ferraz, J. C. Desempenho das fusões e aquisições na indústria brasileira na década de 90: a ótica das empresas adquiridas. *Revista de Economia Contemporânea.* Vol 5, Número Especial, 2001.

Rocha, F. and Kupfer, D. Structural Changes and Specialization in Brazilian Industry: The Evolution of Leading Companies and the M&A Process. *The Developing Economies*, 40(4), 497-520, 2002.

Thomson Financial *Thomson Financial Securities Data.* Base de dados de Fusões e Aquisições, Brasil, 1990-1999.

Table 1 – Number of Transaction by Period and Percentage of Shares Acquired, Brazil, 1990-1999.

Percentage of Shares	Period		Total
	1990-1996	1997-1999	
0-25	25	21	46
25-50	47	32	79
50-75	39	49	88
More than 75	156	170	326
Not Informed	23	20	43
Total	290	292	582

Source: Thomson Financial.

Table 2 – Descriptive Statistics

	N	Minimum	Maximum	Average	Standard Deviation
CR41996	104	0,079	1,000	0,418	0,238
CR81996	104	0,122	1,000	0,530	0,250
CR121996	104	0,155	1,000	0,592	0,247
CR42000	104	0,084	1,000	0,427	0,242
CR82000	104	0,121	1,000	0,544	0,258
CR122000	104	0,148	1,000	0,602	0,253
DCR4	104	-0,400	0,376	0,010	0,096
DCR8	104	-0,318	0,287	0,014	0,086
DCR12	104	-0,270	0,233	0,011	0,079
DPROD	104	-0,142	3,965	0,670	0,622
DIFPROD	104	0,000	0,677	0,235	0,143
INTTEC	103	0,002	0,038	0,015	0,010
RGR	104	-0,472	8,344	0,719	0,980
RENTER	104	-0,552	1,691	0,131	0,355

Source: Own elaboration from Thomson Financial, IBGE – PIA, 1996-2000, IBGE – PINTEC, 2000.

Table 3 – Correlation Matrix

	CR41996	CR81996	CR121996	DCR4	DCR8	DCR12	DPROD	DIFPROD	INTTEC	RENTER	RGR
CR81996	0.974***										
CR121996	0.948***	0.993***									
DCR4	-0.164*	-0.118	-0.091								
DCR8	-0.102	-0.080	-0.058	0.918***							
DCR12	-0.105	-0.094	-0.082	0.857***	0.976***						
DPROD	0.401***	0.413***	0.422	0.384***	0.376***	0.325***					
DIFPROD	0.283***	0.319***	0.346	0.034	-0.018	-0.072	0.370***				
INTTEC	0.333***	0.358***	0.379	-0.111	-0.100	-0.133	0.224**	0.640***			
RENTER	0.038	0.019	0.000	-0.123	-0.134	-0.152	-0.092	-0.214**	-0.185*		
RGR	0.235**	0.218**	0.212	0.209**	0.200**	0.171*	0.738***	0.296***	0.255***	0.185*	
MA	-0.285***	-0.246**	-0.216**	0.208**	0.235**	0.246**	0.018	0.041	0.012	-0.126	-0.098

Source: Own elaboration from Thomson Financial, IBGE – PIA, 1996-2000, IBGE – PINTEC, 2000.
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level

Table 4 – Concentration Level and Changes of Concentration in the Brazilian Manufacturing and Mining Industries, 1996-2000

	Number of Sectors	CR4	CR8	CR12
Arithmetic Average of Concentration Ratio in 1996	104	0,418	0,530	0,592
Weighted Average of Concentration Ratio in 1996	104	0,415	0,521	0,583
Weighted Average by 1996 Sales of Changes in Concentration Ratios, 1996-2000	104	0,012277	0,019371	0,015658
Weighted Average by 2000 Sales of the Changes in Concentration Ratios, 1996-2000	104	0,015757	0,023461	0,018871
Arithmetic Average of Changes in Concentration Ratios, 1996-2000	104	0,009558	0,013552	0,010694
Standard Error		0,009145	0,008475	0,007778
t-Statistics of Hypothesis Ho=0		1,015	1,599	1,375
Arithmetic Average of Changes in Concentration in Sectors with M&A Transactions	68	0,023992	0,028269	0,024797
Standard Error		0,009776	0,009355	0,008888
t-Statistics of Hypothesis Ho=0		2,457**	3,022***	2,79**
Arithmetic Average of Changes in Concentration in Sectors without M&A Transactions	36	-0,017708	-0,014256	-0,015947
Standard Error		0,019397	0,016139	0,014061
t-Statistics of Hypothesis Ho=0		-0,913	-0,883	-1,134
t-statistics for Mean Difference Test between Sectors with and without Transactions		2,144**	2,443**	2,558**

Source: Own elaboration from Thomson Financial, IBGE – PIA, 1996-2000.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Tabela 5 – Least Square Regression Estimates

Dependent Variable	dcr4	dcr8	dcr12
Equation	(1)	(2)	(3)
(Constant)	0,009	0,008	0,015
	(0,323)	(0,293)	(0,604)
F&A	0,016	0,028*	0,031*
	(0,855)	(1,620)	(1,949)
TXCRESC	-0,023	-0,015	-0,005
	(-0,963)	(-0,700)	(-0,224)
TXNEMPR	-0,011	-0,020	-0,030
	(-0,431)	(-0,798)	(-1,328)
INTTEC	-1,012	-0,596	-0,752
	(-0,882)	(-0,561)	(-0,760)
DIFPROD	-0,015	-0,077	-0,095
	(-0,182)	(-1,040)	(-1,391)
DPROD	0,099***	0,081***	0,061***
	(4,154)	(3,647)	(2,921)
CRi1996	-0,132***	-0,069*	-0,047
	(-3,005)	(-1,767)	(-1,269)
Adjusted R^2	0,251	0,217	0,198
F	5,878***	5,027***	4,588***
n	104	104	104

t-statistics in parenthesis.

* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level