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TEXTOS PARA DISCUSSÃO

UFF/ECONOMIA

An interpretation of the mark up behavior in the Brazilian industry in the 1990s based on micro-macro relationships

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Abstract
Our objective in this paper is to investigate the determinants of mark up in the Brazilian industrial firms in the 1990s, a period marked by slow economic dynamism and relevant changes in the macroeconomic environment. Based on the post Keynesian theory of price determination, we discuss that price changes depend on decision about the mark up. The econometric exercise developed in this article showed how microeconomic and macroeconomic variables affected the determination of the mark up. A negative relation was found between demand variation and mark up variation, suggesting that it evolved in an anticyclic way.
Key Words: pricing decisions, mark up determination, micro and macroeconomic interactions.

Resumo
Nosso objetivo nesse texto é investigar os determinantes do mark up nas empresas industriais brasileiras nos anos 1990, período marcado por baixo dinamismo econômico e relevantes mudanças no marco institucional do país. Baseando-nos na teoria pós keynesiana de determinação dos preços, argumentamos que variações nos preços dependem de decisões sobre o mark up. O exercício econométrico desenvolvido nesse artigo mostrou como variáveis microeconômicas setoriais e macroeconômicas afetaram a determinação do mark up. Constatou-se uma relação inversa entre variação da demanda e variação do mark up, sugerindo que esse evoluiu de forma anti-cíclica.
Palavras Chaves: decisões de fixação de preços, determinantes do mark up, interações micro e macroeconômicas.

JEL: L11, L16, O14

1. Introduction

The Brazilian economy experienced significant changes during the 1990s. Economic and financial deregulation, price stabilization and privatizations configured a new economic scenario, shaping new attitudes and strategies of agents. In spite of these changes, economic performance was poor during the decade. Economic growth was marked by short periods of growth followed by deceleration periods. The gross capital formation rate, a key variable to explain the dynamism of economies, was of around 17%, whereas current estimates point to an investment level of around 25% as a requirement for a 5% sustained annual growth rate.

Despite the slow growth, the 1990s saw the recovery of industrial productivity, which had been stagnated since the 1980s. This result can be largely attributed to the external deregulation and exchange rate valuation after the stabilization plan in 1994. In this sense, the recovery of industrial productivity can be understood as the result of the change of the relative price vector of productive resources, contributing to an increase in production efficiency. Yet, to what extent did this supply shock affect the decision process regarding price formation by private firms? The motivation for the article is associated to these aspects.

The microeconomic literature points out that the increase in production efficiency as a result of more flexible commercial relations should result in, at least, two positive effects on the economy.[1] On the one hand, a greater exposure to foreign competition should encourage firms to improve their product quality and productivity by employing more efficient inputs. Thus, an increase in economic growth rates should be expected, encouraged by the acceleration in incorporating technological change. As has been mentioned, economic growth rates were low the 1990s. On the other hand, the reduction in tariff and non-tariff barriers should imply in broadening the market for more firms, increasing competition and contributing to a reduction in profit margins. As will be seen in this article, reduction in profit margins was not observed either.[2]

Considering the macroeconomic scenario in the 1990s, the objective of this paper is to investigate the influence of the new economic environment on the industrial firms pricing decision. In this sense, this text discusses causal links and investigates empirically variables that can be identified as having influence in price formation in the 1990s, through the determination of the mark up of industrial firms. Price formation is a key variable to explain the production and accumulation behavior of the firm, because it largely determines the generation of firm's profits. Also, pricing strategies of firms are fundamental to the understanding how monetary policy affects the real side of the economy. In spite of the relevance of the subject, empirical studies about mark up determination in Brazil in recent times are scarce and not conclusive (see footnote 2). In

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[1] Ferreira & Guillén, 2004 present two other effects, we highlighted only these two.

[2] As will be presented in this article, our results about the behavior of mark up of industrial firms in the 1990s showed that the mark ups changed and, in general, increased (Table A1). These results contrast with those found by Ferreira & Guillén (op. cit), which observed that the mark ups changed little. Those authors, when presenting the results of their econometric estimates about the effect of economic deregulation on the Brazilian productivity and production framework, concluded that: "The channel to this increase in productivity is not, apparently, the increase in competition, since there is no statistical evidence of mark up reduction. This is perhaps the most suprising result in the article, the fact that the mark up does not change significantly after commercial deregulation."(p. 527). Moreira and Correa (1997, p. 85), departing from another data base and analyzing the impact of the commercial openness in Brazilian industry from 1990-95, found a different result for mark up behavior. They observed significant decrease in profit margins in industries producing tradables, but increase in Beverage, Pharmaceutics, Cement and Paper and Rubber.

this context the contribution of this paper is to add new arguments to explain industrial mark up behavior in the nineties.

This paper works with the assumption that prices, in a large portion of the economy, are fixed through the application of a mark up over production costs. The main reference here is the classical empirical study of Hall and Hitch (1939). Thus, the key variable that firms administrate is the mark up - not the price itself. But, as pointed out by Sawyer (1981, p. 139) Hall and Hitch approach to price determination does not state the forces determining mark up. In this paper we will assume that the decision about the mark up depends on the firm's perception in relation to the behavior of the market for its product and on macroeconomic environment, given a growth strategy chosen to be followed over time. This hypothesis allows for the establishment of an interesting relation between microeconomic and macroeconomic variables in the firm's decision process, as well as an important interaction between short term and long term decisions (Feijó, 2002).[3]

This text develops in the following way, besides this introduction. In section two we briefly present theoretically how the price formation process takes place in the context of an oligopolistic firm deciding under uncertainty. In section three we discuss how changes in the macroeconomic scenario of the Brazilian economy in the 1990s affected the industrial firm's behavior regarding the determination of the mark up. In section four we present the econometric results of the model for the industrial mark up determination in industrial Brazilian firms in the 1990s, and the last section summarizes our conclusions.

2. An overview of price determination in the post-Keynesian literature

The post Keynesian literature attributes a particular interest in the mark up determination as it considers that production, price and investment decisions are linked to mark up decision[4]. In this literature, mark up behavior is the result of the interaction of a complex set of economic forces.

Under the assumption that decisions are made under uncertainty, firms cannot fully evaluate the consequences of their actions, and therefore determine for sure the price that maximizes their profits. So, the mark up becomes the strategic variable firms manipulate in search of their maximization targets.[5] Post Keynesian authors advocate that price formation process reflects how diversified firms build their growth strategies according to how they perceive the future behavior of demand, costs, and competition. In this sense we recall Penrose's (1959) observation, that it is subjective judgment, rather than objective fact, that is considered in firm's decision making process.

According to the Kaleckian tradition, the supply price in oligopolized markets reflects the firm cost structure and market power. Such power is associated with two factors: the capability of passing on any direct cost pressure to prices, regardless of the competitors pricing policy and the improvement of a firm's relative position in its industry, even in the absence of changes to its cost structure. Consequently, the price-

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[3] For references of empirical surveys on pricing, see, for example, Sawyer (1981, chapter 9) and Lee, 1995Appendix A, B and C)

[4] For example, Eichner (1973, 1976, 1985), Harcourt & Kenyon (1976); Davidson (1978), Kenyon (1979); Shapiro (1981); Ong (1981), Feijó (1993), Arestis & Milberg (1993-94), Lavoie (1996), Lee (1998), Downward (2000), Shapiro & Sawyer (2003) among others.

[5] Davidson (1978), among many others, suggests that prices are formed by means of a mark up rule over costs given a production level considered as being standard.

direct cost ratio - a firm's mark up - reveals its discretionary power in fixing price, and it is an indicator of the degree of monopoly.[6]

Besides price determination depending on production costs and demand behavior, in the post Keynesian literature it also depends on the internal fund requirements to realize the firm's investment plans.

Given these behavioral hypothesis, Kenyon (1979, p. 39) proposes a sequence of arguments to explain the determination of the mark up by an oligopolistic firm. First, the firm decides about the future investment plans based on the relation between the observed capacity utilization rate and some desired rate – this desired rate being such that the firm will be capable of meeting a sudden increase in demand for its product; after that, the firm chooses the mark up that will allow it to retain the profits required to fulfill its obligations and meet its strategic objectives. The firm then chooses the mark up that will provide the expected profit level. The firm will maintain this price as long as demand conditions indicate that the productive capacity is adequate, and as long as production costs do not deviate from their normal level.

As Shapiro and Sawyer (2003) pointed out, although prices depend on costs, there is no automatic transmission mechanism in costs to prices, that is, prices depend on the mark up (a strategic decision), as well as on costs. When costs change, the prices do not necessarily change, the mark up over the costs may change instead of the prices.[7] In the same way, when demand changes, firms with oligopoly power will decide to change prices according to their strategy of capital accumulation in the long run. Again, there will be no automatic mechanism linking price changes due to changes in demand.

To sum, assuming that rivalry between firms that constitute an industry is enough to ensure that no investment opportunity is wasted, the strategic variable in the study on mark up behavior is the level of expenses with investment by the firms. Investment decision will be driven by rivalry among firms, market growth expectations and the desire to maintain or broaden markets share.

Minsky (1986), contributed to make deeper the understanding of the interaction process between the microeconomic and macroeconomic spheres by showing how mark up decisions are also influenced by the need to generate cash flow to pay for financial commitments taken on.[8] In this context, the process of price formation and mark up determination by firms should be aimed at generating enough profits (or cash flows) to provide resources for the investment financing process. Firms should, therefore, include in their supply prices an amount that, besides exceeding their costs, should also generate enough funds to sustain or value their capital assets. Prices, in this sense, cannot be treated as functions of the resource allocation and income distribution process only, they must also be related to: a) the need to generate funds that will make the capital accumulation process possible, b) make payments of debts feasible, c) induce and partly finance investments and d) make the acceptance of new financial obligations possible.

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[6] According to Kalecki (1971) the firm's mark up is determined by the degree of competition between firms in an industry $(p_i - u_i)/u_i = f_i(p*/p_i)$, where $p*$ is the weighted average price in an industry, u is the direct cost, and i represents the firm's subscription.

[7] As presented by Sylos-Labini (1969), the price equation can be written as: $p = v + qv$, where p is the unit price, v represents direct operational costs, and qv represents the overhead (over a standard production volume) and an acceptable profit margin per product unit.

[8] See Fazzari, et al (1988) for an empirical exploitation on the links between financial structure and real activity. For an empirical analysis of determinants of private investment in Brazil, see Alves and Luporini, 2008.

In sum, the mark up is a strategic variable that changes both by market influence and decisions made by firms to meet their targets over time. Those targets are established considering the evaluation they make about future prospects of gains, given their perception of the present and future evolution of the macroeconomic context.

3. The macroeconomic context of industrial firms in the 1990s

Economic reforms in the 1990s can be seen as characterizing an important inflection point in the evolutionary trajectory of Brazilian firms. At least two main changes can be pointed out as responsible for this inflection: the end of the high inflation regime after the success of the stabilization plan known as the Real Plan, in June 1994, and the commercial and financial deregulation with the end of tariff and non-tariff barriers, which started at the end of the 1980s.

The end of the high inflation regime implied the end of contract indexation, a practice that pervaded all economic transactions. Indexation of contracts was introduced in the mid 1960s as a gradualist strategy to fight inflation. In the early 1980s, when the annual inflation rate reached over 3 digits, indexation, both formal and informal, started to become generalized in the economy. Since the indexation system promoted automatic price correction based on past inflation, as it became more diffused, it made the price system downwardly rigid and more sensitive to shocks[9].

3.1 Price stabilization

As mentioned, the 1990s constituted an important inflection point in the evolutionary trajectory of firms in Brazil. In the previous decade, the prevalence of exchange rate protection and of tariff and non-tariff barriers ensured operational profit margins, what did not encourage cost reduction and the introduction of innovations by firms. Moreover, in a highly inflationary context and with widely diffused contract indexation rules, the high level of effective protection allowed firms to informally index their prices on the expected inflation, estimated according to the official exchange rate or the overnight interest rate variation. This defensive behavior by firms aimed at ensuring adequate profit margins and cash flows to preserve their financial capacity toward unexpected cost variations. Investment decisions on long term capital formation were strongly discouraged as, under the high inflation regime, time horizon of decisions is shortened.

A favorable combination of political moment and economic conditions allowed Brazilian government in late 1993 to launch the basis for an economic program that resulted in the end of almost two decades of high inflation. In July 1994 the old currency was replaced for the real. The Real Plan was the most well succeeded heterodox stabilization plan, among others stabilization attempts that started in 1986 with the Cruzado Plan. As the other plans, the Real Plan diagnosed that the Brazilian inflation had a strong inertial component. But differently from the others, it did not put in practice price freezing, confiscation of bank deposits and changing in monetary contracts rules.

In its conception, the Real Plan followed the traditional method of fighting great inflations of the 20th Century: recovery of trust in the national currency by guaranteeing

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[9] For a discussion about the high inflation regime in Brazil, see Feijó & Carvalho, 1992. For an extensive investigation about pricing dynamics in the industrial sector in 1960s and 1970s, see Considera (1981).

its external value. The monetary anchor was the stabilization of the rate of exchange through the inflow of external financing and the accumulation of foreign reserves in an amount enough (so it was believed) to discourage speculative attacks against the fixed parity. After so many disappointments in previous stabilization plans, the objective of the economic team responsible for the Real Plan was to implement it gradually, without surprises. So the replacement of the currency was made, in a first stage, substituting the old currency for an indexed currency, daily updated. At the end of June 1994, the new currency was finally launched. The fiscal issue was a concern when formulating the announced plan in late 1993, so at the time of the introduction of the new currency the financial situation of the public sector was comfortable.

3.2 Opening of the economy

Commercial and financial deregulations were being processed since late 1980s. At the time of the Real Plan was launched, the country had rejoined the international financial market, which allowed for a significant accumulation of international reserves[10]. We can say that the success of the Real Plan in keeping prices under control relied, in a great extent, on the use of the fix exchange rate as an anchor for domestic prices. Excess of external liquidity, together with high domestic levels of interest rate, caused a strong valuation of the real. So, on one hand, the opening of the economy increased competition, what contributed positively to restrict mark ups, and it was an important factor to stop the process of passing on costs pressures to final prices. On the other, the valuation of the real aided to keep domestic prices under control.

The monthly inflation rate in Brazil did not return to two digits, except in 1999, when the fix exchange rate regime was abandoned and a flexible regime was adopted. Despite the consumption bubble in 1995, the exchange rate crises in Mexico in that same year, the Asian crisis in 1997 and the Russian crisis in 1998, economic authorities, through demand contention policies, managed to keep inflation under control until the end of 1998. Therefore, the Real Plan knocked down the Brazilian chronic inflation. In 1993, it was of around 2708% per year, and in 2005 it was close to 1%.

3.3 Financial fragility after stabilization

Thus, from 1994 onwards the economic environment was one of a low indexation level, a permanent and successful inflation control policy, but with low growth rates. Economic policy showed a stop- and- go pattern, signaling to economic agents that inflationary threats would be fought by strict demand control. The main threats came from the external crisis mentioned above.

Peripheral economies, like the Brazilian, had always been more vulnerable to debt crisis, and the globalization process in the 1990s did not diminish this vulnerability. The financial deregulation process of the Brazilian economy involved the promotion of attractive financial assets that could be taken over by international

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[10] Before the Real Plan, Brazil managed to more than triple foreign reserves. In 1989 they were of around US$9.2 billion, they rose to US$23.7 billion in 1992 and reached US$32.2 billion in late 1993, when the Real Plan was announced. At the time of the Monetary Reform, the reserves were more than US$43 billion, a level that corresponded to 18 months of imports and more than enough to sustain the setting of the exchange rate as an instrument of the stabilization policy. Other aspects of the Brazilian foreign sector at the time of the plan were also solid: trade surplus in 1993 was US$13.3 billion and the current transactions deficit US$675.9 million.

investors – such as public debt securities with short term of maturity and high liquidity, shares of companies under privatization, and so on.

Emerging markets are in general more affected by changes in moods and opinions concerning the sustainability of their respective exchange rate. So, given the intrinsic financial fragility of recently stabilized currencies, it was necessary that assets offered to attract foreign capital produced high capital gains. In this way it was observed that the process of rapid deflation was followed by a slow drop in nominal interest rates. Real interest rates could not be reduced below certain limits established by the spreads demanded by foreign investors to acquire and keep in their portfolio assets denominated in a weak valued currency. This means that the Brazilian stabilization process was intrinsically vulnerable in direct proportion with the dependence on the entrance of foreign resources. In those conditions, the stabilization that was attained was placed under permanent threat of rupturing, and so was perceived by economic agents.

A combination of valued real exchange rate in a context of open economy contributed to the production of permanent current transactions deficits. The year of 1995 is a landmark for the country's foreign accounts, given the magnitude of the changes that occurred: the trade surplus of US\$10.5 billion in 1994 gave place to a deficit of US\$3.5 billion and the result of the current transactions, from a deficit of US\$1.8 billion (0.3% of GDP) became US\$18.4 billion (2.5% of GDP). This result occurred in an environment of low growth.

The tendency to produce current account deficits would have required the implementation of structural policies aimed at equalizing the conditions of foreign and domestic competition, besides gradual adjustments to the exchange rate. However, the liberal economic policy followed, adopted as the main instrument of control of the macroeconomic policy the interest rate, which was kept at high levels, with negative impact on public and external deficits and on investment decisions in fixed capital.

Lastly, the same exchange rate valuation that supported fast deflation, broaden the component that in the formation of the interest rate was correlated with the expectation of exchange rate devaluation. So, to keep credibility on the parity of the exchange rate, the manipulation of the interest rate was the only instrument of monetary policy used every time the real underwent a speculative attack. To contain the outflow of capital in the face of foreign crisis, domestic interest rate suffered sharp increases, and this happened in 1995, 1997 and 1998 after the Mexico the Asian and the Russian crisis, respectively. Therefore, it is not surprising that Brazil displayed after 1994 the highest interest rates among the emerging economies and for global standards – average of above 20% per annum. In early 1999 the exchange rate was devaluated, and the fix regime abandoned.

3.4 Private production and investment decisions in the 1990s

From the firms' point of view, with the commercial deregulation process, they were induced to focus their activities to become more competitive. Privatizations, in turn, opened up opportunities for buying and selling companies which, together with the corporate market dynamism, leveraged the restructuring of firms in the industrial and service sectors. The sensible broadening of domestic markets brought by monetary stabilization and the over valuation of the real created favorable conditions for a number of firms to respond to the competitive pressure produced by imports, through modernization and improving quality of their products. However, as already mentioned, the new more competitive scenario did not stimulate growth.

Modernization implied more imports. So, after a long hibernation period the Brazilian industrial structure underwent a process of renewal/modernization of the basket of products offered, and the massive absorption of organizational and technological improvements known as productive catch up. In this sense, the exchange rate valuation played a dual, contradictory, role of lowering the price of foreign competing products on one hand, and of inputs and capital goods responsible for the productive modernization and diversification of production lines, on the other. It should be remarked that Brazilian industry reacted positively to the new opportunities and challenges. The effects were shown in the industrial productivity growth. Between 1991, before the commercial deregulation, and 1999 labor productivity grew 8.8% yearly[11]. As the level of investment in fixed assets was very low, industrial employment severely decreased.[12] The rate of gross capital formation as a percentage of the GDP was around 17% between 1991 and 1999.

So, despite the punitive macroeconomic environment, the significant growth in productivity, opened space to the drop in production costs. This finding suggests the hypothesis that although the real exchange rate dropped 48.4% between 1985 and 1998,[13] the drop in real prices perceived by the exporting sector was compensated by the reduction in unit costs, which in this way preserved the profit margin/mark up. Perhaps this fact explains why exports grew non-stop between 1991 and 1998, leaping from US$31.6 to US$51.1 billion in a valued exchange rate context.

The exchange rate valuation that occurred after the Real Plan in 1994 had different impacts on price formation among the sectors. Non-tradable goods firms, mainly in the service sector, were in a better position to manage the tradeoff between the desired mark up and preservation of the market share. The same did not happen in tradable goods sector, basically from the manufacturing firms that were exposed to greater foreign competition. The valuation of the exchange rate induced to replacement of local production for imports, mainly those that had abundant international supplier credit at low cost.[14] So, de-industrialization followed the opening of the economy.

The constant threat of a sharp devaluation of the currency added more uncertainty in the macroeconomic context, affecting negatively long run expectations. Overvaluation of the currency discouraged projects aimed at exporting, promoted a shrinking of important chains of production – also affected by predatory imports – and increased foreign property share in the domestic capital stocks.

The impact of high domestic interest rates might also have been different for sectors, depending on the access firms had to the credit market- domestic and international. However, as we have already seen, investment decision in fixed assets were kept low, given in part the uncertainties surrounding the long run prospects of growth of the economy and the high cost of finance. Even firms with access to international capital markets that could take advantage of lower interest rates to finance investment, might have been affected negatively in the formation of their investment expectations by the external vulnerability of the financial accounts of the country.

To sum, financial and commercial deregulation, the change to the exchange rate regime, and price stability significantly altered the price formation process in Brazil from mid nineties on. The commitment to maintain operational revenue, current

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[11] According to the monthly industrial surveys of the Brazilian Statistical Office.

[12] As a consequence, informality rose in labor market.

[13] This result is obtained when the deflators used are the wholesale prices – PPI and IPA. When consumer price indexes are used, this drop is of 67.1%.

[14] In our econometric study reported further on, we found that the real exchange rate had direct influence on the mark up, it being the most significant component to explain the determination of the mark up in the period.

profitability and profit margin, in a context of high uncertainty, given the vulnerability of the economy to foreign crisis and high exposition to international competition, required from firms changes in production and pricing strategies, technological restructuring, and very often the acquisition of new assets or the sale of existing ones.

Given this macroeconomic scenario in the 1990s, the objective of the next section is to empirically investigate the influence of microeconomic variables and the macroeconomic context on the industrial firms' determination of the mark up. In this sense, at the macroeconomic level, it is assumed that inflation, interest and exchange rate variables, the level of commercial and financial deregulation and the domestic aggregate demand performance delimited the firms' potential cash-flows. At the microeconomic level, it is assumed that the supply price reflects the firms cost structure and market power. Given these conditioning factors, firms sought to define current mark ups to their direct average costs which, by ensuring their business profitability, generated income flows and profit margins capable of securing their expansion strategies. Hypothetically, such strategies are basically aimed at defining the adequate level of barriers against the new entrants, and ensure an adequate mix of self-financing and external financing for investment funding.

4. Determinants of mark up in the manufacturing industry in the 1990s

In the mark up determination model for the Brazilian industry in the 1990s, both macroeconomic and microeconomic variables were considered according to the theoretical arguments developed above. Given the availability of data, the mark ups were constructed for industrial sectors, and not industrial firms, considering prices and average production costs as references. In this sense, changes in terms of monopoly power and changes in intra-firm cost structure were not captured.[15] We believe that even with such limitation, the exercise undertaken presented interesting results that are widely consistent with the theoretical discussion presented.

4.1 Econometric Procedures and data estimates

Our objective is to emphasize economic and intuitive arguments to explain the determination of the mark up in the Brazilian industrial firms in the 1990s. We chose to employ clear and intuitive estimation procedures, however in a very strict sense.

Tests were carried out for the presence of common unit roots to all cross-sections, as well as tests with individual unit root process. In general, the results are inconclusive, but there are series I(0) and I(1). However, the power of these tests is strongly affected by the size of the sample. Preliminary experiments indicated that the series are cointegrated, although this conclusion does not hold in the presence of series with different integration order.

In the estimated models (equations) no evidence was found of nonstationarity in the common and individual idiosyncratic errors, which is coherent with the fact that the panel data have a common factor (Bai & Ng, 2004). In face of this argument, it was decided to estimate the model in levels.[16]

The model specification followed the criterion of starting from the more general to the more parsimonious specification following the analysis of common factors. Since the preliminary experiments indicated the presence of a strong serial correlation, the

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[15] As our sample captures large firms, the dispersion of individual mark ups should be low. For a discussion about mark up dispersion, see Roberts and Supina, 1997
[16] The reported analysis is not included in the article but is available for anyone interested.

error term has been specified as a first order autoregressive process – AR(1). This, however, was not sufficient to eliminate the entire autocorrelation for several models. Also, a dummy for economic policy was included to reduce the size of the outliers present in 1993 and 1999, and this way obtain residuals closer to being Gaussian ones.

The selection criterion of the equations estimated was to choose those which residuals presented none or little serial correlation. This criterion eliminated all specifications with fixed and random effects, as well as equations with variables as first differences. The same procedures were applied to the SURE specifications.

The models were estimated by FGLS and the coefficient of the variance matrix was estimated with the White robust estimate version corrected by the degrees of freedom, which is designed to accommodate arbitrary serial correlations and time-variant variances of the disturbances.[17]

The panel model is specified as follows:

$$Y_{it} = \mathbf{X}_{it}\boldsymbol{\beta}_X + \mathbf{Z}_{it}\boldsymbol{\beta}_Z + \mathbf{D}_t\boldsymbol{\delta} + u_{it}$$

for M cross-sectional units (i = 1,…., M) and T time periods (t= 1,…,T) and where Y_{it} is the mark up value (MU), $\mathbf{X}_{it}$ is the vector of k explanatory macroeconomic variables $\mathbf{X}_{it} = \left[X^1{}_{it} X^2{}_{it} \cdots X^k{}_{it}\right]$, $\mathbf{Z}_{it}$ is the vector of g explanatory microeconomic variables $\mathbf{Z}_{it} = \left[Z^1{}_{it} Z^2{}_{it} \cdots Z^g{}_{it}\right]$, $\mathbf{D}_t$ is the vector of s dummy variables $\mathbf{D}_t = \left[D^1{}_t D^2{}_t \cdots D^s{}_t\right]$ and

$\boldsymbol{\beta}_X, \boldsymbol{\beta}_Z, \boldsymbol{\delta}$ are vectors of coefficients $\beta_X = \begin{bmatrix} \beta_{X1} \\ \beta_{X2} \\ \vdots \\ \beta_{Xk} \end{bmatrix}$, $\beta_Z = \begin{bmatrix} \beta_{Z1} \\ \beta_{Z2} \\ \vdots \\ \beta_{Zg} \end{bmatrix}$, $\delta = \begin{bmatrix} \delta_1 \\ \delta_2 \\ \vdots \\ \delta_s \end{bmatrix}$. u_{it} is an

error term that follows a stationary AR (1) process $u_{it} = \rho u_{it-1} + \varepsilon_{it}$, where $|\rho| < 1$ (i.e. strictly stationary), $\varepsilon \approx N(0, \Sigma)$ and Σ is the variance-covariance matrix of order M. We consider the following explanatory variables:

$$\mathbf{X}_{it} = \left[PIBS_{it}, PEN_{it}, IPASR_{it}, Q_{it}, RA_{it}\right] \text{ and } \mathbf{Z}_{it} = \left[ML_{it}, RI_{it}, GA_{it}\right]$$

Where:

MU = mark up, constructed as the quotient of the value of production of one sector by the sum of its respective intermediate consumption, salary and contributions, obtained from the input-output matrix of Brazil from 1985 and 1990 to 1998. For the year of

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[17] Although the GMM estimation model is more general than those presented in the paper, estimation dynamic panel data presents many problems. We performed many trials in order to study most DPDs models as possible. Most specifications displayed reasonable diagnostic residuals. However, in all estimated models the coefficients of variables as imports penetration, real interest rate, sector GDP and investment profitability are non-significant and/or have wrong signals. The relative sector price may be significant or not. In general, only the current and the lagged real exchange rate are significant and have correct (positive) signal. To sum up, the fitted models have no economic meaning because only the exchange rate matters in determining the mark up behavior. Therefore, in spite of being concerned about the simultaneity of the microeconomic variables, like profits margin and investment profitability, we chose to discard DPG/GMM estimation. Furthermore, if we do not employ lagged variables we can catch the long run relationship among the mark up and some intervening variables which sheds light on the firm's decision process.

1999 mark up was estimated using the quotient of the variation of the sector IPA – the Brazilian wholesale price index from the Getúlio Vargas Foundation (FGV) - and the sector cost variation index from the Foreign Trade Foundation (FUNCEX). Table A1 (Appendix) contains the annual mark up estimates for the 26 sectors. The last line and column contain the annual and sector averages and standard deviations, respectively.

PIBS = sector GDP; obtained from the National Accounts computed by the Brazilian Statistical Office (IBGE).

PEN = imports penetration coefficient, calculated as the quotient of the value of imports by sector and the difference between the sector value of production and its net exports, all estimates obtained from the input-output matrix produced by IBGE.

IPASR = relative annual sector producer price index, calculated by dividing the sector wholesale price index (IPA) by the manufacturing industry index. The monthly indexes were aggregated by the annual average. For the petroleum refinement sector (RPE) it was constructed an index based on the annual prices of petroleum, computed by the National Agency of Petroleum (ANP).

RA = annual real rate of interest; obtained considering the nominal basic rate of interest (SELIC) determined by the Brazilian Central Bank, discounted by the inflation rate obtained through the monthly general price index (IGP-DI) from FGV.

Q = real exchange rate, defined by the value of the dollar in domestic currency times the USA producer price index (PPI), divided by the FGV wholesale price index, both indexes, August 1994=100. The real exchange rate was calculated for the month and aggregated by the annual average.

ML = profit margin; calculated from the Annual Net Profit Results [18] and the Company Net Operational Revenue that is available at Gazeta Mercantil Annual Balance. The indicator is calculated as Net Profit/Net Operational Revenue.

RI = investment profitability, calculated from Gazeta Mercantil Annual Balance considering the relation Asset Equivalence Result/Asset Balance Value

GA = sector leverage degree, calculated from Gazeta Mercantil Annual Balance considering the relation Net Debt/Net Worth.

Finally, it should be added that the primary data used in this paper was obtained from a survey originally developed for ECLAC- Economic Commission for Latin America (Miranda et al, 2001). Despite the availability of the mark up series for the period from 1985 to 2000 we chose to analyze in this paper a shorter period (1990-1999) that contained data for all variables of interest (8) and the highest possible number of sectors (26). In this way we built up a database of balanced panel (balanced panel data), containing 243 observations.

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[18] Value stated in the Results Balance Sheet after reverting the interest on own capital.

4.2. Results

The estimated models (4) are presented in Table 1. Table 2 contains reports of residuals diagnostics.[19]. All equations contain an autoregressive term to soften the residual serial correlation. The dummy for economic policy was not introduced in specification 1. As suggested above, the irrelevant variables were deleted from the equations. [20] In equation 3 the variables are specified in logarithms. In equation 4, the cross-section GDPs were replaced by the annual sector average GDP (PIBSM) as it was observed that, due to the lack of data, in several sectors GDP data was repeated.

In Table 2 it can be noted that equation 4 presents residuals closer to being Gaussian and IID. Although the self regressive term coefficients are high, they are all statically smaller than 1. By observing the AR(1) process impulse-response functions – not reported – in all models, they are found to be stable, that is, converge to zero. The equation in logarithms is the one that presents the best stability standard.

The most interesting finding in the econometric exercise is that the sector GDP (PIBS) presented a negative sign in all 4 selected specifications, suggesting that the mark up behavior showed an anticyclic behavior in the period of the study. Considering that mark ups did not show a trend to fall after the opening of the economy (Table A1), this can be interpreted as an important indication of the defensive behavior of firms that were exposed to greater uncertainties as the macroeconomic context changed significantly in the 1990s.

Higher uncertainty, in spite of the stabilization of prices from 1994 onwards, might explain why industrial firms in a more competitive scenario and showing significant productive gains did not lowered their mark ups, neither did increase their capital accumulation in fixed assets. In a macroeconomic context of slow growth and high uncertainties about the future, given mainly the high degree of external vulnerability of the economy, the rational choice for firms was to use their market power to preserve their market share. In equation 3, for example, a 1% increase in the sector GDP (PIBS) induces to a drop in the mark up of approximately 0.001%.

Besides this evidence, in all the equations the signs of the relevant variables correspond to the theory forecast. Starting with the macroeconomic variables, we observe that when the real exchange rate variable (Q) rose, it increased the domestic protection degree in relation to imports, also implying in the increase of the mark up. During a large part of the period analyzed, the exchange rate was overvalued, reducing the domestic production protection degree and therefore the exchange rate contributed to contain the firms' mark up. As already mentioned this variable was the most significant component to explain the determination of the mark up in the period.

The variation of the relative price of the sectors (IPASR), that is, a variable that captures the firm pricing power, implied an increase in the mark up. The positive sign confirms the hypothesis that firms with market power used it to maintain or broaden their market share.

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[19] The reports on the models presented contain the R^2 statistics, standard regression error (SER), F statistic p-value, Durbin-Watson (DW) statistic together with its *p-value* The asymmetry coefficient (sk) the excess residuals Kurtosis (ek) are also reported. Besides the Ljung-Box statistics *p-values* [Q(p)] for the second, fourth, sixth and eighth order to test for the presence of serial correlation in the residuals; Bera-Jarque (BJ) to test the normality; Goldfeld-Quandt [GQ(h)] for the heteroskedasticity; and the BDS (bootstrap) test for independence of residuals specified with dimension 6 and distance of 0.7.

[20] Note that none of the specifications of the asset profitability appeared as significant, and therefore they were eliminated.

The rise in the real interest rate (RA), raises the cost of loans, stock loading and reduces the aggregate demand and, therefore, tends to reduce sector mark ups. During the 1990s, the real interest was maintained in high levels and the aggregated demand controlled most of the time, a fact which also contributed to compress the mark ups.

Taking equation 3, for example, imports penetration degree (PEN) has the highest negative impact, that is, a 10% increase in the economy opening degree implies a 3% drop in the sector mark ups. This result confirms the importance of foreign competition through the process of economic opening in containing tradable goods price increases.

Finally, variables that represent microeconomic relations explaining the mark up behavior -profit margin, investment profitability and the degree of leverage - presented the expected sign. Profit margin directly affects mark up determination (equations 2 and 4). Investment profitability variable (equations 2 and 4) showed a positive effect on the mark up, which indicates that the mark up behavior is related to the investment decision. The degree of leverage (GA) presents a negative relation with the mark up, which means that a smaller leverage power pressures the demand to generate internal funds to finance investments. About this evidence we should remark that Pereira and Carvalho (2000, p.18) observed growing industrial firm leverage levels after monetary stabilization in Brazil. However, according to the authors, these levels would be relatively low when compared to the average for Asian countries in the 1990s, for example. The observation that there was an increase in the leverage power and that the investment level in fixed assets was relatively low reinforces the anticyclic behavior of the mark up, which aimed at preserving firm's the market share.

5. Conclusion

The discussion about the behavior of industrial mark up in Brazil in the 1990s has produced little consensus among authors. We believe that part of the difficulty in dealing with this subject is the lack of a compatible official statistical data for the industrial sector for the decade that limited empirical studies.[21] In this context we believe that the contribution of this paper to the literature has been to bring some empirical evidences about mark up behavior based on a post Keynesian interpretation.

In order to accomplish our objective we started with a brief presentation of the post Keynesian pricing theory. According to this approach, the mark up is the strategic variable that firms administrate according to the perception regarding their opportunities of growth, In this perspective price variations depend on decisions about the mark up, and it is the need to accumulate internal resources aimed at financing growth that it is understood as the main motivation to the determination of the mark up. In conclusion, there is no automatic mechanism to explain how costs and demand pressures are pass on prices. Post Keynesian pricing theory establishes a complex set of interactions among micro and macroeconomic variables to explain price changes in monetary economies.

With this analytical perspective in mind, we presented the macroeconomic scenario of the Brazilian economy in the 1990s. This scenario was marked by price stabilization and economic opening. A combination of domestic high interest rate, fix exchange rate regime and high uncertainty in the external environment lead the economy to a stop-and-go pattern of growth. Opening of the economy and exchange rate overvaluation had a dual contrary effect on pricing decisions of industrial firms: it

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[21] It should be observed that industrial surveys produced by the Brazilian Statistical Office underwent major methodological changes in mid 1990s, compromising comparison along the decade. For a brief discussion about this matter, see Feijo and Carvalho (1999).

lowered production and investment costs, but it increased competition. The result was modernization of the productive structure on one side followed by de-industrialization, and price stabilization, on the other. Modernization and the recovery of productivity growth occurred with low levels of investment in fixed capital. So price stability, productivity growth and increased competition did not result in sustained economic growth pushed by an investment boom.

Mark ups did not show a trend to decrease, signaling that firms were able to preserve their profit margins. The question to be answered is why under a more competitive environment and sustained mark ups industrial firms invested little in fixed capital. One suggested possibility is that the 1990s were a period of high macroeconomic uncertainty in the economy. Firms moved from a period of high inflation regime at the beginning of the decade to price stability period after the Real Plan, which highly relayed on exchange rate stability. The second half of the decade was marked by speculative attacks on emerging economies currencies, among them the real. Sharp increase in domestic interest rates was largely used to avoid capital flight. The dependence on external flow of capital to keep price stability put the economy in a macroeconomic trap: if it grew too fast, balance of payments imbalances threatened exchange rate stability and so aggregate demand was restricted by economic policy. In this scenario, long term investment plans would be discouraged either by the high cost of finance and/or by expectations of low growth rates. A rational choice for firms would be to follow a defensive strategy, keeping market shares with low investment.

In our empirical analysis we developed an econometric exercise exploiting how micro and macroeconomic variables affected the determination of the mark up in the 1990s. An interesting result is that mark up showed an anticyclic pattern. This finding confirms our hypothesis of a defensive behavior by firms. Among the macroeconomic variables, the real exchange rate was the most important to explain the determination of the mark up. Overvaluation of the exchange rate after the Real Plan reduced domestic production protection degree and therefore the exchange rate contributed to contain the firms' mark up. Other macroeconomic variables, as changes in relative price, real interest rate and imports penetration showed the expected signal. Microeconomic variables confirmed post Keynesian hypothesis that mark up is influenced by variables related to investment decision in fixed capital such as profit margin, investment profitability and degree of leverage.

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Appendix

Table 1: Estimated Models - Dependent Variable: Mark-up*

VARIABLES	EQUATION 1		EQUATION 2		EQUATION 3		EQUATION 4	
	Coeff.	t-Statistic P-Value	Coeff.	t-Statistic P-Value	Coeff.	t-Statistic P-Value	Coeff.	t-Statistic P-Value
C	1.3983	8.8302 0.0000	1.5235	7.5938 0.0000	0.9118	4.2763 0.0000	1.6505	11.0446 0.0000
PIBS	-0.0008	-1.9093 0.0575	-0.0014	3.2334 0.0014	----	----	----	----
PIBSM	----	---	----	----	----	----	-0.0028	-4.1105 0.0001
ML	----	----	0.0858	2.0689 0.0397	----	---	----	----
RI	----	----	0.0153	3.7252 0.0002	----	----	0.0146	3.0186 0.0028
GA	-0.0439	-2.3138 0.0216	-0.0904	-4.2573 0.0000	----	----	-0.1077	-4.5522 0.0000
PEN	-0.3422	-2.3285 0.0208	-0.3450	-2.5890 0.0103			-0.2786	-2.2117 0.0280
IPASR	0.0850	2.5713 0.0108	0.0604	2.2358 0.0264	----	----	0.0756	2.8165 0.0053
Q	0.1456	5.7205 0.0000	0.1096	4.8219 0.0000	----	----	0.0895	3.9286 0.0001
RA	-0.0825	-4.1091 0.0001	-0.0357	-1.9988 0.0468	----	----	-0.0674	-3.7514 0.0002
Log(PIBS)	----	----	----	----	-0.0972	-2.7250 0.0069	----	----
Log(1+ML)	----	----	----	----	0.0475	1.5445 0.1239	----	----
Log(1+RI)	----	----	----	----	0.0244	3.2600 0.0013	----	----
Log(1+GA)	----	----	----	----	-0.1035	-3.8483 0.0002	----	----
Log(1+PEN)	----	----	----	----	-0.3098	-2.3214 0.0212	----	----
Log(IPASR)	----	----	----	----	0.0593	2.5017 0.0131	----	----
Log(Q)	----	----	----	----	0.0732	3.7023 0.0003	----	----
Log(1+R)	----	----	----	----	-0.0301	-1.8473 0.0660	----	----
DUM	----	----	0.0357	4.6150 0.0000	0.0268	4.5428 0.0000	0.0379	5.2086 0.0000
AR(1)	0.9317	29.7430 0.0000	0.9483	30.7473 0.0000	0.9451	30.1373 0.0000	0.9311	29.7260 0.0000

*Covariance matrix calculated with White consistent estimate (see text).

Table 2: Residual Diagnostics

Equation 1					
ITERAT= 15	R²=0.7258	SER=0.0757	F=0.0000	DW=1.7675/0.0753	Q(2)=0.0622
Q(4)=0.1732	Q(6)=0.1308	Q(8)=0.1814	GQ(75)=0.4867	Sk=0.4119	Ek=0.2831
BJ=0.0243	BDS=0.0280				

Equation 2					
ITERAT= 16	R²=0.7468	SER=0.0739	F=0.0000	DW=1.7951/0.1171	Q(2)=0.0334
Q(4)=0.0865	Q(6)=0.0729	Q(8)=0.0967	GQ(75)=0.5216	Sk=0.3824	Ek=0.2878
BJ=0.0386	BDS=0.1112				

Equation 3					
ITERAT= 15	R²=0.7602	SER=0.0529	F=0.0000	DW=1.7944/0.1158	Q(2)=0.0480
Q(4)=0.1225	Q(6)=0.1178	Q(8)=0.1395	GQ(75)=0.5391	Sk=0.3121	Ek=0.1040
BJ=0.14200	BDS=0.1072				

Equation 4					
ITERAT= 15	R²=0.7464	SER=0.0739	F=0.0000	DW=1.7387/0.0456*	Q(2)=0.0810
Q(4)=0.1607	Q(6)=0.1272	Q(8)=0.1682	GQ(75)=0.5359	Sk=0.2987	Ek=0.2929
BJ=0.1156	BDS=0.0696				

* Q(1)=0.8726

TABLE A1: MARK UPS – MANUFACTURING INDUSTRY

Sectors	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Avg.	DP
1) NON-METALLIC MINERALS (MNM)	1.33	1.41	1.38	1.40	1.49	1.46	1.40	1.39	1.42	1.69	1.44	0,10
2) NON-FERROUS METALLURGY(MNF)	1.24	1.27	1.25	1.23	1.34	1.34	1.29	1.28	1.26	1.40	1.29	0,05
3) SIDERURGY(SID)	1.17	1.20	1.24	1.27	1.25	1.26	1.25	1.23	1.21	1.34	1.25	0,06
4) OTHER METALLURGICAL(OSI)	1.09	1.13	1.14	1.16	1.22	1.19	1.18	1.16	1.14	1.30	1.17	0,06
5) MACHINES AND TRACTORS(MTR)	1.31	1.31	1.42	1.63	1.55	1.51	1.56	1.47	1.47	1.60	1.48	0,12
6) ELECTRIC MATERIAL(MEL)	1.21	1.22	1.30	1.26	1.25	1.25	1.24	1.17	1.17	1.19	1.23	0,04
7) ELECTRONIC EQUIPMENT(EQE)	1.37	1.38	1.38	1.41	1.47	1.49	1.51	1.39	1.34	1.24	1.40	0,08
8) AUTOMOBILES, TRUCKS AND BUSES(VAL)	1.16	1.21	1.20	1.23	1.27	1.29	1.31	1.29	1.23	1.20	1.24	0,05
9) OTHER VEHICLES AND PARTS(OUP)	1.16	1.14	1.19	1.22	1.24	1.23	1.21	1.14	1.10	1.12	1.17	0,05
10) PAPER AND PRINTING(PAG)	1.16	1.25	1.16	1.10	1.13	1.20	1.17	1.13	1.11	1.48	1.19	0,11
11) RUBBER INDUSTRY(BOR)	1.25	1.25	1.28	1.30	1.31	1.32	1.37	1.32	1.28	1.46	1.31	0,06
12) CHEMICAL ELEMENTS(ELQ)	1.30	1.36	1.40	1.67	1.60	1.54	1.50	1.53	1.48	1.93	1.53	0,18
13) PETROLEUM REFINEMENT(RPE)	1.33	1.28	1.46	1.79	1.64	1.56	1.45	1.49	1.66	2,14	1.58	0,25
14) MISCELLANEOUS CHEMICALS(QDI)	1.25	1.27	1.23	1.25	1.24	1.21	1.27	1.21	1.20	1.50	1.26	0,09
15) PHARMACEUTICS AND PERFUMERY(FAR)	1.36	1.24	1.41	1.49	1.48	1.42	1.39	1.47	1.49	1.48	1.42	0,08
16) PLASTIC ARTICLES(PLA)	1.36	1.32	1.29	1.36	1.33	1.38	1.46	1.30	1.30	1.46	1.36	0,06
17) TEXTILE INDUSTRY(TEX)	1.29	1.23	1.23	1.25	1.23	1.25	1.26	1.23	1.19	1.17	1.24	0,03
18) CLOTHING ARTICLES(VES)	1.30	1.25	1.29	1.25	1.26	1.25	1.29	1.25	1.26	1.17	1.26	0,04
19) FOOTWEAR MANUFACTURING(CAL)	1.08	1.11	1.24	1.23	1.18	1.17	1.22	1.14	1.07	1.00	1.14	0,08
20) COFFEE INDUSTRY(CAF)	1.15	1.16	1.12	1.24	1.25	1.25	1.20	1.15	1.16	1.28	1.19	0,06
21) PROCESSING OF VEGETABLE PRODUCTS(BE)	1.19	1.25	1.29	1.29	1.25	1.20	1.32	1.22	1.21	1.23	1.25	0,05
22) ANIMAL SLAUGHTER(ABA)	1.10	1.10	1.09	1.14	1.15	1.16	1.18	1.13	1.13	1.29	1.15	0,06
23) DAIRY INDUSTRY(LAT)	1.14	1.13	1.13	1.14	1.14	1.18	1.22	1.19	1.23	1.23	1.17	0,04
24) SUGAR INDUSTRY(ACU)	1.15	1.14	1.11	1.16	1.16	1.11	1.10	1.05	1.04	1.32	1.14	0,08
25) VEGETABLE OILS MANUFACTURING(OVE)	1.14	1.18	1.26	1.17	1.17	1.15	1.14	1.21	1.23	1.25	1.19	0,04
26) OTHER FOODSTUFFS(ALI)	1.14	1.16	1.20	1.21	1.20	1.21	1.23	1.22	1.23	1.30	1.21	0,04
AVERAGE	1.22	1.23	1.26	1.30	1.30	1.29	1.30	1.26	1.25	1.38	1.30	0,07
STANDARD DEVIATION	0,09	0,08	0,10	0,17	0,15	0,13	0,12	0,13	0,15	0,25		
VARIATION COEFFICIENT	0,07	0,07	0,08	0,13	0,11	0,10	0,10	0,10	0,12	0,18		

Source: Brazilian Statistical Office (IBGE) Input-Output Matrix (1985, 1990 a 1998); Getúlio Vargas Foundation (FGV) Wholesale Price Index (IPA); Foreign Trade Foundation (FUNCEX) cost indicators. Own calculations.