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Econometric evidence on the determinants of the mark up of industrial Brazilian firms in the 1990s

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RESUMO

Nosso objetivo neste trabalho foi testar econometricamente os determinantes do mark up em firmas industriais no Brasil nos anos 1990, um período de profundas mudanças no ambiente macroeconômico. Nossos modelos econométricos, para estimar o comportamento do mark up, foram realizados sobre uma base de dados de painéis para as firmas do setor industrial, utilizando variáveis micro e macroeconômicas. Encontramos uma relação negativa entre a variação na demanda agregada e no mark up, sugerindo que o mark up evoluiu de forma anti-cíclica. Este comportamento pode ser interpretado como resultado do aumento da incerteza que afetava as expectativas dos agentes nos anos 1990, sobre futuras mudanças no cenário macroeconômico. Diversos modelos econométricos foram testados e reportados. Todos apresentaram resultados consistentes com nossas interpretações analíticas.

PALAVRAS-CHAVE: estimação em dados de painel, precificação, determinação do mark up, interações micro e macroeconômicas.

ABSTRACT

First Draft

Our aim in this paper is to investigate in econometric terms the determinants of mark up in the Brazilian industrial firms in the 1990s, a period of relevant changes in the macroeconomic environment. Our regressions to estimate the behavior of the mark up, based on panel data for industrial firms, considered microeconomic and macroeconomic variables. A negative relation was found between demand variation and mark up variation, suggesting that it evolved in an anticyclic way. This behavior is explained based on the increase degree of uncertainty that surrounded changes in the macroeconomic scenario in the 1990s. Several econometric models were tested and all presented the expected results according to our theoretical interpretation.

KEYWORDS: estimation with panel data; pricing; mark up determination; micro and macroeconomic interactions.

JEL: C33, D21, D40, E31.

Introduction

Despite significant changes in the institutional environment of the Brazilian economy in the 1990s, caused mainly by economic and financial deregulation, price stabilization and privatizations, growth rates were modest along the decade (Hermann, 2002). Contrasting with this result, industrial productivity recovered from a long period of stagnation since mid-1980s. This recovery can be largely attributed to the external deregulation and exchange rate appreciation after the stabilization plan in 1994.

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. On one hand, a greater exposure to foreign competition should positively influence 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 in 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 mark ups. Reduction in industrial mark ups was not observed either. In the 1990s the average mark up of industrial firms moved from 1.22, in 1993, to 1.30 in 1996 and 1.38 in 1999 (see Table in Annex), so, mark ups had changed and increased. [1]

Our main explanation for such evidence is that the macroeconomic scenario in the 1990s did not reduce the degree of uncertainty in the economy, inducing industrial firms to a defensive behavior when setting their prices. In this sense, this text briefly discusses theoretically causal links among micro and macroeconomic variables that can be identified as having influence in price formation in the 1990s, through the determination of the mark up of industrial firms in Brazil. In more detail it investigates econometric models that better explain mark up behavior of industrial firms in the 1990s. Our data are organized in panel data structure. It is assumed that 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.[2] In spite of the relevance of the subject, empirical studies about mark up determination in Brazil in recent times are scarce and not conclusive. In this context the contribution of this paper, with the econometric evidence, is to add new arguments to explain industrial mark up behavior in the nineties.[3]

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[1] This is in sharp contrast with the findings of Ferreira & Guillén (2004, p 527), for whom industrial mark ups showed little change in the 1990s and did not decrease, as they would have expected The 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 surprising result in the article, the fact that the mark up does not change significantly after commercial deregulation."

[2] For an empirical study on mark up formation in industry in Brazil in the 1970s, in line with the theoretical assumptions in this paper, see Calabi and Luque, (1985). See also Camargo and Landau (1983)>See Considera (1981) for an empirical research about the behavior of industrial prices in the 1960s, and 1970s. See Marquetti (1994) for a survey on empirical evidences on price formation, with reference on Brazil.

[3] This paper works with the assumption that prices, in a large portion of the economy, are fixed through

This paper develops in the following way. In the next section we briefly present theoretically how the price formation process takes place in the context of an oligopolistic firm deciding under uncertainty. Then 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. Afterward, we present the econometric model, the procedures and results of the model for the industrial mark up determination in industrial Brazilian firms in the 1990s, testing several different econometric specifications. Subsequently we offer an interpretation. The results found in the econometric exercise confirmed the main conclusions of our economic analysis, and also, we found out that the more simple specifications presented the more robust result. A last section summarizes our conclusions.

An overview of mark up determination based on 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. In this literature, mark up behavior is the result of the interaction of a complex set of economic forces[4]. 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.[6] According to the Kaleckian tradition, the supply price in oligopolized markets reflects the firm cost structure and market power.[7] According to Eichner, it is also assumed that it reflects the internal fund requirements to realize the firm's investment plans.

Kenyon (1979) 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

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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.

[4] For example, Eichner (1973, 1976, 1985), Harcourt and Kenyon (1976); Davidson (1978), Kenyon (1979); Shapiro (1981); Feijó (1993), Arestis and Milberg (1993-94),, Shapiro and Sawyer (2003) among others.

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

[6] 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.

[7] 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.

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[8]. 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.

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.

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.

The macroeconomic scenario in Brazil in the 1990s: main issues

The 1990s is a decade marked by deep changes in Brazilian macroeconomic scenario. Two economic reforms are the most important to explain the changes in the economic environment: 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. In a highly inflationary context in the 1980s and beginning of the 1990s 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 changes, and to finance investments required to keep their market share.

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. The success of the Real Plan in keeping prices under control relied, in a great extent, on the use of the fixed exchange rate as an anchor for domestic prices. Excess of external

[8] 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.

liquidity, together with high domestic levels of interest rate, caused a strong appreciation of the internal currency (*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 appreciation of the *real* aided to keep domestic prices under control.

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 speculative attacks against the Brazilian exchange rate. As emerging markets are more affected by changes in moods and opinions concerning the sustainability of their respective exchange rate, 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 appreciated real exchange rate in a context of open economy contributed to the production of permanent current transactions deficits. Moreover, 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 appreciation 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. In January 1999, the exchange rate regime was changed to a floating exchange rate regime, and in June an inflation target regime started being implemented.

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. The sensible broadening of domestic markets brought by monetary stabilization and the overvaluation 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, the new more competitive scenario did not stimulate investment and growth.

Modernization implied more imports, allowing for a renewal of the Brazilian industrial structure. In this sense, the real exchange rate appreciation 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, as the effects were shown in the industrial productivity growth. Indeed, from 1991, prior to the commercial deregulation

and 1999 labor productivity grew 8.8% per year[9]. Because the level of investment in fixed assets was very low, industrial employment severely decreased – the rate of gross capital formation as a percentage of the GDP was around 17% between 1991 and 1999. In sum, in spite of the punitive macroeconomic environment, the significant growth in productivity, opened space to the drop in production costs[10].

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.

To sum, financial and commercial deregulation and price stability significantly changed the price formation process in Brazil from mid nineties on. The commitment to maintain operational revenue, current 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 and macroeconomic variables 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.

Determinants of mark up in the manufacturing industry in the 1990s: an econometric model

In the mark up determination model for the Brazilian industry in the 1990s, both macroeconomic and microeconomic variables were considered. Given the availability of data, the mark ups were constructed for industrial sectors, and not 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[11]. We

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

[10] This finding suggests the hypothesis that although the real exchange rate dropped 48.4% between 1985 and 1998 (this result is obtained when the deflators used are the wholesale prices, when consumer price indexes are used, this drop is of 67.1%.) 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 appreciated exchange rate context.

[11] It is interesting to observe that along the nineties the mark up dispersion increased among the industrial

believe that even with such limitation, the exercise undertaken presented interesting results that are widely consistent with the theoretical discussion presented. The effect of the macroeconomic context was captured through the behavior of the real exchange and the interest rate, and the sectors relative prices, opening degree and sectors GDPs level. The microeconomic variables were captured through sectors profit margin, investment profitability and leverage degree.

In this paper we chose to analyze the period 1990-1999 because data are available for all variables of interest (8) with the highest possible number of sectors (26). Furthermore, as mentioned in third section, this is a period characterized by significant changes in the Brazilian economy, that influenced the way firms fixed their prices.

In this way we built up a balanced panel data, combining microeconomic and macroeconomic variables, containing 260 observations. Our panel model is specified as follow:

$$Y_{it} = \beta_{iX}X_{it} + \beta_{iZ}Z_{it} + \eta_i + \delta D_t + u_{it}$$

$$u_{it} = \rho_i u_{it-1} + \epsilon_{it} \quad \text{with} \quad \epsilon \sim N(0, \Sigma)$$

for i = 1,…,M cross-sectional units observed for dated periods t = 1,…,T. And where Y_{it} is the mark up vector, X_{it} is a vector of macroeconomics variables, Z_{it} of microeconomics regressors, while η_i represents cross-section fixed effects and D_t a vector of policy dummies. u_{it} are the disturbances following an autoregressive process of order one, where $|\rho| < 1$ (i.e. strictly stationary) and ε_{it} is a white noise process. The $\sum$ is the variance-covariance matrix of order M. $\boldsymbol{\beta}_{iX}, \boldsymbol{\beta}_{iZ}, \boldsymbol{\delta}$ are vectors of coefficients. We consider the following explanatory variables:

$\mathbf{X}_{it} = [SGDP_{it}, OPEN_{it}, RPI_{it}, RER_{it}, RIR_{it}]$ and

$\mathbf{Z}_{it} = [PM_{it}, IP_{it}, LD_{it}]$.

The mark ups (**MU**) were constructed as the quotient of the production value of one sector by the sum of its respective intermediate consumption, salary and contributions[12]. The profit margin (**PM**) was obtained by dividing the sector net profit by the net operational revenue. Investment profitability (**IP**) was computed by the relation between asset equivalence result and asset balance value; and the sector leverage degree (**LD**) by the relation net debt/net worth. The sector GDP (**SGDP**) was computed by the value added methodology. The opening degree sector (**OPEN**) was obtained as the quotient between the value of imports and the difference between the value of production and net exports. The relative annual sector price index (**RPI**) was calculated as the sector producer price by the aggregated price industry. The real exchange rate (**RER**) was

sectors. From 1990 to 1992 the dispersion was around 0.073; in 1994 it jumped to 0.131 and then stabilized in 0.100, between 1994 and 1997; in 1999 it achieved 0.177. We can suggest that the increasing in dispersion is an indicative of the defensive behavior of bigger firms, with more market power, in setting their mark ups. Also it is an indicative that, in spite of augmented competition due to commercial opening of the economy and exchange rate overvaluation, big firms chose to maintain their market share. These considerations are to be confirmed in our next econometric study.

[12] The methodology describing the whole set of data is in annex.

defined by the value of the dollar in domestic currency times the USA producer price index (PPI), divided by Brazil PPI (IPA-DI). Finally, the real interest rate (**RIR**) was obtained considering the basic interest rate of the Central Bank discounted by the inflation rate measured by the general price index.

Econometric Procedures

Our objective is to estimate econometric models which highlight economic and intuitive arguments that explain the determination of the mark up in the Brazilian industrial firms in the 1990s and are in line with the hypotheses of the econometric theory. For this purpose, we pick up models in which a greater number of the explanatory variables presented the expected signs, as suggested by the outlined theory presented. However, it should be observed that models, in which the regressors presented different signs from the expected, were also reported. Our main criterion to chose a model, though, was that the residuals were closer to be NIID.

We first carried out tests for the presence of common unit roots to all cross-sections, as well as tests with individual unit root process. We employed Levin, Lin and Chu test (LLC) which assumes common unit root process[13]. Also we preformed Im, Pesaran and Shin W-test, (IPS) and ADF – Fisher test. Both assume individual unit root process[14]. But, the power of these tests as of their size distortions are strongly affected by the size of the sample (the large of M and T). Moreover, there is the potential risk of concluding that the whole panel is nonstationary even when there is a large proportion of stationary series in the panel (Baltagi, 2007). Then careful analysis of both the individual and panel unit root test results is required to fully assess the stationary properties of the panel.

Tests were specified with individual terms or none effects. The lag length selection was based on asymptotic t-statistic (with p-value equals to 0.1), Andrews' bandwidth estimator and quadratic spectral kernel. The unit root tests results are in Table 1.There are series I(0) and I(1) and the panel cross sections may have or not a common unit root. The presence of fixed effect is crucial and tests are inconclusive. For these reasons we assume that the series are not cointegrated and let the search of cointegrating panel for furthers studies.

We then tested several econometric models. We first look at a specification with no fixed effects ($\eta=0$, $\forall i$), using FGLS estimators, and with the errors being modeled as an autoregressive process of first order and with the estimator for the covariance matrix robust on the presence of generically forms of serial correlation and heterocedasticity of the residuals. In this group the variables are in level and one of the equations is specified in logs.

Then we estimated models with fixed effects and in first differences, with and without logs. We also examined an ADL model with fixed effects and the series in levels. Two

[13] However, this test is very restrictive in the sense that it requires that all cross-sections have or do not have a unit root. Further the test crucially depends upon the independence assumption across cross-sections and is not applicable if cross-sectional correlation is present (see Baltagi, 2007, p 241-250).

[14] The small sample performance of IPC is reasonably satisfactory and has generally better performance than the LLC test. By the other side, IPS has more stable size than Fisher test for small M while in terms of the size-adjusted power the Fisher test seems to be superior to the IPS (Baltagi, 2007).

other ADLs models were estimated, one with part of the series in levels and the other part in first differences – those that are conclusively I(1), such as pointed out by the unit root tests- with and without fixed effects.

Given our concern about the simultaneity of the microeconomic variables, like profit margin and investment profitability we decided to perform another group of models. Then we estimated models through the two least squares process, with and without fixed effects. We assumed that all series are I(0) and that the regressors opening degree sector (**OPEN**), real exchange rate (**RER**) and the real interest rate (**RIR**) are strictly exogenous. Finally, several GMM models were estimated, including DPD specifications.

In general, the models specifications 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 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 the period, and this way obtain residuals closer to being Gaussian ones. The choice of the intervention periods has been done looking at each sector considering the specified model without dummies.

It should be observed that the selection criterion of choosing the estimated equations which residuals presented the least serial correlation eliminated all specifications with random effects, as well SURE models. So, the models were estimated by FGLS and the coefficient of the variance matrix was estimated with the White robust estimate version, designed to accommodate arbitrary serial correlations and time-variant variances of the disturbances and, corrected by the degrees of freedom. The non-significant variables were deleted from the equations.

TABLE 1: Panel Unit Root Tests

SERIES	TESTS	FIXED EFFECTS P-VALUES	DECISION	NONE TERM P-VALUES	DECISION
MU	LLC	0.0013	REJECT	0.9566	ACCEPT
	IPS	0.0030	REJECT	----	-----
	ADF - FISHER	0.0017	REJECT	1.0000	ACCEPT
SGDP	LLC	0.0000	REJECT	0.3825	ACCEPT
	IPS	0.0000	REJECT	----	-----
	ADF - FISHER	0.0000	REJECT	0.9999	ACCEPT
OPEN	LLC	0.9969	ACCEPT	1.0000	ACCEPT
	IPS	1.0000	ACCEPT	----	-----
	ADF - FISHER	1.0000	ACCEPT	1.0000	ACCEPT
RPI	LLC	0.0000	REJECT	0.0000	REJECT
	IPS	0.0000	REJECT	----	----
	ADF - FISHER	0.0000	REJECT	0.0012	REJECT
RER	LLC	0.0000	REJECT	0.9970	ACCEPT
	IPS	0.0000	REJECT	----	-----
	ADF - FISHER	0.0000	REJECT	1.0000	ACCEPT
RIR	LLC	0.0000	REJECT	0,0000	REJECT
	IPS	0.0000	REJECT	----	----
	ADF - FISHER	0.0000	REJECT	0.0000	REJECT
PM	LLC	0.0000	REJECT	0,0000	REJECT
	IPS	0.0000	REJECT	----	----
	ADF - FISHER	0.0000	REJECT	0.0000	REJECT
IP	LLC	0.9999	ACCEPT	0.0026	REJECT
	IPS	0.9998	ACCEPT	----	----
	ADF - FISHER	0.9222	ACCEPT	0.3708	ACCEPT
LD	LLC	0.9944	ACCEPT	1.0000	ACCEPT
	IPS	0.9998	ACCEPT	----	-----
	ADF - FISHER	0.9071	ACCEPT	1.0000	ACCEPT
Mark up and Macro Variables	LLC	0..0000	REJECT	0.0004	REJECT
	IPS	0.0003	REJECT	----	-----
	ADF - FISHER	0.0000	REJECT	0.4480	ACCEPT
Mark up and Micro Variables	LLC	0.0000	REJECT	0.9215	ACCEPT
	IPS	0.0516	REJECT	----	-----
	ADF - FISHER	0.0039	REJECT	0.0038	REJECT
Macro Variables	LLC	0.0000	REJECT	0.0000	REJECT
	IPS		REJECT	----	----
	ADF - FISHER	0.0002 0.0000	REJECT	0.0344	REJECT
Micro Variables	LLC	0.0000	REJECT	0.1687	ACCEPT
	IPS	0.1298	ACCEPT	----	-----
	ADF - FISHER	0.0100	REJECT	0.0000	REJECT

Results

The estimated models are presented in Table 2, 4, 6 and 8. Tables 3, 5, 7 and 9 contain reports of residuals diagnostics.[15] In Table 10 we summarize all estimates performed.

The equations on Table 2 contain an autoregressive term to reduce the residual serial correlation. Although the autoregressive term coefficients are high, they are all statically smaller than 1. By observing the AR(1) process impulse-response functions – not reported – in the models, they are found to be stable, that is, converge to zero. The residuals are near Gaussian.

The models specified with fixed effects (Table 4) are more stable than the models of the first group, however they showed a high serial correlation, what in part is corrected by the FGLS estimation and the use of the White robust matrix. In fact, the effects are highly significant (p-value near to zero). However, some of the microeconomic variables lost their explanatory importance for this reason in equation 6 we re-specified the model to deal with the serial correlation through a lagged dependent variable. As a drawback the real interest rate has a positive signal.

When the model is specified in first differences, what implies to remove the unobserved effects, the problem of serial correlation is, in part, solved what strengths inference procedures, making the estimates closer to be efficient. This finding suggests the hypothesis that the errors should be specified as a random walk across time. Nonetheless, equation 7 shows the profit margin with a positive signal.

The ADL models, on their turn, seem to be in the track of solving the problem of high serial correlation; however this specification without fixed effects presents an explosive nature. Moreover, the signs of the real exchange rate and of the investment profitability are negative, what contradicts our theoretical interpretation. Therefore we did not report these estimates.

In the estimation of the two stages least squares FGLS (3SLS) models we used as instruments all variables of this study. We employed instruments of period *t*-1 and the variables openness, real exchange rate and real interest rate also in period *t*. Although the diagnosis of the residuals were good, in the model with fixed effects the real interest rate variable and the relative price did not show statistical significance, while in the DGLS-fixed effect specification the real exchange rate has positive signal. By other side, equation 8 estimated without unobserved effect with 3SLS procedure has clear results with residuals near to be NIID. Their estimates are also comparable with those from models 1 and 2. So we can argue that the possible presence of endogenous regressors were not material to distorts the estimates when this effect is not taken into account. Therefore our main conclusions will remain.

[15] 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) and 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.

In the GMM FGLS specifications we employed as before instruments of period *t-1*, variables OPEN, RER and RIR as strictly exogenous (Table 8). Models were estimated without and with observed effects. The DPD models were performed with normal ($\Delta x_{i,t-1}$) instruments and GMM-type instruments (y_{t-i}, i=1,2), in first and orthogonal difference. The DPD model estimated with orthogonal difference (Eq. 14) has poor diagnostics results and should not take into consideration. While in the DPD model with first difference (eq. 13) the relative price present negative signal. As in general the model without fixed effect has the better results with residuals near to be NIID.

TABLE 2: Estimated Models with FGLS (Cross-section Weights) and **No Fixed Effects**
Dependent Variable: Mark-up (White consistent covariance matrix computed)

VARIABLE	EQUATION 1		EQUATION 2		EQUATION 3	
	Coef.	t-Statistic P-Value	Coef.	t-Statistic P-Value	Coef. LOGS	t-Statistic P-Value
Constant	1.5235	7.5938 0.0000	1.3982	8.1394 0.0000	0.7001	4.0186 0.0001
PM	0.0858	2.0689 0.0397	----	----	----	----
IP	0.0153	3.7252 0.0002	0.0116	2.5466 0.0116	0.0180	2.0967 0.0371
LD	-0.0904	-4.2573 0.0000	-0.0589	-3.2923 0.0012	-0.0657	-2.8379 0.0050
SGDP	-0.0014	3.2334 0.0014	-0.0009	2.5030 0.0130	-0.0546	-1.8577 0.0645
OPEN	-0.3450	-2.5890 0.0103	-0.3386	-2.5122 0.0127	-0.2908	-1.9932 0.0475
RPI	0.0604	2.2358 0.0264	0.0870	2.5104 0.0128	0.0782	2.7476 0.0065
RER	0.1096	4.8219 0.0000	0.1426	6.2717 0.0000	0.1030	5.1437 0.0000
RIR	-0.0357	-1.9988 0.0468	-0.0810	-5.2958 0.0000	-0.0630	-4.6370 0.0000
DUMMY	0.0357 Dum02	4.6150 0.0000	0.0257 Dum02yc	3.3554 0.0000	0.0195 Dumo02yc	2.9246 0.0038
AR(1)	0.9483	30.7473 0.0000	0.9384	28.9869 0.0000	0.9348	29.9240 0.0000

Table 3: Residuals Diagnostics

Equation 1					
ITERAT= 16	R^2=0.7468	SER=0.0739	F=0.0000	DW=1.7951/0.1171[1]	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 2					
ITERAT= 17	R^2=0.7566	SER=0.0751	F=0.0000	DW=1.8135/0.1459	Q(2)=0.2351
Q(4)=0.4497	Q(6)=0.3684	Q(8)=0.4380	GQ(75)=0.	Sk=0.0513	Ek=0.3290
BJ=0.5606	BDS=0.0472				
Equation 3					
ITERAT= 14	R^2=0.7641	SER=0.0535	F=0.0000	DW=1.8116/0.1158[2]	Q(2)=0.2406
Q(4)=0.4659	Q(6)=0.4190	Q(8)=0.4570	GQ(75)=0.	Sk=0.0236	Ek=0.1597
BJ=0.8736	BDS=0.1452				

1) Q(1)=0.9072; 2) Q(1)=0.8187

TABLE 4: Estimated Models with FGLS (Cross-section Weights) and **Fixed Effects**.
Dependent Variable: Mark-up (White consistent covariance matrix computed)

VARIABLE	EQUATION 4		EQUATION 5		EQUATION 6		EQUATION 7	
	Coef.	t-Statistic P-Value	Coef.	t-Statistic P-Value	Coef.	t-Statistic P-Value	Coef. Difference	t-Statistic P-Value
Constant	1.2738	12.2637 0.0000	1.3140	13.3644 0.0000	0.8007	5.5036 0.0000	0.0112	4.6935 0.0000
PM	----	----	-----	-----	0.2619	5.5640 0.0000	-0.0046	-0.2099 0.8340
IP	0.0059	1.4822 0.1399	0.0074	1.9125 0.0572	0.0266	3.6265 0.0004	0.0090	1.6555 0.0992
LD	----	-----	-----	-----	-0.0475	-1.4708 0.1429	-0.0692	-4.2812 0.0000
SGDP	-0.0014	-2.3381 0.0204	-0.0015	-3.1101 0.0021	-0.0015	-2.3301 0.0208	-0.0005	-1.7584 0.0800
OPEN	-0.3130	-1.9126 0.0572	-0.3575	-2.4731 0.0142	-0.2608	-2.8319 0.0051	-0.4801	-3.3770 0.0009
RPI	0.1184	3.0040 0.0030	0.1221	3.0429 0.0027	0.0509	2.4042 0.0171	0.0755	1.9661 0.0505
RER	0.1062	4.1825 0.0000	0.0809	2.4577 0.0148	0.0607	2.2078 0.0284	0.1397	6.2532 0.0000
RIR	-0.1193	-6.6827 0.0000	-0.1279	-7.9513 0.0000	0.0259	0.8552 0.3935	-0.0755	-5.4373 0.0000
DUMMY	0.0398 Dum2xc	5.0966 0.0000	0.0389 Dum02yc	6.0481 0.0000	0.0598 Dum02	6.6855 0.0000	0.0491 Dum02yc	4.5025 0.0000
AR(1)	0.5150	8.3289 0.0000	0.4896	8.0172 0.0000	0.4245 Mu(-1)	5.0663 0.0000	-----	-----

Table 5: Residuals Diagnostics

Equation 4					
ITERAT= 16	R^2=0.8237	SER=0.0713	F=0.0000	DW=1.8113/0.1489	Q(2)=0.0000
Q(4)=0.0000	Q(6)=0.0000	Q(8)=0.0000	GQ(75)=0.9196	Sk=0.2242	Ek=0.3538
BJ=0.2039	BDS=0.0000				
Equation 5					
ITERAT= 15	R^2=0. 8367	SER=0. 0708	F=0.0000	DW=1.8454/	Q(2)= 0.0000
Q(4)=0.0000	Q(6)=0.0000	Q(8)=0.0000	GQ(75)=0.9834	Sk=0.3021	Ek=0.3466
BJ=0.0940	BDS=0.0000				
Equation 6					
ITERAT= na	R^2=0.8249	SER=0.0690	F=0.0000	DW=1.8014/	Q(2)= 0.0016
Q(4)= 0.0052	Q(6)= 0.0214	Q(8)= 0.0090	GQ(75)=0.3991	Sk=0.3312	Ek=0.0020
BJ=0.1178	BDS= 0.2808				
Equation 7					
ITERAT= na	R^2=0.4369	SER=0.0755	F=0.0000	DW=1.8129/	Q(2)=0.1561
Q(4)=0.2324	Q(6)=0.2483	Q(8)=0.3239	GQ(75)=0.5326	Sk=-0.2777	Ek=0.4808
BJ=0.0720	BDS=0.0056				

* Q(1)=0.9428

TABLE 6: Estimated Models with Two-Stage FGLS (Cross-section Weights), **without Fixed Effects and with Fixed Effect**s
Dependent Variable: Mark-up (White consistent covariance matrix computed)

VARIABLE	EQUATION 8 No Fixed Effects		EQUATION 9 Fixed Effects		EQUATION 10 Level-Difference Fixed Effects	
	Coef.	t-Statistic P-Value	Coef.	t-Statistic P-Value	Coef.	t-Statistic P-Value
Constant	1.7469	9.0108 0.0000	0.5568	4.0860 0.0001	1.5214	11.1106 0.0000
PM	----	----	0.5892	6.9386 0.0000	----	----
IP	0.0242	3.8317 0.0002	0.0383	4.2754 0.0000	0.0314 Differ.	5.3184 0.0000
LD	-0.2008	-3.5228 0.0005	-0.0683	-2.2978 0.0226	----	----
SGDP	-0.0027	-3.4334 0.0007	-0.0011	-1.5981 0.1116	-0.0019	-1.6475 0.1013
OPEN	-0.3222	-2.7262 0.0069	-0.3006	-3.9703 0.0001	-0.7448 Lag. Differ.	-4.6378 0.0000
RPI	0.0706	2.5488 0.0115	0.0654	1.5540 0.1218	0.2408	5.3952 0.0000
RER	0.1091	3.7525 0.0002	0.2281	4.3759 0.0000	-0.2397	-5.3386 0.0000
RIR	-0.0920	-3.0688 0.0024	0.0381	1.2299 0.2202	-0.2263	-4.0431 0.0001
DUM	0.0335 Dum02	4.1180 0.0001	0.0275 Dum02yc	2.6796 0.0080	0.0645 Dum02yc	4.9865 0.0000
AR(1)	0.9401	30.09710 0.0000	0.4545 Mu(-1)	4.8349 0.0000	----	----

Table 7: Residuals Diagnostics

Equation 8					
ITERAT= 18	R^2=0. 7162	SER=0. 0768	F=0.0000	DW=1.8923/	Q(2)= 0.0787
Q(4)=0.2011	Q(6)=0.1363	Q(8)=0.1602	GQ(75)=0.5214	Sk=0.1725	Ek=0.1585
BJ=0.4761	BDS=0.0072				
Equation 9					
ITERAT= NA	R^2=0. 7975	SER=0.0721	F=0.0000	DW=2.0357/	Q(2)=0.0436
Q(4)=0.0479	Q(6)=0.1111	Q(8)= 0.0397	GQ(75)=0.3731	Sk=0.2846	Ek=0.0764
BJ=0.2004	BDS=0.2256				
Equation 10					
ITERAT= NA	R^2=0.8811	SER=0.0814	F=0.0000	DW=1.6814/*	Q(2)=0.1468
Q(4)=0.0769	Q(6)=0.0380	Q(7)=0.0635	GQ(75)=0.4860	Sk=0.4350	Ek=0.1236
BJ=0.0352	BDS=0.068				

* Q(1)=0.9428
Eq. 8 Inst. Spec.: C MU(-1) PM(-1) IP(-1) LD(-1) SGDP(-1) OPEN(-1) RPI(-1) RER(-1) RIR(-1) OPEN RPI RER RIR DUM02(-1).
Eq. 9 Inst. Spec.: C MU(-1) PM(-1) IP(-1) LD(-1) SGDP(-1) OPEN(-1) RPI(-1) RER(-1) RIR(-1) LD SGDP OPEN RPI RER RIR DUM02yc.
Eq. 10 Inst. Spec.: c MU(-1) d(IP(-1)) d(LD(-1)) d(OPEN(-1)) RIR(-1) d(OPEN) RPI RIR DUM02yc

TABLE 8: Estimated Models with GMM FGLS (Cross-section Weights), **without Fixed Effect and with Fixed Effect.**
Dependent Variable: Mark-up (White consistent covariance matrix computed)

VARIABLE	EQUATION 11		EQUATION 12		EQUATION 13		EQUATION 14	
	Coef.	t-Statistic P-Value	Coef. Difference	t-Statistic P-Value	Coef. **DPD Difference**	t-Statistic P-Value	Coef. **DPD Orthogonal**	t-Statistic P-Value
Constant	2.0300	4.9237 0.0000	----	----	----	8.5104 0.0000	----	----
PM	----	----	----	----	0.5899	9.7292 0.0000	0.4036	6.4951 0.0000
IP	0.0386	5.5098 0.0000	0.0259	4.2099 0.0000	0.0720	11.8420 0.0000	0.0237	3.9748 0.0001
LD	-0.2994	-4.5101 0.0000	----	----	-0.3154	-8.2908 0.0000	----	----
SGDP	-0.00323	-3.5590 0.0005	-0.0009	-2.3871 0.0179	-0.0046	-3.2514 0.0013	-0.0016	-2.4257 0.0162
OPEN	-0.2955	-3.2184 0.0015	-0.5753	-6.2283 0.0000	-0.5797	-7.0216 0.0000	-0.4362	-3.8258 0.0002
RPI	0.0688	2.4836 0.0137	0.0516	2.6554 0.0086	-0.2576	-5.7917 0.0000	0.0822	2.2784 0.0238
RER	0.0457	1.4562 0.1467	0.0648	3.1670 0.0018	0.0807	1.8579 0.0647	0.0748	2.2752 0.0240
RIR	-0.0771	-2.2976 0.0225	0.0907	3.5484 0.0005	0.1931	6.7491 0.0000	0.0719	2.4619 0.0147
DUM02	0.0623	6.2254 0.0000	0.0623	8.4948 0.0000	0.1114	8.3408 0.0000	0.0546	3.7849 0.0002
AR(1)	0.9610	32.4090 0.0000	----	----	0.2743 Mu(-1)	8.5104 0.0000	0.5546 Mu(-1)	3.7912 0.0002

Table 9: Residuals Diagnostics

Equation 11					
ITERAT=85/25[a]	R^2=0.6722	SER=0.0824	F=0.0000	DW=2.0190	Q(2)=0.0630
Q(4)=0.1747	Q(6)=0.1698	Q(8)=0.1759	GQ(75)=0.4165	Sk=0.1017	Ek=-0.0814
BJ=0.7912	BDS=0.0256	J-Stat.=15.9370	Inst. Rank=15		
Equation 12					
ITERAT= 12[b]	R^2=0.3447	SER=0.0827	F=0.0000	DW=1.9691	Q(2)=0.0608
Q(4)=0.1287	Q(6)=0.2067	Q(8)=0.2310	GQ(75)=0.5038	Sk=0.3704	Ek=0.0571
BJ=0.09715	BDS=0.	J-Stat.=10.2128	Inst. Rank=8		
Equation 13					
ITERAT= 60[c]	R^2=NA	SER=0.1003	SSR=1.9928	DW=NA*	Q(2)=0.4363
Q(4)=0.5210	Q(6)=0.2880	Q(7)=0.3074	GQ(75)=0.9525	Sk=0.9209	Ek=2.6961
BJ=0.0000	BDS=0.0352	J-stat.=19.7833	Inst. Rank=26		
Equation 14					
ITERAT= 2[d]	R^2=NA	SER=0.0744	SSR=1.1018	DW=NA**	Q(2)=0.0000
Q(4)=0.0000	Q(6)=0.0000	Q(8)=0.0000	GQ(75)=0.8424	Sk=0.8991	Ek=1.8727
BJ=0.0000	BDS=0.0000	J-stat.=12.4000	Inst. Rank=14		

a) 85 Coef iterations and 25 weight iterations; b) 12 weight iterations; c) 60 weights iterations; d) iterate to convergence 2-steps. * Q(1)=0.3275; **Q(1)=0.0000

Eq. 11 Inst. Spec.: C MU(-1) PM(-1) IP(-1) LD(-1) SGDP(-1) OPEN(-1) RPI(-1) RER(-1) IPR(-1) OPEN RPI RER IPR DUM02

Eq. 12 Inst. Spec.: C d(MU(-1)) d(RER(-1)) d(SGDP) d(OPEN) d(RPI) d(RER) d(RIR)

Eq. 13 Inst. Spec.: levels: C MU(-1,-2) DUM02; difference: PM(-1) IP(-1) SGDP(-1) OPEN(-1) RPI(-1) RER(-1) RIR(-1) OPEN RPI RER RIR.

Eq. 14 Inst. Spec.: levels: MU(-1,-1); difference: RER(-1) SGDP OPEN RPI RER RIR

Interpreting the results

The most interesting finding in the econometric exercises is that the sector GDP (SGDP) presented a negative sign in the 14 select specifications, suggesting that the mark up behavior showed a counter-cyclic behavior in the studied period. Considering that mark ups did not show a trend to fall after the opening of the economy, 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 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 2, for example, a 1% increase in the sector GDP 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 are coherent with the economic intuition. Starting with the macroeconomic variables, we observe that when the real exchange rate (RER) rose, it increased the domestic protection degree in relation to imports, also implying in the increase of the mark up. So, because a large part of the analyzed period the exchange rate was appreciated it contributed to contain the firms' mark up. [16]

Changes in the relative producer price (RPI) – a variable that captures the firm pricing power – contributed to increase in the mark up. The positive sign confirms the hypothesis that firms with market power used it to keep or broaden their market share.

In general, the rise in the real interest rate (RIR) increases the burden of loans, stock loading and reduces the aggregate demand and, therefore, induces the reduction in the sector mark ups. During the 1990s, the real interest was kept at high levels and the aggregate demand constrained most of the time, a fact which also contributed to compress the mark ups. However, the estimated equations with fixed effects and by 3SLS and GMM in first difference (6, 9, 12, 13, 14)[17], indicate a positive sign to this variable, what suggests that the interest rate could have an ambiguous signal because costly loans tend to decrease the leverage degree and then the mark up. If this is the case, we would observe that income effect would be more important than the substitution effect. This reasoning would contradict the well known hypothesis that the substitution effect dominates the revenue effect.

The *OPEN* coefficients capture the importance of foreign competition to control inflation. In all specifications the signs were negative, confirming the importance of foreign competition through the process of economic opening in containing tradable

[16] Silva and Vernengo (2009) observe that the pass-through of the exchange rate in Brazil had dropped substantially after the opening in the 1990s.

[17] Notice that in equations 6 and 9 this variable has non- significant coefficients. Meanwhile, equation 14 has residuals with strong serial correlation and in equation 13 the relative prices has positive signal. So the fact that the real interest rate may have a positive signal must be taken with cautions. Be aware that in these three last equations the possible endogeneity of the micro variables was solved with the use of instrumental variables.

goods price increases. In equation 3, for example, the sector opening degree has the highest impact, that is, a 10% increase in this variable implies a 3% drop in the sector mark ups. .

TABLE 10: Estimated Models with FGLS (Cross-section Weights), **without Fixed Effects and with Fixed Effects**
Dependent Variable: Mark-up (White consistent covariance matrix computed)

VARIABLE	FGLS			FGLS			
	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ. 5	EQ. 6	EQ. 7
	NO FE	NO FE	NO FE LOGS	FE	FE	FE	DIFFERENCE
Constant	1.5235	1.3982	0.7001	1.2738	1.3140	0.8007	0.0112
PM	0.0858	----	----	----	-----	0.2619	-0.0046
IP	0.0153	0.0116	0.0180	0.0059	0.0074	0.0266	0.0090
LD	-0.0904	-0.0589	-0.0657	----	-----	-0.0475	-0.0692
SGDP	-0.0014	-0.0009	-0.0546	-0.0014	-0.0015	-0.0015	-0.0005
OPEN	-0.3450	-0.3386	-0.2908	-0.3130	-0.3575	-0.2608	-0.4801
RPI	0.0604	0.0870	0.0782	0.1184	0.1221	0.0509	0.0755
RER	0.1096	0.1426	0.1030	0.1062	0.0809	0.0607	0.1397
RIR	-0.0357	-0.0810	-0.0630	-0.1193	-0.1279	0.0259	-0.0755
DUM	0.0357 Dum02	0.0257 Dum02yc	0.0195 Dumo02yc	0.0398 Dum2xc	0.0389 Dum02yc	0.0598 Dum02	0.0491 Dum02yc
AR(1)	0.9483	0.9384	0.9348	0.5150	0.4896	0.4245 Mu(-1)	----

TABLE 11: Estimated Models with TSGLS and GMM FGLS (Cross-section Weights), **without Fixed Effects and with Fixed Effects.**
Dependent Variable: Mark-up (White consistent covariance matrix computed)

VARIABLE	TWO-STAGE GLS			GMM			
	EQ. 8	EQ. 9	EQ. 10	EQ. 11	EQ. 12	EQ. 13	EQ. 14
	NO FE	FE	FE LE-DIFF	NO FE	DIFFERENCE	DIFFERENCE DPD	ORTHOG. DPD
Constant	1.7469	0.5568	1.5214	2.0300	----	----	----
PM	----	0.5892	----	----	----	0.5899	0.4036
IP	0.0242	0.0383	0.0314 Differ.	0.0386	0.0259	0.0720	0.0237
LD	-0.2008	-0.0683	----	-0.2994	----	-0.3154	----
SGDP	-0.0027	-0.0011	-0.0019	-0.00323	-0.0009	-0.0046	-0.0016
OPEN	-0.3222	-0.3006	-0.7448 Lag. Differ.	-0.2955	-0.5753	-0.5797	-0.4362
RPI	0.0706	0.0654	0.2408	0.0688	0.0516	-0.2576	0.0822
RER	0.1091	0.2281	-0.2397	0.0457	0.0648	0.0807	0.0748
RIR	-0.0920	0.0381	-0.2263	-0.0771	0.0907	0.1931	0.0719
DUM	0.0335 Dum02	0.0275 Dum02yc	0.0645 Dum02yc	0.0623	0.0623	0.1114	0.0546
AR(1)	0.9401	0.4545 Mu(-1)	----	0.9610	----	0.2743 Mu(-1)	0.5546 Mu(-1)

Finally, variables that represent microeconomic relations explaining the mark up behavior – profit margin (PM), investment profitability (IP) and the degree of leverage (LD) – presented the expected sign. Profit margin directly affects mark up determination (equations 2 and 3). Investment profitability variable (equations 2 to 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 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[18]. About this evidence we should remark that Pereira and Carvalho (2000) 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 market share.

As a last observation, we would mention that the main conclusions of our analysis were supported by the large majority of the models tested. So, the links among the variables proposed by our theoretical interpretation that supported our economic analysis were confirmed by most of the econometric equations. In particular, the main conclusion about the anticyclic behavior of the industrial mark up during the 1990s was established in all econometric specifications. It should also be observed that the less sophisticated specifications in econometric terms, as equations 1 and 2, produced the main results that

[18] We notice that no material multicolinearity was detected. We achieve this conclusion by running each independent variable against the others and computing the correspondent R^2.

were confirmed with the more sophisticated modeling. Furthermore, the employment of instrumental variables through 3SLS and GMM estimation did not change materially our first conclusions.

Conclusion

This paper discussed the determinants of the mark up in the Brazilian industrial firms in the 1990s. This discussion has been empirically supported by an econometric model, which has been tested in 14 different specifications. The econometric model showed great robustness as the expected signs of the variables were confirmed and the main results were observed in almost all econometric specifications

According to the theoretical approach, we assume that the mark up is the strategic variable that firms rule according to the perception regarding their opportunities of growth. In this perspective price changes 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. Thus, there is no automatic mechanism to explain how costs and demand pressures are passed through on prices; the process of pricing depends on 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 set off by price stabilization and economic opening. A combination of domestic high interest rate, fixed exchange rate regime most of the time 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 lowered production and investment costs, but it increased competition. The result was modernization of the productive structure on one side 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.

In this context, mark ups did not show a trend to decrease, signaling that firms were able to preserve their profit margins in spite of increased competition, in spite of increased competition. In our empirical analysis we developed several econometric exercises exploiting how micro and macroeconomic variables affected the determination of the mark up in the 1990s. An interesting result that was confirmed in all econometric specifications 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. Appreciation 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 economy opening showed the expected signal, however not all of them were confirmed in all econometric specifications.

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ANNEX: TABLE 1 - 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.

Methodological Annex - Definition of the variables

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 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 in the Annex 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.

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

OPEN = 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.

RPI = 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).

RER = 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.

RIR = 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.

PM = profit margin; calculated as Net Profit/Net Operational Revenue available at *Gazeta Mercantil Annual Balance.*

IP = investment profitability, calculated as Asset Equivalence Result/Asset Balance Value from *Gazeta Mercantil Annual Balance.*

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

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.