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Price-Setting Behavior in Brazil: survey evidence*

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Abstract

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Price surveys became popular after the seminal work of Blinder (1991) exploring the price-setting practices of the US firms, which filled some blanks left by the simple observation of prices charged by firms. The present paper reports the findings of a survey conducted by the Central Bank of Brazil with local firms. The sample covered 7,002 firms, the entire country and 3 economic sectors: manufacturing, services and commerce. The collected answers suggest important features about price-setting behavior in Brazil, such as: (i) the cost of reviewing price are low, but there is important nominal rigidity—firms report that change prices 3.6 times per year—, (ii) state-dependent rules seem to be more frequent than time-dependent behavior, (iii) markup pricing appears to be the dominant strategy, and (iv) the two most important factors driving price changes are the cost of intermediate goods and the inflation rate. A complete description of the results is found throughout the paper and summarized in the final section. The paper also discusses some policy implications from the results.

Key words: Survey data, price setting, nominal rigidity, micro price data

JEL classification: E30, E50, D40

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1 Introduction

Price setting behavior is a key variable to any central bank as it determines the nature of price stickiness and therefore how monetary policy affects inflation and real variables. The macroeconomic effects of nominal shocks in many of the models frequently used for policy analysis depend crucially on the assumption of nominal rigidity. Thus, understanding the extent and causes of price stickiness has been the objective of the extensive literature dealing with micro price data (Bils and Klenow, 2004; Dhyne et al. 2006; Klenow and Malin, 2011, Nakamura and Steinsson, 2008, among others).[1]

There are, however, some aspects of the behavior of price setters that cannot be fully characterized observing only the price adjustments registered on these large micro price datasets. For example, issues such as the rationale behind the price setters' decisions, the importance of different theories of price rigidity, the type of information used in price reviews, the main factors driving price changes, among others, have been better addressed in the literature using qualitative data, through price surveys.

After the seminal work of Blinder (1991) and Blinder et. al. (1998) for the United States, many national surveys have been conducted to explore the detail of price setting practices of firms. Examples include surveys for Sweeden (Apel et. al., 2005), the Euro Area (Fabiani et. al., 2005, 2006), Canada (Amirault et. al., 2006), the United Kingdom (Greenslade and Parker, 2010) and many others.

This paper reports the findings of a survey with Brazilian firms conducted by the Central Bank of Brazil. It covers the responses of 7,002 firms surveyed over the period from July 2011 to April 2012, in the three economic sectors: manufacturing, services and commerce. After providing additional evidence on the price-setting behavior of Brazilian firms, the paper discusses some policy implications from the results.

Regarding the firms and the market characteristics, the survey suggests the following findings. The Brazilian economy is diversified, but individual companies concentrate their business in a few products, specially in services sector. Most of firms report having some market share, which means that monopolistically competitive markets seem to be the rule in Brazil. The economy is considerably closed: less than 20% of Brazilian firms report that sell their products to the rest of the world and nearly 74% answer that operate only in the domestic market.

Firms report that the costs of gathering and processing information necessary for price adjustments are low. Consequently, more than a half of firms answered that review their prices frequently. We also find a negative relationship between adjustment costs and

[1] See also the papers produced by the project "Inflation Persistent Network" developed by the European Central Bank and the national central banks belonging to the Eurosystem.

frequency of price changes. The degree of competition seems to be correlated with more frequent price reviews and price changes.

With regard to price setting practices, overall the average number of times that firms change prices is 3.6 per year, which is line with studies of price setting behavior in Brazil with microprice data (Gouvea, 2007; Barros et. al, 2009). The services sector seems to be more rigid, while commerce is more flexible. The survey investigated the form of pricing rules. The majority of Brazilian firms adjust prices using state-dependent practices, but some also consider elements of time dependency, particularly in services sector.

Markup pricing seems to be the dominant price setting strategy followed by firms. Another important element is the price of competitors: around 67% of respondents consider crucial to change prices only after knowing about how competitors have repriced. The main drivers of price changes were evaluated. Considering the aggregate economy, results suggest that the two most important determinants are the costs of intermediate goods and the inflation rate. The relevance of the first factor is compatible with the markup over costs strategy followed by firms; and the second factor should not be a surprise in the case of Brazil, considering the long history of high inflation.

Finally, the survey evaluated the relevance of the most important theories of price rigidities proposed in the literature. Three theories seem to be more appropriate in the case of Brazil: cost-based pricing, explicit contracts and implicit contracts. Beside the relevance of these theories, problems of coordination and adjustment in non-price factors are minor obstacles to faster price changes in Brazil.

The structure of the paper is the following. Section 2 presents the survey design, the sample selection and the main characteristics of the firms. Section 3 investigates the price reviewing stage and provides evidence on the costs of reviewing prices, and the time- and state-dependent nature of pricing rules. Section 4 deals with the actual price changing stage. It documents how often firms change prices, the strategies followed when they reprice, and explores the relations between survey and theory. The main factors driving price changes are analyzed in Section 5. Section 6 concludes with a summary of results and a discussion of some policy implications.

2 Survey description

2.1 Sample design

The survey was undertaken by the Central Bank of Brazil and operationalized by the Brazilian Institute of Economics at Getulio Vargas Foundation (FGV-IBRE) during the period from July 2011 to April 2012.

We appraise the survey results through the lens of the economic theory on price setting, which assumes a profit-maximizing behavior of firms. Thus, the survey selected a sample of companies more likely to be representative of such behavior. Companies that have the main products subjected to monitored and regulated prices, such as public transportation services, oil and gas, energy, among others, were excluded from the sample. We also excluded companies whose products are intensive in inputs denominated in international currencies and those that have prices determined by international market conditions rather than by local price setting behavior. Therefore, the surveyed companies are representative of the group of free prices, which is approximately 75% of the consumer price index in Brazil.

In total, the survey covered 7,002 companies in the three economic sectors: manufacturing, services and commerce. These sectors may, in turn, were divided into 47 subsectors defined according to the official national classification of economic activity (CNAE): 18 subsectors in manufacturing, 14 in services and 15 in commerce. The sample reproduces the Brazilian sectorial firm structure, and it is divided as follows: 2,424 firms in manufacturing, 2,090 in commerce and 2,488 in the service sector. The sample covered the five geographic regions of the country and the number of firms in each sector is balanced across regions.

Table 1: Surveyed companies by sector and geographic region

Region	Manufacturing	Services	Commerce	Total	Relative Freq.
North	172	233	267	672	9.6%
Northeast	422	417	297	1,136	16.2%
South	635	536	600	1,771	25.3%
Southeast	909	944	584	2,437	34.8%
Midwest	286	358	342	986	14.1%
Total	2,424	2,488	2,090	7,002	-

The questionnaire was designed to reduce the burden faced by the respondents in terms of the number of questions and sensitivity of administrative information that could be revealed. In few questions, respondents were asked to give quantitative answers. For example, firms were requested to disclose estimates of their market environment as well as their price setting practices. Most questions have a selection of pre-defined qualitative answers such as "*unimportant*", "*low importance*", "*important*" and "*very important*" were designed.

The total of 31 designed questions[2] were organized in two parts. The first part collects general information about the company (such as the number of employees, number of

[2]Not all questions were applied to all firms and the response rate varied depending on the question (91.3% on average).

products sold, etc...) and about the market in which the company operates (such as market share serviced by the firm, number of competitors, among others). The second part focuses on the price setting behavior of firms and aims to explore issues as frequency of price changes, importance of backward- and/or forward-looking components, importance of competitors' price, whether firms follow state-dependent and/or time-dependent rules, main factors driving price changes, among others.

2.2 Main characteristics of the firms

Here, we present some characteristics of the firms in our sample. Panel A of Figure 1 shows de distribution of firms by size, considering the number of employees. We classify as *small* firms those with up to 49 employees, and as *large* those with more than 250 employees. The proportions of small, medium and large firms are very similar in the sample. The share of small firms (39.1%) is only slightly larger than the others. The small firms are concentrated in the services and commerce sectors (43.3% and 39.3% respectively), while the majority of firms in the manufacturing sector is of large firms (50.4%).

Panel B reports the distribution of firms by the number of products sold, considering four classes: firms working with less than 5 products, from 5 to 100 products, from 100 to 500, and more than 500 products. As shown, the distribution is very heterogeneous, which reflects the diversification of the Brazilian economy: some firms operate in very specific markets (nearly 30% sell less than 5 products) and some other firms are very diversified (27% of firms sell more than 500 products). There are also marked difference across sectors. While firms in the services sector are usually more specialized (57% of firms in this sector sell less than five products), in the commerce sector firms are more diversified: 63% of firms sell more than 500 products.

In Panel C companies are grouped according to turnover diversification. When less than 20% of the firm turnover comes from the main product, we label such a firm as highly diversified. When this share is more than 50% we consider that diversification is low. More than 54% of firms in our sample have their turnover concentrated in a few products and only 13.6% reported that have highly diversified turnover. According to this criterion, as expected the commerce is the most diversified sector (22% in the "high" group) and the service is the less diversified one (7.3% of firms of the sector in the "high" group).

Panel D classifies companies according to their market share. We consider a firm with "large" market share if it serves more than 80% of the total market, and "low" when its market share represents less than 5%. In our survey, 6% of Brazilian firms reported that have large market share and 72% answered that have medium market share. Therefore,

monopolistically competitive markets seem to be the rule.

In Figure 2 companies are grouped according to the source and destination of their products. Question about source and destination of products were not applied to firms in the service sector. Here, we wanted to check if products are produced and sold exclusively in the local market, exclusively in the rest of the world, or in both markets. The numbers presented in panels A and B of Figure 2 show that the Brazilian economy is considerably closed, with most of products being locally produced and sold. Less than 20% of Brazilian firms report that sell their products to the rest of the world and nearly 74% answered that operate only in the domestic market.

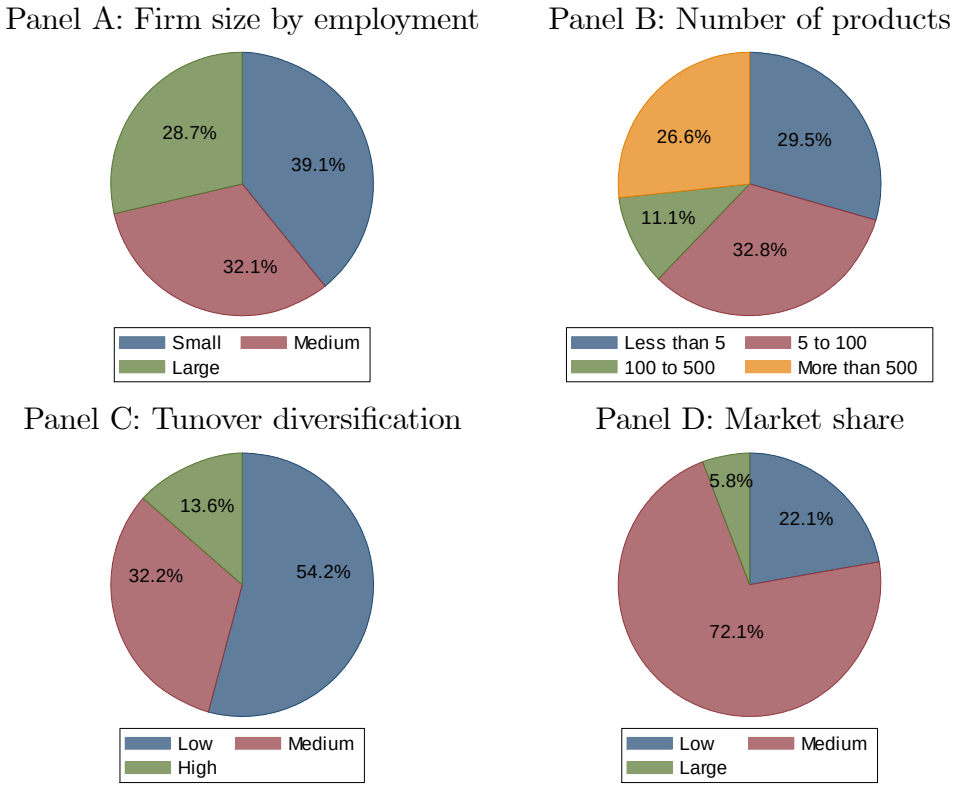

Figure 1: Characteristics of firms in the survey

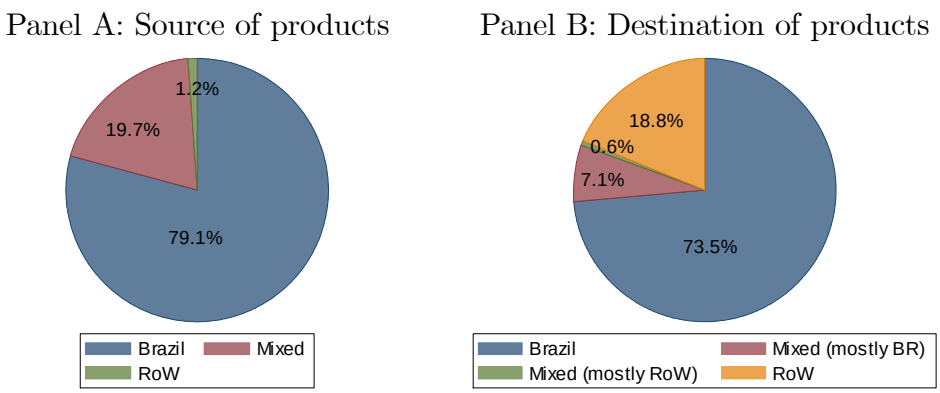

Figure 2: Destination and source of products

3 Price reviews

The first stage of the price adjustment process is the evaluation of whether the firm's current price is optimal or not, depending on the information that firms have about the relevant variables for decision. Price reviews are different from price changes. After all, an individual firm may review its prices but decide to leave them unchanged. This section documents the main features of price reviews in Brazil.

3.1 The cost of reviewing prices

The leading theories on monetary policy transmission mechanisms require some degree of price rigidities. A standard justification for discontinuous price changes in theoretical macroeconomic models is the existence of a cost for price adjustment (known as menu costs), usually assumed to be fixed. There are many reasons why price reviews as well as price adjustments may be costly. One interpretation is that these costs result from the decision and implementation of price changes. This treatment produces the state-dependent pricing models, where price adjustments are a function of the state of the economy (see, for instance, Sheshinski and Weiss, 1977, Caballero and Engle, 1993, Golosov and Lucas, 2007, Gertler and Leahy, 2008).

On the other hand, the sticky information theory assumes that gathering, absorbing and processing information is costly. For example, Mankiw and Reis (2002) and Reis (2006) show that, because information is costly, it may be rational for firms to be inattentive to some news, updating their information set and their prices infrequently.

Levy et al. (1997) exploit supermarket data to measure adjustment costs and find that menu costs account for about 0.7% of annual revenues. The estimates in Slade (1998) are higher (1.7%). Structural estimates include both fixed and variable costs of price adjustments. Aguirregabiria (1999) estimates costs of the same magnitude as Slade. Willis

(2000) finds adjustment cost of 2% of revenues. More recently, Stella (2011) considers a multi-product model and estimates the total cost of changing prices to be bounded between 0.13% and 0.76% of revenues.

Aiming at learning more about pricing decision, our survey contains a question about the costs of price adjustments. Firms were asked if costs of gathering and processing information necessary for price adjustments are *high* or *low*, but without suggesting specific values such as percentages of annual revenues for these two categories or other reference. Firms had four options to answer the question: i) costs are high and therefore price reviews are carried out only in fixed interval; ii) costs are high but price reviews are carried out frequently; iii) costs are low and therefore reviews are carried out frequently; and iv) costs are low but reviews are carried out only in fixed intervals.

Figure 3 presents the results considering the concepts of *high* and *low* costs. Most of Brazilian firms (57.3%) report that costs of reviewing prices are low. There are only small differences across sectors, with service sector showing the highest percentage of firms reporting low costs. But in every sector most of firms answer that costs of gathering and processing information are low. This piece of evidence is in line with the international literature, which suggests that costs of adjustment prices are relatively low, even though important.

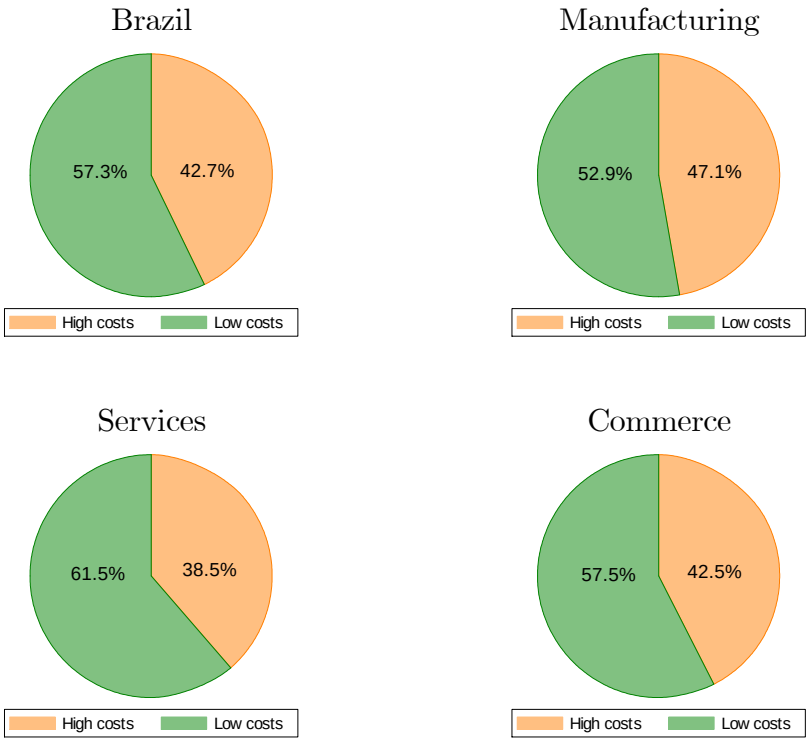

Figure 3: Cost of collecting and processing information

3.2 Size of adjustment costs and frequency of price changes

In state-dependent pricing models, prices of individual firms change as a function of the state of the economy. The existence of a menu cost makes as an optimal firm's behaviour to remain their prices constant constant, waiting for a sufficiently large change in market conditions, when the deviation of the optimal price from the actual price compensates the adjustment cost. Thus, the larger the size of menu costs, the lower the frequency of price changes.

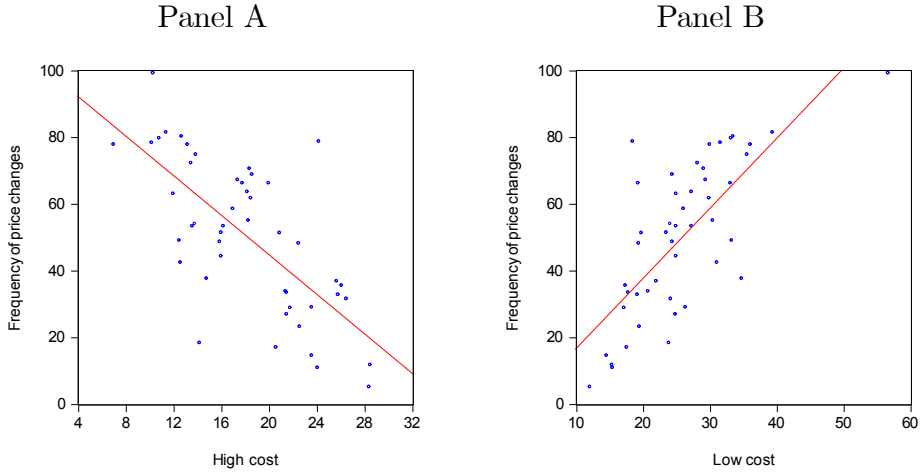

Figure 4: Cost of information and frequency of price changes

Notes: 1) Panel A: Percentage of firms in each subsector reporting high costs and frequency of firms reporting at least one price change in six months.
2) Panel B: Percentage of firms in each subsector reporting low costs and frequency of firms reporting at least one price change in six months.

To investigate the effect of adjustment costs on the frequency of price change, we use the responses of firms about the size of the cost of gathering and processing information and the reported frequency of price changes. As we do not have specific values for menu costs reported by firms, but only if they are low or high. We split the economy in 47 subsectors and calculate the percentage of firms (in each subsector) reporting low costs and high costs. Likewise, we calculate the percentage of firms in each subsector reporting that change their prices at least once in six months.

Panel A of Figure 4 shows the relationship between the percentage of firms reporting at least one price adjustment in six months and those reporting high costs of collecting and processing information. Panel B shows the association with those reporting low costs. In Panel A the correlation is -0.70, while in Panel B is equal to 0.73. Linear regressions presented in red in Figure 4 produce parameters of costs statistically significant in 1%. Therefore, there seems to be a robust negative relationship between adjustment costs and

frequency of price changes: subsectors with higher percentages of firms reporting low costs are also those with higher percentages of firms reporting high frequency of price changes.

3.3 How often firms review their prices

Differently from other national surveys, our questionnaire does not have a question about how often firms review their prices. So, we cannot provide the median or mean frequency of price reviews. But the choices given in a question about the costs of price reviews allow us to estimate the share of firms reporting that review their prices in fixed intervals of time and those reviewing frequently. However, we do not know the size of these fixed intervals or the exact meaning of the word *frequently* in terms of the amount of time (days, weeks, months etc.). Here we interpret that the time interval embedded in the option *frequently* is smaller than that in the option "fixed intervals". In other words, if an individual firm answered that it reviews its prices *frequently* instead of *at fixed intervals*, we interpret that it reviews its prices more often.

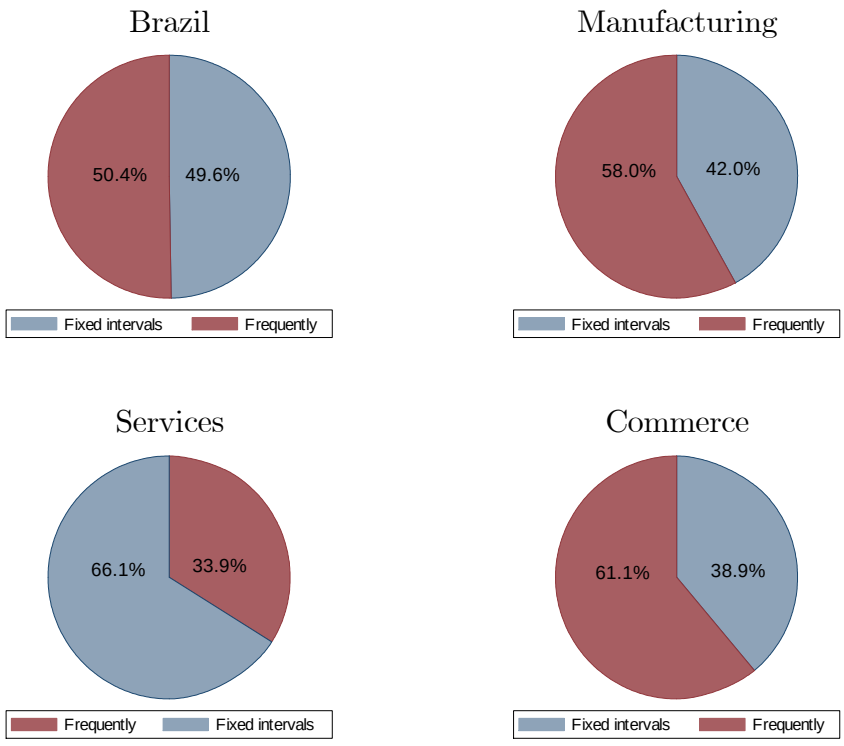

Figure 5: Frequency of price reviews

Figure 5 shows that 50% of firms in Brazil review prices frequently and 50% review at fixed intervals. In order to explore regularities in the pattern of price reviews, we investigated if there are differences across sectors and if firm's size (or the degree of com-

petitiveness in different subsectors) affects the frequency of price reviews. We did not find any relation between reviewing behavior and firm's size. Regarding the differences across sectors, firms in services sector review less frequently than those in commerce or manufacturing sectors—66% of firms in services sector review their prices in fixed intervals, compared to 39% in commerce and 42% in manufacturing. This result is evident in cases such as educational services, whose prices are reviewed only in fixed interval, usually once a year.[3] For example, in the subsector "services provided to households", which includes some educational services, more than 70% of interviewed firms report that review their prices in fixed intervals. A similar finding for services sector is reported by Fabiani et. al. (2005) for seven European countries (Italy, Luxembourg, Netherlands, Austria, Portugal, Belgium and Spain).

In terms of competition, Figure 6 shows that in subsectors where firms report that face more intense competition firms also answer that review their prices more frequently. More competition is correlated with more frequent price reviews (correlation coefficient equals to 0.67), and the parameter of competition in regression presented in red is statistically significant at 1%. This result confirms the international evidence of a relationship between competitive environment and pricing behavior of firms.

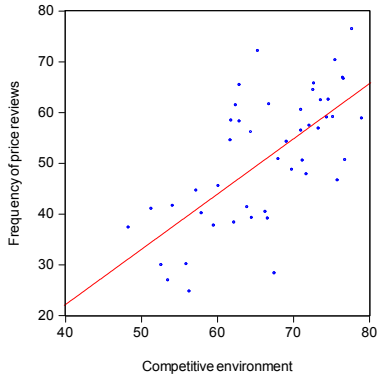

Figure 6: Competitive environment and frequency of price reviews

Notes: 1) Percentage of firms in each subsector reporting a very competitive environment and percentage of firms reporting frequent price reviews.
2) Number of subsectors: 47

3.4 Time versus state-dependent pricing rules

The dominant view in macroeconomics is that prices at the micro level remain unchanged for periods that can last up to several months (see Bils and Klenow 2004, Klenow and

[3] These numbers also provide information about the types of pricing rules. This issue is explored in the next subsection.

Kryvtsov 2008, Dhyne et al. 2006). The theoretical literature considers two main types of price stickiness: state-dependent and time-dependent. In time-dependent sticky price models the timing of price changes is exogenous (does not explicit depend on the economic circumstances). In some models, such as in Taylor (1980), a firm set its price every n^{th} period, but in other models, such as in Calvo (1980), the time interval is randomly determined. In state-dependent sticky price models, firms choose when to change prices according to economic conditions and subject to some adjustment cost.

In search of evidence on the type of pricing rules, firms were asked about the form of their price adjustments, if they review/change prices in fixed intervals or in response to cost or demand conditions. Following other studies in the literature, our survey includes the possibility of a combination of a state-dependent and a time-dependent pricing rule. There were two other possible answers to the question: the firm always changes its prices when competitors change; and another rules, not specified.

Table 2 shows that in Brazil 23% of the interviewed companies follow purely time-dependent rules. Another 23% answered that generally change their prices in fixed intervals, but sometimes respond to cost or demand shocks. Considering this mixed rule, the survey suggests that the majority of Brazilian companies adjust prices taking into account changes in the state of the economy[4].

The share of firms following purely time-dependent rules in Brazil is lower than those suggested in surveys for some developed economies. For example, in the Euro Area, 34% of firms review/change prices purely in fixed intervals, while in the UK this share is 42% and in the US is 40% (Fabiani et. al. 2005, Greenslade and Parker 2010, Blinder et. al. 1998). If we take the evidence given in section 3.1 that adjustment costs are low, this is an expected result considering that countries like Brazil are more exposed to large shocks, and consequently it may be more costly for firms to change prices purely at periodic intervals, without considering changes in demand or costs conditions.

[4] Almost two thirds of the companies: 35% following purely state-dependent pricing rules in addition to those 23% considering some element of state-dependency.

Table 2: Pricing rules

Sectors	Prices are changed in fixed intervals	Generally in fixed intervals. Sometimes in response to cost/demand change	Always changed in response to cost or demand change	Always changed when competitors change their prices	None of the previous rules
Brazil	22.5	23.4	35.2	4.7	14.2
Manufacturing	14.9	29.3	36.5	5.7	13.6
Services	41.4	22.0	17.4	3.5	15.7
Commerce	8.9	18.2	54.9	4.9	13.1

Note: Numbers reported are shares of responses, %.

There are also interesting differences across sectors. In the services sector 41% of firms respond that follow purely time-dependent pricing rules, while this share is only 9% in the commerce sector. The previous subsection had already suggested that most of firms in the services sector review/change prices in fixed intervals. In contrast, in the commerce sector 55% of firms report that adopt purely state-dependent rules. This evidence of higher share of firms following mainly time-dependent rules in the services sector is also found in European countries (see Fabiani et. al. 2005).

Around 5% of firms in Brazil respond that follow a different pricing rule, in which price adjustments are triggered by competitor's price changes. These firms report that always change their prices when competitors change. The share of firms following this pricing rule is roughly the same across sectors, showing that intra-sectorial interactions may be an important component of pricing decisions. This fact is confirmed by the high share of firms (67%) reporting that knowing how the competitors have changed their prices is important for the decision of adjusting prices or not. Finally, another 14% of firms report that follow other unspecified pricing rules.

4 Price changes

The second stage of the price adjustment process is the implementation. This section documents the main features of the implementation stage. In particular, we focus on the frequency of price changes, the determinants of price adjustments (or how the selling price is determined), the relationship between price changes and price reviews, and the evidence on theories of price rigidities.

4.1 How often firms change their prices

How sticky are prices in Brazil? To address this issue, firms were asked the following question: "On average, how often do prices of your company change?" Table 3 presents the results, grouped into five categories: (i) at least monthly, (ii) quarterly, (iii) half-yearly, (iv) annually and (v) less than one price change per year. According to these data, around 20% of the Brazilian companies change prices once a month, whereas approximately 42% of firms does so annually. Around 17% of firms changes prices half-yearly.

Overall, the average number of times that firms change prices is 3.6 per year. This means that the average price duration is around 3.3 months. This number is compatible with those reported by Gouvea (2007), which suggests using micro data of price changes in Brazil that the CPI average duration of price spells varies from 2.7 to 3.8 months, depending on the computation method applied. On this perspective, the survey provides the same evaluation about price setting behavior in Brazil as micro price data. Compared to other countries, this piece of evidence suggests that prices in the Brazilian economy change more often than in the Euro Area, the UK, the United States and Sweden, but less frequently than in Canada (4 changes per year) (see Fabiani et. al. 2005, Greenslade and Parker 2010, Apel et al. 2005, Amirault et al. 2006).

Table 3 also shows the distribution of price change frequencies across sectors, pointing to significant differences. On one hand, firms in the services sector change their prices less frequently than those in other sectors, with 65 percent of the firms answering that change their prices once a year. On the other hand, the frequency of price changes is highest in commerce sector, with 40 percent of the firms reporting that change prices at least monthly.

Table 3: Frequency of price changes – percentage of firms

Days between price changes	Sector			Brazil
	Commerce	Manufacturing	Services	
1-30	40%	15%	5%	19%
31-90	18%	17%	5%	13%
91-180	18%	21%	12%	17%
181-360	20%	37%	65%	42%
>360	4%	10%	12%	9%

Table 4: Effect of market and firms characteristics on the frequency of price changes

Characteristics	Days between price changes				
	1-30	31-90	91-180	181-360	>360
Firm size (number of employees)					
Small (less than 50)	18%	12%	17%	42%	11%
Medium (50 to 249)	20%	14%	17%	41%	8%
Large (more than 249)	20%	13%	17%	44%	6%
Geographic distribution of sales					
Mainly for the domestic market	27%	17%	20%	29%	7%
Mainly for the export market	28%	22%	16%	27%	7%
Importance of competitors' prices					
High	21%	14%	18%	39%	8%
Low	15%	11%	16%	47%	11%
Market share					
Less than 5 percent	18%	12%	17%	43%	10%
Between 5 percent and 30 percent	19%	14%	17%	42%	8%
Between 30 percent and 80 percent	17%	14%	18%	42%	9%
More than 80 percent	19%	10%	15%	45%	11%
Price review type					
Time dependent	7%	7%	12%	67%	7%
Mostly time dependent	13%	14%	21%	43%	9%
State dependent	32%	17%	19%	26%	6%
Whenever competitior readjusts	25%	17%	17%	30%	11%
Other	15%	10%	13%	42%	20%

Table 4 relates some markets and firms characteristics to the frequency of price changes. For each characteristic, columns report the shares of firms answering that change prices at monthly frequency, quarterly, semianually etc. Firm size (measured by the number of employees) appears to have impact on how often companies reset prices. Larger firms are more likely to set prices at high frequencies, with 20% of large firms responding that change prices at least monthly. Only 6% of large companies change prices at a frequency lower than once a year, compared to 11% of small firms.

The degree of competition is also important for the price setting behavior. Firms that perceive themselves as facing stronger competition change their prices more frequently. This is the case whether competition is measured by the importance attributed to competitors' prices or by the firm's market share. Companies responding that give importance for competitor's price, reprice more frequently—21% in the monthly frequency, compared to 15% among those giving low importance to competitors' price. This was expected, since under competition demand tends to be more sensitive to price. Evidence from studies using microdata is mixed in terms of whether more concentrated industries adjust prices more frequently in response to changes in demand or costs, or not.

Another interesting result is the relationship between the reported frequency of price changes and the type of the pricing rule. The rule that seems to produce more price flexibility is the state-dependent rule. Among those firms responding that follow this type of rule, 32% report that change prices monthly. In contrast, as expected, for those following state-dependent rules, the majority respond that change prices annually (67%). Finally, there is no significant differences in the reported frequency of price changes between firms producing mainly for domestic market and exporting firms.

4.2 How do firms set prices?

To go deeper into the pricing strategy followed by firms, the survey asked them about how their selling prices are determined. Respondents were provided with four options: (a) the selling price is calculated by a markup over costs, (b) the price follows the competitors' selling price, (c) the price is regulated by contract, and (d) other forms. Table 5 summarizes the results.

Table 5: How firms calculate the selling price

Options	Sector			Brazil
	Commerce	Manufacturing	Services	
Markup over costs	58.1	52.6	36.9	48.7
Competitors' price	19.6	23.5	18.2	20.4
Regulated by contract	4.8	5.9	23.6	11.8
Other	17.5	18.0	21.3	19.1

Markup over marginal costs: The strategy of placing a markup over total costs is very important among firms in the survey. Overall, almost 49% of respondents declare that follow this pricing rule. In commerce sector, the percentage of firms using this strategy reaches 58%. Therefore, markup pricing is the dominant price setting strategy followed by Brazilian firms. The overall result is similar to those obtained for the Euro Area, the United States and for the United Kingdom, where over half of firms adopt the markup over cost practice (Fabiani et. al., 2005; Greenslade and Parker, 2010).

Regulated prices and other rules: Despite the fact that firms whose main product is monitored or regulated by contract have been excluded from the survey, a small number of firms (12%) in our sample still answered that their prices are determined by contract, mainly in services sector. This probably reflects some other products sold by the firms or the existence of indexation mechanisms in the Brazilian economy. A still significant share of firms (19%) reported that have prices determined by "other" rules.

Table 6: Competition and price changes

Importance of readjusting only after competitors	Sector			Brazil
	Commerce	Manufacturing	Services	
High	44.8	34.1	22.8	33.3
Medium	31.2	37.8	31.8	33.7
Low	24.0	28.1	45.4	33.0

Importance of competitors' prices: Another important element affecting pricing strategy of firms is competition. Table 5 shows that more than 20% of firms in the sample report that take into account competitors' prices when forming their own prices. The share of firms following this practice is roughly homogeneous across sectors.

The importance of competition for the pricing behavior of Brazilian firms is confirmed by other two questions. First, firms were asked about the importance of changing prices only after knowing about how competitors have repriced. Table 6 shows that overall 67% of surveyed firms consider this information of medium and high importance. Second, the survey asked companies about the relevance and the number (if many or few) of competitors. Table 7 shows that more than 66% of firms consider their competitors *relevant*. As

expected, the higher the number of competitors, the larger the relevance of competition reported.

Table 7: Relevance of competition

Competition	Sector			Brazil
	Commerce	Manufacturing	Services	
Relevant	71.9	70.1	58.0	66.4
Many firms	59.7	48.7	44.5	50.6
Few firms	12.2	21.4	13.5	15.8
Irrelevant	28.1	29.9	42.0	33.6
Many firms	20.4	17.0	27.7	21.8
Few firms	7.7	12.9	14.3	11.8

4.2.1 Exporting firms

Considering specifically firms that produce mainly for export, the questionnaire asked if companies calculate the selling price in domestic currency and convert it into foreign currency or they sell using the price prevailing in international markets. As shown in Table 8, around 58% of surveyed companies set prices in "Brazilian reais" and then convert them into the currency of the foreign country. This suggests most of Brazilian exporting firms either have some market power in international markets or answer without reporting actual practice. This result holds in the two sectors that operate with tradable goods: manufacturing and commerce.

Table 8: Producer currency pricing versus international price taking

Options	Sector		Brazil
	Commerce	Manufacturing	
In domestic currency and convert	62.4	58.0	58.4
Determined by international prices	37.6	42.0	41.6

4.3 Price reviews and price changes

Do firms change prices every time they review? Figure 7 shows a direct and very close relationship between price reviews and price changes in the 47 subsectors covered by our survey. Subsectors where price reviews are more frequent are also those with higher frequency of price changes reported. Unfortunately, we do not have the exact frequency of price reviews,[5] and we can not say whether price reviews are more frequent than price

[5] See section 3.3 for details about the question concerning price reviews.

changes, as found in other national surveys. But the evidence suggests that price adjustments take place in two stages. First, firms evaluate their prices to check if they are at the optimal level according to the general economic conditions, or need to be ajusted. Second, changes are implemented, if necessary. Figure 7 shows that these two stages are closely related.

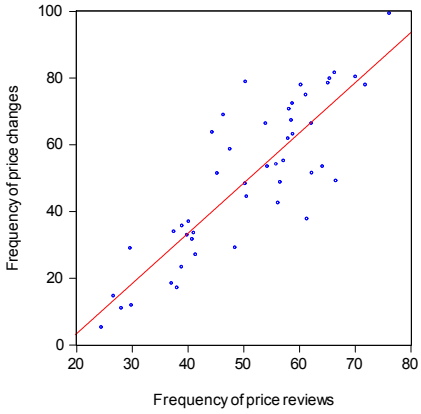

Figure 7: Frequency of price reviews and frequency of price changes

Notes: 1) Percentage of firms in each subsector reporting frequent price reviews and frequency of firms reporting at least one price change in six months.
2) Number of subsectors: 47

4.4 Price increases and price decreases

The empirical literature on price changes at the micro level documents that there are asymmetries in price reactions. Price increases are more frequent than price reductions. Studies using microdata report that in many countries, such as in the US and in the Euro Area, around 55% to 60% of price changes are price increases (see Dhyne et. al. 2006, Klenow and Kryvtsov 2004, among others). In Brazil, Gouvea (2007) documents that approximately 54% of price adjustments are price increases, suggesting some degree of nominal downward price rigidity as well. Micro price studies also document asymmetries in the size of price changes, with average price increases being usually smaller than average price reductions. In Brazil, there is also evidence of asymmetric behavior with respect to size of price changes, but the average size of price increases is greater than the average reductions—16% and 13%, respectively (Gouvea 2007, and Barros et. al 2009).

In order to understand these asymmetries, firms were asked if they use the same criteria for implementing a price increase and a price decrease. From the total of firms interviewed, 65% answered that adopt the same criteria and the other 35% reported that use different criteria for price increases and price reductions. In some subsectors, the share of firms

reporting different criteria is more than 50%. There is thus indication that, in some way, many firms follow different strategies and consider distinct factors in defining upward and downward movements in individual prices. Some national surveys suggest that demand conditions and competitors' prices are the most important determinants for price decreases, while rises in labor costs and raw materials emerging as the main factors driving prices upward.

4.5 Evidence on theories of price rigidities

Many theories have been developed to explain why prices are sticky. The survey asked questions to assess the importance of some of these theories in explaining the price setting behavior in Brazil. In which follows, we summarize the most relevant theories in the literature and document the results in our survey.

Menu cost and costly information. Many papers in the New Keynesian tradition assume that changing prices may be costly due to the act of printing and distributing new price lists (see, for example, Sheshinski and Weis, 1977). The literature uses the term menu costs in this narrow sense. Changing prices may also be costly, as suggested by Mankiw and Reiss, because gathering and processing information required by pricing decisions is costly and time consuming. We do not differentiate the two types of costs, but as discussed in subsection 3.1, 57.3% of Brazilian firms consider that the costs of price adjustments are low, which suggests that this is not the most important factor for keeping prices constant.

Coordination failure. This theory emphasizes the interactions between firms. Depending on the market structure, after a shock, firms may not want to change their prices if other firms do not change, in fear of sparking off a price war. Without coordination mechanisms that allow firms to move together, firms may prefer "to wait and see", producing price rigidities. The survey asked the following question: "What the importance of only changing prices after learning how competitors readjusted their prices?" In the aggregate, 67% of surveyed firms answered that this information is *important*, among which 34% answered that this is *very important*. The share of firms considering this information very important is higher in commerce sector (45%).

Cost-based pricing. The argument is that the costs of inputs are the most important determinant of firms' pricing decision. Thus, if costs of inputs do not change, prices of firm's products will not change either. The survey asked about the importance of increases in the costs of inputs for the calculation of price adjustments. The results show that the costs of inputs are *very important* for pricing decisions for 79,4% of firms in the survey. However, the survey also asked if "when an increase in the costs is known, the price

adjustment is immediate or not". In this case, 65% of firms answered that the adjustment is not immediate. In particular, firms wait to evaluate if changes in costs are temporary or permanent. Therefore, as already mentioned in subsection 4.2, costs play a key role in price-setting decisions, but other factors also matter.

Change in non-price factors. Rather than adjusting prices immediately in response to changes in market conditions, firms may prefer first to use strategies such as postponing the delivery time, modifying the quality of products, adjusting the level of inventories, among others. To evaluate this possibility, the survey asked two questions. The first question was the following: "If demand for your main product increases, before increasing the price, do you consider an extension of the delivery time?" Around 54% of firms responded affirmatively. In the second question, firms were asked "if they consider an adjustment in inventories, before increasing prices". In this case, 75% of surveyed companies answered that they first accommodate demand changes using the level of inventories.

Judging quality by prices. In an environment of imperfect information on product quality, firms do not want to decrease the prices of their products because customers might misinterpret the price decrease as a reduction in quality. To evaluate the impact of this effect on price setting behavior in Brazil, firms were asked the following question: "If you have reason to reduce the price of your main product, before to do so do you consider the possibility that your clients might think the quality of your product has decreased?" In this case, 38.3% of firms answered "yes", while 57.4% responded "no". The other 4.3% reported they "do not know how to answer the question".

Explicit contract. Firms may have contractual arrangements with their costumers, which guarantee to offer products at specific prices or according to predetermined rules of price setting. Probably, this is the most straightforward explanation of price stickiness (see, for example, Fisher, 1977). As already mentioned, our survey does not cover firms whose main products have prices monitored and regulated (in many cases, by contracts or following explicit rules). However, managers of surveyed firms were asked about the participation of products whose prices are adjusted by contracts in the list of products sold by the firm. Almost 20% of firms answered that the participation is *high*, while 49% responded the participation is *low, if any*. Nevertheless, we should keep in mind that the group of prices monitored or administered by contract, which is not part of the survey, represents around one third of the consumer price index in Brazil.

Implicit contracts and avoiding bothering costumers. According to this theory, firms also want to build up long-run relationships and enter into implicit contracts to win customer loyalty by avoiding to change prices as little as possible. Price changes are considered damaging for relations with customers, and firms hold prices constant in face

of demand shock to avoid bothering clients (see Okun, 1981). To test the importance of this mechanism, the survey asked: "What is the importance of not bothering clients with successive price increases, ensuring their loyalty?" Among surveyed firms, 79% answered that this is very important.

In summary, based on these results three theories seems to be more relevant to explain price setting behavior in Brazil: cost-based pricing, explicit contract and implicit contract. Cost pressures are very important for almost 80% of firms, even though price changes are not immediate after cost shocks, since firms consider other factors (in particular, if the shock is temporary or permanent). This is confirmed by the results of subsection 4.2 pointing to the relevance of markup over costs form of pricing. The importance of explicit contracts is mainly due to the large share of monitored and regulated prices in the CPI. But even among firms whose main product is not classified as monitored or regulated by authorities, almost 20% responded that the share of products with prices adjusted by contracts is high. Implicit contracts also provide a further explanation for price stickiness: 79% of firms consider very important not jeopardize customer relationship with successive price increases. Beside the relevance of these three theories, coordination failure and adjustment in non-price factors are also minor obstacles to faster price changes in Brazil. Overall, our findings are in line with results for other countries, as shown by Fabiani et. al. (2005), Zbaracki et. al. (2004), Lunnemann and Matha (2006), among others.

5 Factors driving price changes

In order to identify the main drivers of price changes in Brazil, the survey included questions about factors that are important for pricing decisions. Firms were asked to assign the importance (*very important*, *medium importance* and *low importance*) of five factors for price adjustments: exchange rate, wages, costs of intermediate goods, inflation and interest rate.[6] We ranked the relative importance of these factors by calculating, for each factor, the share of firms reporting that it is *very important*. Besides the total sample, we also explore results considering subsamples with groups of firms with common characteristics: firms facing strong competition in their market, firms setting prices asymmetrically, firms following time-dependent pricing rules and those using other rules, and firms engaged in foreign trade. Except in the latter group, the results were very similar to those in the

[6] We included the cost of intermediate goods among the factors, even though it may not be considered a primary factor. After all, the cost of an intermediate good used by a firm as an input is also the price of the product of another firm (the producer). This price is affected by the other factors. For example, shocks in the exchange rate affect prices of inport products used as intermediate goods by other firms. However, we do not want to make a structural interpretation, but understanding how price setters perceive the different factors affecting their pricing decisions.

Table 9: Importance of different factors driving price changes – Total sample

Factors	Sector			Brazil
	Commerce	Manufacturing	Services	
Exchange rate	41%	48%	20%	36%
Wages	33%	36%	54%	41%
Intermediate goods	70%	85%	0%	50%
Inflation rate	51%	44%	56%	50%
Interest rate	47%	37%	37%	40%

whole sample and will not be presented. In what follows we first analyze the results for the total sample and then explore those considering exporting and importing companies.

5.1 Aggregate sample

Table 9 shows the results for the total sample. Considering the aggregate economy, the two most important factors reported by surveyed firms are intermediate goods and inflation rate. In both cases, 50% of firms answered they are very important. Regarding the intermediate goods, this shows that the costs of inputs are a crucial determinant for firms' pricing decision, which is consistent with results of the previous section pointing to the importance of cost-based pricing. The importance of inflation rate for pricing decisions should not be a surprise in the case of Brazil, considering the long history of high inflation. These two factors are followed as the most relevant by wages, interest rate and exchange rate.

As expected, in services sector, besides the inflation rate, another very important factor is wage. This reflects the large weight of labor input in the composition of costs in this sector: 75% of firms in this sector report that the wage share of the total cost is medium and high. In manufacturing, 85% of firms consider the price of intermediate goods very important. The second most important factor for manufacturing is the exchange rate, certainly reflecting the high exposure of importing and exporting firms to international trade. Interestingly, in the services sector no firm considered intermediate goods as a very important factor.

5.1.1 Backward- and forward-looking components

To deepen the analysis of the role of inflation for pricing decisions, the survey also tried to assess the importance of backward-looking and forward-looking terms of the Phillips curve in Brazil. The questionnaire included two questions about the importance of past inflation and the expected future inflation for pricing decisions.

Again, we ranked these components by the number of firms reporting them as *very*

Table 10: Importance of expectated inflation and inflation target – Total sample

Factors	Sector			Brazil
	Commerce	Manufacturing	Services	
Expected inflation	39%	33%	41%	38%
Past inflation	38%	32%	47%	39%
Inflation target	51%	39%	48%	45%

important. Table 10 shows that backward-looking and forward-looking components have similar weights in the calculation of current price adjustment, considering the aggregate economy: respectively, 38% and 39% of surveyed firms consider expected inflation and past inflation as very important. These results are consistent with works that estimate Phillips curve for Brazil, which report parameters of these two variables with very close magnitudes (see, for example, Minella and Souza-Sobrinho 2013). Moreover, results suggests the target is an important public signal in forming expectations.

5.2 Firms engaged in foreign trade

We used the two questions that asked about "origin" and "destination" of products sold by the company to identify firms involved in foreign trade. A total of 64% of the 7,002 surveyed firms answered these two questions. Based on their answers, we separate those acting mainly as importers and exporters. We considered firms that answered that either *all* or the *majority* of their products are sold abroad as exporters. We grouped companies reporting that the origin of their products is either *all from abroad* or *partly from abroad* and considered them importers. The first group represented approximately 5% of the total surveyed firms, while the second reached around 13% of the total sample. The small number of firms involved in foreign trade is explained by the fact that Brazil is a relatively closed economy.

The results about the important factors for pricing behavior of exporters and importers are presented in Tables 11 and 12. Note that for these companies the importance of exchange rate is much higher than in the total sample: 67% of exporters and 58% of importers consider this factor very important. However, the most important factor for these companies is the cost of intermediate goods, particularly in the manufacturing sector. After intermediate products, the interest rate is the most relevant factor among exporters (close to exchange rate) and headline inflation among importers.

There are some possible reasons for the importance of these factors for firms engaged in foreign trade. First, hedge products are broadly used by Brazilian companies involved in international trade, historically exposed to high exchange rate volatility. Second, most Brazilian exporters are dependent on credit and rely heavily on capital markets. Finally,

Table 11: Importance of different factors driving price changes – Exporters

Factors	Sector		Brazil
	Commerce	Manufacturing	
Exchange rate	67%	67%	67%
Wages	38%	31%	32%
Intermediate goods	59%	83%	81%
Inflation rate	56%	38%	40%
Interest rate	59%	71%	69%

Table 12: Importance of different factors driving price changes – Importers

Factors	Sector		Brazil
	Commerce	Manufacturing	
Exchange rate	55%	62%	58%
Wages	30%	33%	31%
Intermediate goods	73%	83%	77%
Inflation rate	77%	41%	61%
Interest rate	49%	37%	44%

as the Brazilian importing sector is intensive in intermediate goods[7], importers tend to adjust their final selling price mainly based on a total cost metric. Consequently, prices of intermediate goods and inflation must have a major role in pricing decisions.

6 Summary of results and some policy implications

The survey raised several interesting findings on the price setting practices of Brazilian firms. Overall, they are consistent with previous works on price setting in Brazil using micro price data. Indeed, these two sources of studies provide complementary information: the micro price data provide a way of quantifying individual price setting behavior, and the survey data favor the development of explanations for those findings.

Here we summarize the findings of our survey. From the industrial organization perspective, Brazilian firms seem to concentrate their business in a few products and typically operate in monopolistically competitive markets.

Regarding the frequency of price changes, firms report that, on average, they change prices 3.6 times per year, leading to a price duration of 3.4 months. Firms in service sector change prices less frequently than those in commerce or manufacturing sectors. Therefore, the evidence is that overall prices are sticky in Brazil, but the degree of price rigidity is lesser than in most of developed countries.

[7]See, for example, the import modelling in the DSGE model of the BCB: Castro et. al. (2011), "SAMBA: Stochastic Analytical Model with a Bayesian Approach", Working Papers Series of the BCB no. 239.

On how to change their prices, the majority of firms answers that follow state-dependent practices, but they also consider elements of time dependency, particularly in the service sector. Another important element for pricing decisions is competition: firms prefer to set their prices only after knowing about how their competitors have repriced. They also report that the costs of gathering and processing the necessary information for price changes are low. We find a negative relationship between reported menu costs (in a broader sense) and the frequency of price reviews and changes. We also find a positive correlation between price reviews and price changes.

In search for evidence to support the theoretical models available in the literature, we find markup-over-cost pricing as the main strategy reported by firms. According to the survey, three theories seem to be appropriate to explain the price rigidities in Brazil: cost-based pricing, explicit contracts, and implicit contracts. Coordination failure and adjustments in non-price factors seems to have a minor role.

The survey also explored the determinants of pricing decisions. Firms responded that the main factors behind price changes are the inflation rate and the costs of intermediate goods. For firms engaged in foreign trade, exchange rate and interest rate are also relevant.

All these findings have important implications for monetary policy. But rather than traying to formulate any guidance for policy makers, we now focus on some broad lessons that can be inferred from the survey results.

First, the evidence of price stickiness and the prevalence of monopolistically competitive markets, as found in many other national surveys and studies using micro price data, reinforces the New Keynesian view that monetary policy exhibits short-run non-neutrality, and hence that the conduct of monetary policy can have significant impacts on the evolution of the real economy through changes in the real interest rates.

However, two other aspects should affect the real impacts of monetary policy, each acting in opposite direction. From one side, the theoretical literature has shown that heterogeneity in the degree of price ridigidy across sectors, as suggested by the survey, increases the short-run non-neutrality (Carvalho 2006, Nakamura and Steinsson 2010). Heterogeneity has also implications for optimal monetary policy (see, for example, Aoki 2001). On the other side, the literature suggests that monetary policy shocks tend to have much less effect if price setters use state-dependent rules, as indicated by the survey, than in time-dependent models (Golosov and Lucas 2007, Gertler and Leahy 2008).

The evidence in favor of state dependency might also interact with other aspects of the price setting behavior. For instance, since exchange rate is reported to be an important determinant of prices particularly for firms engaged in foreign trade and there are other non-price factors of adjustments after a shock, the state dependent nature of price decisions

might cause the size of the exchange rate pass-through to change over time. Moreover, since markup-over-cost pricing is the main strategy followed by firms and the two most important elements driving price changes are the costs of intermediate inputs and the inflation rate, the state-dependent price setting behavior is reinforced. All these pieces of evidence highlight the benefits of maintaining price stability over time and raise the case for low inflation.

The broadly similar magnitudes of the backward-looking and forward-looking components emphasize the role of expectations. Besides, in an environment of infrequent price changes, individual firms have strong incentives to assess not only the current factors but also the future outlook when resetting prices. Therefore, the survey evidence provides support for the view that designing credible policies and managing private sector expectations through good communication are essential for stabilizing the economy in response to unexpected disturbances.

Finally, the survey found that sectors with a higher labor share, such as services, are typically characterized by lower frequency of price changes. This fact suggests that it is also crucial to look at wage-setting behavior in order to understand price dynamics in Brazil, and this should be the focus of further research.

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