Wage and Price Setting: New Evidence from Uruguayan Firms*

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Abstract

This paper presents new evidence on wage and price setting based on a survey of more than 300 firms in Uruguay in 2013. Only one in ten companies believes that the one year inflation rate in the policy relevant horizon will be located in the target range set by the Central Bank of Uruguay. Most of the firms set prices considering costs and adding a profit margin; therefore, they have some degree of market power. The evidence indicates that price increases seem quite flexible in Uruguay (prices are downward rigid). Most of the firms adjust their prices without following a regular frequency although wage changes are concentrated in January and July, which suggests that price changes in Uruguay are state-dependent. Interestingly, the cost of credit is seen by companies as an irrelevant factor to explain price increases. We also find that cost reduction is the principal strategy to a negative demand shocks. Finally, the adjustment of prices to changes in wages is relatively fast.

Keywords: price setting, labor market, survey evidence, Uruguay

JEL Classification: E31, D40, J30, L16

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* The opinions expressed in this document are the sole responsibility of the authors and do not compromise nor represent the position of the Banco Central del Uruguay.

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1. Introduction

In recent years there has been a large increase in the empirical literature on price behavior. Following the work of Calvo (1983), Taylor (1980) Fuerer and Moore (1995) among others, understanding the microstructure of price setting allows us to better understand the way to fight price rigidity and conduct a more efficient monetary and macroeconomic policy. As new and detailed data sets become available, we observe a number of important studies on the microeconomic fundamentals of price setting by firms—mainly retailers—and their impact on inflation. This analysis allows a better understanding of the behavior, dispersion, and volatility of prices.

However, there are few studies that analyze price setting from surveys that directly ask companies regarding price formation, and most of the literature is concentrated in developed countries. In Uruguay in particular, despite recent progress for the retail sector (Borraz and Zipitría (2012)) and in wage formation (Mazzucchi et al (2008)) there is no direct evidence on the price formation strategies by firms. In this study we use a novel data set of a survey to 307 large Uruguayan firms on price setting.

The purpose of this study is to present stylized facts about price setting in Uruguay based on a survey of firms. This new evidence must be viewed as a complement to the new literature on the topic on Latin America. However, the principal objective of this study is to raise a number of unknown questions about price formation for future research. Therefore, the objective is to generate questions as well as answers that would be useful for monetary policy design and to set the future agenda on the microeconomics of price setting. This study can be viewed as a first step to generate a new approach to analyze monetary policy options in a small open economy.

Our findings are as follows: i) prices in Uruguay seem to be more rigid than in previous studies, ii) the frequency of price change is state dependent, iii) the response of prices to wages is fast, iv) Firms do not have a clear view on how to respond to unanticipated demand shocks. More research is needed to understand better the response of firms to unanticipated demand shocks, v) firms seem to pay more attention to wages than their weight on the cost structure would justify, a puzzling behavior that might be related to the way wage negotiations are conducted, vi) there is a high degree of inertia in the manufacturing industry sector.
The rest of the paper proceeds as follows: Section 2 presents a brief review of related literature, section 3 makes a brief description of the data, section 4 presents the basic results of the survey and section 5 concludes.

2. A Brief Literature Review

As mentioned above, the price setting literate based on firm surveys is scarce. Most of the literature is concentrated on developed countries. Using surveys to analyze price-setting behavior of firms was initiated by Blinder (1991, 1994) and Blinder et al. (1998) from the USA.

In the case of Germany, Stahl (2005) finds that most of the manufacturing firms have market power to set producer prices. Additionally, indexation is minor. Babecký Checz (2008) finds that in Czech firms prices are less rigid than wages and a weak pass through of wages to prices. They also find that in response to an unanticipated demand shock, firms reduce temporary employment and non-labor costs.

For fifteen European countries Druant et. al. (2009) finds a close relationship between wages and prices and between wages and the frequency of price changes.

In the local region, Irregui et. al. (2011) analyze the link between wages and prices in Colombia using a survey of firms. They find that firms adjust their wages principally in the first quarter. They also find the stronger pass through of wages to prices in labor intense sectors or sectors with high labor productivity. The empirical evidence also suggests time-dependent price changes are less common than time-dependent wage adjustments in Colombia.

In the case of Canada, David Amirault et. al. (2006), firms show a wide variation in the frequency with which they adjust prices. Almost 33% of Canadian firms declare price adjustments once a year or less while a similar portion adjust prices more than
twelve times per year. Similar studies for Swedish firms (Mikael Apel et. al. - 2001), for Spanish firms (Luis J. Álvarez et. al. -2004) and Portugal firms (Fernando Martins -2006) show that firms adjust their prices only once a year. Canadian firms consider wage cost as a very important factor to increase prices.

Jennifer V. Greenslade and Miles Parker (2012) analyzed the case of the United Kingdom asking companies directly how their prices behave. As with the studies mentioned before, the median number of price changes was once per year. UK firms were asked how prices were determined for their main product and the explanations that most of the firms considered most important were competitors’ prices (68% of firms) and mark-up over costs (58% of firms). Another interesting result was that, in particular, labor costs and raw materials were the most important cause of price rises, whilst lower demand and competitors’ prices were the main factors resulting in price reductions.

Luis J. Álvarez et. al.(2004) analyzed the price –setting behavior of Spanish firms and found some interesting results. First, around two thirds of companies follow pricing policies with an element of state-dependence while only one third of them use a pure time-dependent pricing rule. Second, changes in costs are the main factor underlying price increases. There are also significant differences across industries in the frequency of price changes; the higher frequency being in the trade sector.

The study made by Richard Friberg and Kerstin Hallsten for Swedish firms also finds that the median firm adjusts the price once a year. Another finding is that state-dependent and time-dependent price setting are equally important.

For Portuguese firms (Fernando Martins -2006) they found that more than 30% of total price changes are price decreases. Another important finding is that the degree of price stickiness seems to be higher in services sector than in manufacturing sector.
3. Data

Our study is based on a survey that was conducted by the National Statistical Office of Uruguay (Instituto Nacional de Estadística, INE) in agreement with the Central Bank of Uruguay (Banco Central del Uruguay, BCU) in February 2013 on the basis of a sample covering all economic sectors with the exception of the public sector. The firms where selected using stratified random sampling. The stratification was made according to the number of employees (from 50 to 99; 100 to 199; 200 or more) and the economic sector of the firm. Therefore, only firms with 50 or more employees are in the sample. The survey was sent to 630 firms by traditional mail. A reminder was sent to those firms that had not responded. At the end, 363 valid questionnaires were received (a response rate of 58%). If a firm did not respond, it was not substituted in order to avoid skewing of results. Instead the weights were reestablished.

In order to have more information about the firms we merge this survey with the yearly Economic Activity Survey, EAS (Encuesta de Actividad Económica) conducted by INE. The EAS contains information about sales, investments, and labor force and cost structure for Uruguayan firms. The survey is conducted among all private and state-owned firms which operate in Uruguay with 5 or more employees. As a result of the merger of the two samples we end up with a sample of 307 firms.

The original purpose of the survey was to obtain an inflation forecast by well informed agents that influence prices such as firms. The average and median value of the yearly expected inflation of the firms for the February-2013 to January-2014 and August-2013 to July-2014 are approximately 9 % (Figure 1a) in all sectors of activity. Interestingly we observe an important discrepancy between the forecast of the firms and those made by experts in the inflation expectation survey (IES) conducted by BCU. The experts forecast a yearly inflation that is 1.5 p.p. lower than the prediction of the firms. One possible explanation could be related to the strategy behavior of firms or the fact that the companies are better informed agents than the experts.
Interestingly, only one in ten firms expected that the yearly inflation for the relevant policy horizon (18 months at the time of the survey), will be located within the target range imposed to the Central Bank of Uruguay by the Ministry of Finance. Also, almost 30% of the firms have inflation expectations of 10% or more.

Figure 1b shows the distribution of the expectation of the yearly increase in costs. The median of the expectation is 10%, that is 1 p.p. higher than the expected increase in inflation.

4. Empirical Results

This section presents the main results of the analysis of the survey on price setting practices in Uruguayan firms. We present the data without the weights both because of a very uneven non-response rate among sectors and because their use does not change the results.

4.1 Price setting behavior

4.1.1 Market microstructure and price setting.

We asked firms what was their strategy for setting prices. Figure 2a shows that the majority of firms, regardless of sector, set their price with a mark-up over costs, which would indicate the prevalence of imperfect competition. This is a result that is usually found in the literature (Irregui et. al. (2011) and Stahl (2005)). Also, the only economic sector that does not set their price with a profit margin is the transport sector that has their prices regulated by the Government (Figure 2b). The price setting based on cost and a mark-up is highest in the trade and other business sectors. As expected, manufacturing is the sector with the highest exposure to international competition.

In Figure 2.c we analyze the price setting inside manufacturing. Cost and mark up price setting is predominant in heavy industry. Also, this sector has the lowest
exposure to international competition. This result reflects the high participation of heavily protected industries. Other manufacturing subsectors tend to find the international price more important as a reference for price setting, probably as a result of lower redundant protection. If we consider domestic and international competition, the subsectors that show a higher exposure to it are food and wood, both basic export commodities in the case of Uruguay (60 and 67% of firms respond to competition). Since the main export goods of Uruguay are produced by the food sector, the lower response to competition the sector shows compared to wood, which is puzzling in principle and deserves further research, might be related to market segmentation in some strategically important food components. Overall, the high percentage of firms that follow non-competitive practices might be related to the trade protection structure.

4.1.2. Frequency of price adjustment

Analyzing the frequency of price changes, Figure 3 indicates that 40% of firms do not have a regular frequency and in 30% the adjustments are semiannual. This result, based on a survey of producers and consumers firms, suggests that prices are more rigid than in the findings of Borraz and Zipitría (2012). They find that the median duration of prices in food, beverages and personal products in the retail sector is approximately two months and half. The large proportion of firms claiming not to have a regular frequency of price adjustment might indicate that price adjustment opportunities arise in a random way, as in Calvo (1983). This result comes in stark contrast to the relatively large importance given to wages in the price formation process, particularly when wages, since Uruguay returned to centralized wage negotiations, are adjusted mostly twice a year in January and July. It would be important to compare the wage adjustment in the sectors and the claimed frequency of price setting. As mention before, Swedish (Mikael Apel et. al. - 2001), Spanish (Luis J. Álvarez et. al. -2004), United Kingdom (Miles Parker et. al 2012) and Portuguese (Fernando Martins -2006) firms adjust their prices only once a year which shows a difference with the frequency with which Uruguayan firms adjust their prices.

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1 The Uruguayan government has special regimes for some food commodities that have an important share of the consumption basket of the population.
Table 1 analyzes the correlation between the frequency of price change and employment (in thousands) and sector of activity. The dependent variable is a discrete one with values from 1 (weekly prices changes) to 7 (no regular pattern). Surprisingly, the results show a negative correlation between price rigidity and employment. However, this correlation becomes positive at the employment level of four thousand. Additionally, once we control for employment, we do not find a significant correlation between the frequency of price changes and the sector of activity. This evidence seems to suggest that the frequency of price change in Uruguay is state dependent. This is consistent with Borraz and Zipitría (2012) who find that the empirical evidence seems to point to state-dependent models as the main explanation for the inflation phenomena in Uruguay.

Only 29% of firms (see Figure 4), mostly transport and real estate sectors, declare that they change their price in a particularly month. The others firms do not concentrate their price changes at a specific time of the year. The percentage of firms that do not change prices in a particular month ranges from 50% for transport and communications and others business to 97% for the trade sector. For the manufacturing industry the response is 82%. Not surprisingly, the most important months for price adjustment are January and July that coincide with the dates of adjustments to the most of the sector in the Wages Councils (Figure 5).

4.2 Factors Affecting Pricing

Figure 6 indicates that wages and raw material prices are the more relevant factors for firms to increase their prices. In all the different economic sectors salary was ranked as a very important factor to determine a change in the main product price. The study of Canadian firms also ranks wage costs as a very important factor to determine a change in price, whereas the study of Swedish firms ranks it as less important.

The economic sectors that consider the price of raw materials more relevant are manufacturing industry and the trade sector. The high importance given to wages in price formation contrasts with the relatively low participation of wages in the cost structure of firms. As can be seen in table ..., the weight of wages on total cost...
averages less than 20% while raw materials are close to 60%. Since raw materials include a large proportion of commodities, it is also puzzling that the exchange rate plays a lesser role than wages.

Another interesting finding obtained from the survey is that finance costs do not affect prices in any economic sector. This might reflect the fact that Uruguayan firms show relatively low levels of banking credit. Other factors that do not have an important influence in the price of any economic sector are the price of the competitor, the price of the dollar and the demand. Considering that firms set their price with a mark-up we believe it is logical that they do not take into account the price of their competitors.

Inflation is a factor that is considered very important for transport and real estate firms at the time of changing prices. On the other hand manufacturing industry and the trade sector do not consider it significant.

A striking fact is the high importance given by employers to wages to determine price increases. One can think that this is a strategic behavior by firms because of the existence of Wage Councils that mandate wage negotiations between the employers, employees and the government. Therefore it is possible that firms overweight the importance of wages to increase prices. In order to check this we compare the firm’s response with the true structure of costs from INE for the manufacturing sector.

Table 2 presents the correlations between the importance of wages (inputs) to increase prices and the wages (inputs) share in total costs. Although the correlation is positive and significant it is far away from 1. Interestingly the correlation between input and inputs share in total costs is not significantly different from zero. This response generates concern about the firm’s survey.

We also analyze the importance of expected changes in wages to determine prices changes. With this question we can determine the forward looking degree in the decisions of the firms. This is a relevant factor for monetary policy design. In most of the sectors we do not find differences between the importance of wages versus expected wages. The two exceptions are in the manufacturing and transportation and communications sectors. Interestingly, in both sectors, more weight is given to the
current wage than to expected wages. This fact suggests the existence of an important degree of inertia in those sectors. Given the importance of the manufacturing sector, this result has an important implication for monetary policy.

The backward-looking characteristic of the manufacturing and transportation and communications sectors with respect to wages is also observed with respect to the price of inputs and the exchange rate. The others sectors of the economy are neutral.

4.3 Prices and Wages

We study the speed of price adjustment after an increase in salaries in Figure 7. Firms were asked to report the average time between the increase of salaries and the corresponding price reaction. Almost 60% of the firms declared adjustment of their prices very quickly (less than one month to three months). Approximately 22% of the firms declared no increase in prices and absorbed the costs of the salaries. This result cast doubts regarding some of the responses of the firms. These types of answer turned on an alert signal for the analysis of surveys of companies. The design of the surveys should capture these contradictions in the answers.

4.4 Firms reaction to an unexpected demand shock

The majority of the firms when faced with a decrease in demand tend to reduce their costs (Figure 8). Another reaction they have is to disseminate the mark-up they generate. Although when they have a decrease in demand they do not decrease their prices or their production.

Finally, Table 2 presents the cross correlation between the different strategies of the firms to a demand shock. Suspiciously there is a highly significant positive correlation between two opposite strategies like price increases and prices reductions. This can be explained by the fact that both strategies are not relevant at all for the firms under a negative demand shock. This result suggests a certain amount of price rigidity.
We find that the optimal response of the firm to a negative demand shock is not just one but a mix of strategies such as reduction of costs and margins and to some extent production.

5. Conclusions (incomplete)

This study provides new insights into price setting in a small economy like Uruguay based on a survey of firms. We also discuss a new question about price formation in Uruguay for future research.

The results indicate that prices are more rigid than previously thought and indicate a relative low degree of competition in the markets.

Some of the results cast doubt on the responses of the firms (for example one in five responses is zero pass through from wages to prices). This type of answer turned on an alert signal on the analysis of surveys of companies. The design of the surveys should capture these contradictions in the answers.
6. References


Mikael Apel, Richard Firberg and Kerstin Hallsten. “Microfoundations of Macroeconomic Price Adjustment: Survey Evidence from Swedish Firms”


Figures

Figure 1a: Kernel Density Estimation – Yearly Inflation Rate: Feb-2013 to Jan-2014 (solid line) and Aug-2013 to Jul-2014 (dash line)

![Kernel Density Estimation - Inflation Rate](image1a)

Notes: Kernel Epanechnikov, Silverman (1986) optimal bandwidth.

Figure 1b: Kernel Density Estimation – Yearly Increase in Costs: Feb-2013 to Jan-2014 (solid line) and Aug-2013 to Jul-2014 (dash line)

![Kernel Density Estimation - Costs Increase](image1b)
Notes: Kernel Epanechnikov, Silverman (1986) optimal bandwidth.

Figure 2a. Pricing of the Firm’s Main Product (in %)

Figure 2b. Pricing of Firm’s Main Product by Sector (in %)
Figure 2c. Price Setting in the Manufacturing Industry by Subsector (in %)

Figure 3. Frequency of Price Adjustment (in %)
Figure 4. Are Price Changes Concentrated in a Particular Month?

Figure 5. Price Changes by Month (in %)
Figure 6. Factors Determining Price Increases (Median Response)
1=Not Relevant, 5=Very Relevant

Figure 7. Months to Adjust Prices when Wages Change
(In %)
Figure 8. Firms Reaction to an Unexpected Sales Fall
1=Not Relevant, 5=Very Relevant

- Raise Prices
- Cut Prices
- Lower Margins
- Reduce Production
- Reduce Costs
## Tables

**Table 1. Multinomial Logit Model**

Frequency of Price Change. Marginal Effects

<table>
<thead>
<tr>
<th>Exploratory Variables</th>
<th>Coeff. / S.E.</th>
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</thead>
<tbody>
<tr>
<td>Employment</td>
<td>-0.0012*** (0.0005)</td>
</tr>
<tr>
<td>Employment²</td>
<td>0.0003* (0.0002)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.0318 (0.0442)</td>
</tr>
<tr>
<td>Trade</td>
<td>0.0246 (0.0363)</td>
</tr>
<tr>
<td>Other Business</td>
<td>-0.0001 (0.0001)</td>
</tr>
<tr>
<td>Education</td>
<td>-0.0000 (0.0001)</td>
</tr>
<tr>
<td>Mining</td>
<td>-0.0001 (0.0001)</td>
</tr>
<tr>
<td>Health</td>
<td>0.0006 (0.0006)</td>
</tr>
</tbody>
</table>

Observations 307

Robust Standard Errors in Parentheses

** p<0.05, * p<0.1

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**Table 2. Correlation of True Cost Structure and the Importance Declared by Employers of each Cost Factor**

<table>
<thead>
<tr>
<th></th>
<th>Wages</th>
<th>Wages Share</th>
<th>Inputs</th>
<th>Inputs Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wages</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages Share</td>
<td>0.21***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inputs</td>
<td>0.54***</td>
<td>0.14***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Inputs Share</td>
<td>-0.27***</td>
<td>-0.66***</td>
<td>-0.03</td>
<td>1</td>
</tr>
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</table>

*** p<0.01

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**Table 3. Correlation of Firms Strategies under a Sales Fall**

<table>
<thead>
<tr>
<th></th>
<th>Raise Prices</th>
<th>Cut Prices</th>
<th>Lower Margins</th>
<th>Reduce Production</th>
<th>Reduce Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raise Prices</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut Prices</td>
<td>0.22***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Margins</td>
<td>0.00</td>
<td>0.38***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce Production</td>
<td>0.04</td>
<td>0.27***</td>
<td>0.11***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Reduce Costs</td>
<td>0.01</td>
<td>-0.02</td>
<td>0.16***</td>
<td>0.15***</td>
<td>1</td>
</tr>
</tbody>
</table>

*** p<0.01
Survey Questionnaire.

1) ¿Cómo se fija el precio del producto principal de la empresa en su mercado principal?
   a. El precio es regulado
   b. El precio es fijado por la casa matriz
   c. El precio es fijado por el principal comprador
   d. El precio es fijado siguiendo a los competidores
   e. El precio es fijado según costos y un margen de beneficios
   f. El precio es fijado siguiendo al precio internacional

2) Bajo circunstancias normales, ¿Cuál es la frecuencia con que su empresa cambia el precio del principal producto?
   a. Diariamente
   b. Semanalmente
   c. Mensualmente
   d. Trimestralmente
   e. Semestralmente
   f. Anualmente
   g. No existe una frecuencia regular

3) Bajo circunstancias normales, ¿Los cambios de precios se concentran en algún mes en particular?
   a. No
   b. Si. Escribir mes/es

4) ¿Cuál es la importancia de los siguientes factores para determinar aumentos de precios del producto principal de su empresa? Califique de 1 (nada relevante) a 5 (muy relevante).
a. Aumentos de salarios
b. Aumentos del costo del crédito
c. Aumento de precios de materiales e insumos
d. Aumento del precio de los competidores
e. Aumento de la inflación del país
f. Aumento de la demanda
h. Aumento del dólar

5) ¿Cuál es la importancia de los siguientes factores para determinar aumentos de precios del producto principal de su empresa? Califique de 1 (nada relevante) a 5 (muy relevante).

a. Aumentos esperados de salarios
b. Aumentos esperados del costo del crédito
c. Aumentos esperados de precios de materiales e insumos
d. Aumentos esperados del precio de los competidores
e. Aumentos esperados de la inflación del país
f. Aumentos esperados de la demanda
h. Aumentos esperados del dólar

6) ¿Cuánto tiempo lleva a la empresa ajustar los precios de sus productos/servicios cuando cambian los salarios?

a. Menos de un mes
b. Entre uno y tres meses
c. Entre 3 y 6 meses
d. Más de 6 meses
e. La empresa no aumenta precios y absorbe el aumento de salarios

7) ¿Cómo reacciona su empresa ante una caída imprevista en las ventas? Calificar de 1 a 5 donde 1 es nada relevante y 5 muy relevante.
1. Aumenta los precios
2. Reduce los precios
2. Reduce los márgenes
3. Reduce la producción
4. Reduce costos