

Price-Setting Discoveries: Results from a Developing Country¹

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Abstract

We present results of 1189 structured interviews about price-setting behavior of the formal firms in the manufacturing and services sector of Pakistan. Our key discoveries are that frequency of price change is considerably high in Pakistan, lowering the real impact of monetary policy. Price rigidity is mainly explained by firms caring about relative prices and the persistence of shocks. The exchange-rate and cost shocks are more important than financial and demand shocks for both setting prices and also the readiness with which these pass-through to the economy. Formal sector firms with connections to the informal sector, especially through demand, have a lower probability of price adjustment. The lack of taxes and compliance with tax regime, i.e. enforcement are held responsible for existence of the informal sector by formal sector firms.

Keywords: Price-Setting Behavior; Structured Interviews; Formal Sector; Developing Economy

JEL Classification: E32; E52; O11.

1 Introduction

The idea of sticky prices is at the heart of modern day macroeconomics for explaining economic fluctuations over the short horizon. It implies that instead of being vertical, the aggregate supply curve is upward sloping. Therefore, fluctuations in aggregate demand can cause fluctuations in output. This setup is fundamental for monetary policy as it determines the extent to which money growth, with its influence on aggregate demand, can influence the real economy. As it is commonly implied, the lengthier the period between price changes the greater the influence of monetary policy. Therefore, it is quintessential to empirically establish the extent and the nature of sticky prices.

Until recently, there had been a gap between theoretical explanations of price-stickiness and studies of their empirical importance. Partly in response to this gap and partly because of the apparent success over the last two decades of monetary policy in curbing inflation, central bankers and academics of advanced economies have devoted much resources to the empirical study of price stickiness.¹ To name a few studies Rotemberg (1982), Carlton (1986), Cecchetti (1986), Kashyap (1995), Blinder (1991), Blinder et al. (1998), Taylor (1999), Aspland, Eriksson and Freiberg (2000), Hall, Walsh and Yates (2000), Bils and Klenow (2004), Levy, Datta and Bergen (2002), Amirault et al. (2005) and more recently Fabiani et al. (2007), Nakamura and Steinsson (2008) and Greenslade and Parker (2012). This large literature for U.S. and European countries shows that the degree of price-stickiness is considerable and pricing strategies are complicated.

However, the corresponding effort to study price-stickiness in developing economies leaves much to be desired. Such a study is all the more important in light of the growing literature that documents the contrasting features of the developing world such as: (i) *procyclical* monetary policies, (ii) persistence of inflation levels in the double-digits and (iii) higher than average volatilities of annualized inflation rates (see especially Agénor and Montiel (2010) and Frankel (2010) and the literature therein). Furthermore, with the expected rise of the emerging markets as world economic engines it will become increasingly important to study in detail the behavior of their product markets and the extent to which they differ from that of the developed world.

In this paper, we present results of 1189 face-to-face structured interviews carried out in 2009 to 2011 with entrepreneurs representing formal firms in the manufacturing and services sector of Pakistan. By formal, it is meant that our firms are officially registered, tax liable and also report data to employment agencies. Therefore, these firms necessarily take part in the official GDP and employment statistics. This study is comparable to similar research work in developed countries in that key questions were benchmarked and drawn from the pioneering works by Blinder (1991) and Blinder et al. (1998) for the U.S., Fabiani et al. (2007) for the Euro area and Greenslade and Parker (2012) for the U.K.

The interviewers inquired about the nature of the product market, frequency of price reviews and price changes, key explanations for price-stickiness, dissemination of economic shocks, and the nature of interaction with the informal sector entrepreneurs. Understanding the linkages

¹The European Central Bank has a large team working under the aegis of ‘Inflation Persistence Network’ to study prices.

with the informal sector is important given that in Pakistan the informal economy² employs more than 70% of non-agricultural labor force.³

To the authors' knowledge, features such as the scale of structured interviews (only Blinder et al. (2007) for US, Amirault et al. (2005) for Canada and to a smaller extent Loupias and Ricart (2004) for France used structured interviews), sectoral coverage, updated list of price theories and questions on the informal sector makes our survey the first exercise of its kind jointly conducted by a central bank and statistical agencies. Furthermore, this study is a good test for the universality of a great number of price theories developed by economists over the last few decades.

A few words on the macroeconomic situation of Pakistan at the time of the interviews (Dec 2009-Jun 2011) before the presentation of key results. In November 2008, Pakistan entered a 23 month IMF program (the 11th since 1988) after a balance-of-payments crisis in May 2008. The average annualized inflation rates for Pakistan during the three months of the interviews in Punjab was 12.5%, and during the year of survey in Sindh was 14%; which is 4-6% above Pakistan's 50-year trend. During the fiscal year 2010, (i.e. July 2009-June 2010) real GDP grew by 3.8% and the annual unemployment rate was 5.6%.⁴ Monetary policy was conducted under a dirty-float, with implicit inflation and growth rate targets of 9% and 3.3% respectively.

We establish twelve stylized facts about price-setting behavior in Pakistan's formal manufacturing and services sectors and compare them with previous work where possible:

Fact 1 The median frequency of price changes in the manufacturing and services sector is 6 and 2 times a year respectively. The equivalent figures are 1 and 1.4 times a year in Europe and the US respectively;

Fact 2 Prices are rigid downwards and more so for the services sector; a result consistent with previous work;

Fact 3 Formal firms are relatively more sensitive and promptly accommodate to changes in (a) overall cost and in particular that of energy and intermediate inputs, (b) competitors' prices and (c) the exchange rate. However, changes in demand and financial-costs matter less. This is consistent with previous literature for developed countries, with the main difference being that labor costs relative to energy costs were found to be more relevant for them;

Fact 4 Time dependent price rules are more common than state-dependent ones, with 51% of firms using the former; while for developed economies the same figure is 33%;

Fact 5 The top three reasons for delaying price changes upwards are: (a) the fear that other firms will not follow, (b) the uncertainty that shocks might be temporary and (c) the fear of customer retaliation. The first and the third reasons are in line with the results from developed economies;

Fact 6 37% of owners reported that prices are benchmarked to competitor's price, while 47% reported setting prices on the basis of constant or variable markup. The same figures stand at 27% and 52% respectively for developed countries. However, there is considerable imperfect competition in all types of economies;

²Informal sector output is at least one-fifth of the reported GDP (see Arby, Hanif and Malik (2010))

³Pakistan Labor Force Survey 2009-10.

⁴The unofficial unemployment rates are higher, but they are hard to assess as 70% of non-agricultural household's working hours are spent in the informal sector.

Fact 7 The manufacturing sector—where costs of raw material account for 70% of total cost—responds more to cost shocks relative to the services sector— where labor costs account for 40% of total cost;

Fact 8 All firms, big or small, use backward and forward-looking information sets in making price decisions. In particular, 46% of firms use a combination of backward and forward looking information while only 29% use pure forecasts. In contrast, the use of forecast information is considerably higher in developed countries, with 55% of firms relying on it;

The remaining facts are particular to the linkages between formal and informal sector as viewed by the formal sector entrepreneurs:

Fact 9 43% of formal firms interviewed interact with the informal sector either through demand or supply channels;

Fact 10 Economies of scale, customer preferences and market power motivates formal firms to remain in the formal sector;

Fact 11 According to formal firms, tax exemptions and weak enforcement are the main reasons for the existence of informal sector;

Fact 12 Formal firms with frequent interaction with the informal sector tend to have relatively lower probability of price change suggesting that interactions with informal economy serve as a shock absorber; in particular for demand shocks.

This paper presents results from our survey and compare our results with the US and the Euro Area where possible. The rest of the paper is organized as follows: Section 2 presents the research design. Sections 3-7 discuss various aspects of pricing. Section 8 presents caveats of our study while a final section concludes.

2 The Research Design

Generally, there are three approaches to obtaining information on price stickiness at the firm level: (i) using secondary data from which one may infer stickiness, (ii) sending surveys through e-mail or post or (iii) conducting one-on-one structured interviews.

The first approach has the concern that data on economic outcomes is not sufficiently detailed in Pakistan at the firm level for a meaningful study on prices. The second approach has the concern that unlike in western countries in Pakistan, the concept of obtaining qualitative information through e-mail and post is relatively new which might lead to low response rates. Also, there is no guarantee that the survey would be filled by a suitable person in the organization. The concern for the third approach is that it is costly (especially for large sample size like ours) and the length of the survey process may be longer.

We adopted structured-interviews approach for our survey for three reasons: complexity of the questionnaire, potential poor response rate through traditional mail and the fear that questionnaire might not reach the appropriate person. Generally, lower response rates do not necessarily indicate any bias, especially if distributed systematically across the sample. However, we post-stratify our sample results based on firms' size and economic activity to reduces this bias. This proved important as we had a lower response rate for larger firms. Other surveys such as Kwapil et al. (2005) and Loupias and Ricart (2004) also find similar large firm behavior.

Despite the higher cost, face-to-face interviews are considered to produce higher quality results and a higher response rate. They also reduce the possibility of fluke answers, provide direct access to the suitable individual and allow interviewers to carry out a longer list of queries.

Overall, the literature recognizes the potential of Blinder’s unorthodox survey approach. Indeed, no less than 17 developed countries have used detailed questionnaires (via e-mail or post) to study the pricing pattern⁵ in the manufacturing and services sectors. Nonetheless, with all the qualitative surveys (structured interviews or otherwise) there is the danger of misinterpretation by respondents with the slightest change in the wording of the questions leading to disproportionate responses. In many cases, respondents may use intuition rather than what they do in practice to respond to the questions.

In full recognition of the possibility that these challenges might be more acute for a developing country like Pakistan, we teamed up with the premier statistical agencies of Pakistan.⁶ They selected experienced interviewers with local know-how and contacts to conduct our survey. The State Bank of Pakistan provided focused training (both theoretical and practical) to these selected interviewers for complex real world situations, where they need to elaborate and explain the questions for clarity. SBP⁷ also conducted two separate pilots before launching the study. For a further quality check, economists from the State Bank randomly audited 10% of live interviews.

The face-to-face interviews took place between December 2009 and June 2011. The study began in the province of Punjab in December 2009 and ended in March 2010. In the province of Sindh, it was launched in June 2010 and ended in October 2011.⁸

2.1 The Questionnaire

The questionnaire is benchmarked to Blinder (1991) and the collection of studies in Fabiani et al. (2007). This is imperative as it allows us to draw parallels between price-setting behavior of firms in developing and developed economies where possible.

In line with previous work, section A of our questionnaire contains questions on the general profile of the firm as well as queries on the types of customer and the nature of competition in their respective market. Section B, C, and D contain questions on various aspects of price setting of the main product—the one with highest domestic sales. Section E contains queries on existing theories of price-stickiness and dissemination of shocks. Section F contains queries on the interlinkages between the formal and informal sectors.

In order to better capture the ground realities of the Pakistani economy, the questionnaire was customized in the following ways: First, we asked formal firms about their interactions and views on the informal sector. Second, we asked entrepreneurs about breakdown of their cost structure. Third, in the section on price-dissemination we paid particular attention to the

⁵The U.S. used structured interviews.

⁶These agencies are well-equipped for this exercise as they conduct the census of the manufacturing sector in Pakistan.

⁷State Bank of Pakistan, which is the Central Bank of the country.

⁸The main reason for delay in completion of surveys in Sindh was the precarious law and order situation during the period of surveys

effects of external shocks on prices. Indeed, Pakistan is exceptionally vulnerable to external shocks with 11 IMF programmes since 1988.⁹ This is important as little is known about shock transmission in developing countries at the micro level.

On the testing side, the newly designed questionnaire was tested between ourselves and crucially on a separate sample of 50 randomly selected firms in Karachi;¹⁰ The final questionnaire was then translated into Urdu.¹¹ We have attached the questionnaire in Appendix C.

2.2 Sampling

We covered the ‘formal’ manufacturing and services sector in the provinces of Punjab and Sindh. The other two provinces of the country (Balochistan and Khyber-Pakhtun Khwa) were avoided due to safety reasons at the time of the interviews. Our focus on the larger provinces and sectors ensures that our results are a good representation of the pricing pattern of the formal sector in Pakistan.

The population frame for the manufacturing sector consists of all firms which reported in the last census of manufacturing industries (CMI). The manufacturing sector is dominated by certain types of economic activities as well as having a greater share of small sized firms. Therefore, a purely random sample would run the risk of having a bias towards these activities and firms. To overcome this problem, stratified random sampling was used.

The firms were stratified on the basis of economic activity and firm size. The manufacturing sample covers firms with International Standard Industrial Classification (ISIC) economic activity codes from 15 to 36 (excluding 30).¹² The population of firms for the above mentioned sub-sectors of the manufacturing sector was split into three categories of employment brackets: 10-50, 51-250 and more than 250 employees. On the basis of these classifications, a random sample for the manufacturing sector was drawn from 63 mutually exclusive strata. We drew a sample of 1200 firms for the manufacturing sector in Sindh and Punjab, along with a replacement-sample representing 50% of the original sample to cover the possibility of non-response. In case of non-response, a firm from a particular stratum was replaced by another firm from the same stratum to maintain sectoral representation.

The sampling for the services sector is more complicated in that there is no formal population frame available for firms in the services sector. Therefore, we used the database of Securities and Exchange Commission of Pakistan (SECP) which maintains a complete list of firms registered with them. However, the SECP frame lacks information on firm size and dormant/ non-dormant status of firms. Therefore, we impose the following constraints on the sample selection in the

⁹See www.imf.org.

¹⁰Pakistan’s largest metropolis.

¹¹Pakistan’s national language.

¹²The activities are: 15-(food products & beverages), 16-(tobacco products), 17-(manufacture of textiles), 18-(wearing apparel), 19-(leather products), 20-(wood & wood products), 21-(paper & paper products), 22-(publishing, printing & reproduction), 23-(petroleum), 24-(chemicals & chemical products), 25-(rubber & plastics products), 26-(other non-metallic mineral products), 27-(basic metals), 28-(fabricated metal products), 29-(machinery & equipment N.E.C.), 31-(electrical machinery & apparatus), 32-(Radio,TV & communication equipment), 33-(medical & optical instruments), 34-(motor vehicles & trailers), 35-(other transport equipment), 36-(furniture).

services sector. First, to minimize the chance of selecting dormant firms from a massive database, we only selected firms that had been registered within the last 10 years and if registered before that time period have reported to SECP at least once in the last 10 years.¹³ Second, to avoid small firm bias, only firms with paid-up capital more than RS. 2,000,000 (USD 23,500) were selected in our sample. Third, we only included firms involved in economic activities where it is possible to identify a main service. A random sample of 270 firms was selected from transport and telecommunication, hotels and restaurants, education and health care services on the basis of sectoral distribution. With the above limitations, results for the services sector should be interpreted cautiously as they only reflect price-setting behavior for selected services and not from a well-defined sample frame. We, therefore, present services sector results separately as well.

Table 1 provide details of the sample. As of June 2011, 1189 structured interviews were completed. Of these interviews, 1025 are from the manufacturing sector with 286 (that is 28%) out of 1025 from the Sindh province. The services sector accounted for 14% of the sample. In practice, most of the price-setting surveys in the Euro Area are biased towards the manufacturing sector, due to particular nature of price-setting surveys.

TABLE 1
The Sample

	<i>Manufacturing</i>	<i>Services</i>	<i>Total</i>
Small	573	103	676
Medium	291	40	331
Large	161	21	182
Sindh Representation	28%	37%	29%
Total	1025	164	1189

Source: Author's calculations

Notes: Position as of 30th June 2011

A few thoughts on the sample size before we discuss the results. The sample size of 1189 manufacturing and services sector firms makes our survey the fifth largest price survey among the existing European and U.S. surveys. Also, to best of author's knowledge this survey is first of its kind for an emerging economy like Pakistan. The covered sample of 1025 firms in the manufacturing sector is about 9.4 % of the target population, which is well above the usual convention of choosing a sample of about 5 % of the population. However, sample for the services sector was selected as a small proportion of a pseudo-sample because of the non-availability of any formal population frame as discussed earlier.

¹³Every firm registered with SECP has the obligation to report its statistics on annual basis but few do so on a regular basis.

In order to make sure that our sample is a good representation of the population, we allocated the sample according to respective strata shares in population. However, for stratas with very small share in population sample size was deliberately increased to be able to make stronger statistical inferences for them. The allocated sample was then drawn randomly from sample frames. For very small stratas, we included all of the firms from such stratas in our sample.

To draw valid inferences for the population on the basis of this sample, it was necessary to post-stratify the data to control for possible selection bias due to either closure of some selected firms, firms being sole-exporter of their product or firms shifting to a different economic activity. Similarly, large firms' decisions are likely to be more important. Also, we had lower response rate from larger firms so data needed to be adjusted for firm size as well. Furthermore, aggregate weighted results appear under the nomenclature of 'total' in our Tables. For this, we reweighed the data on the basis of sector weights in the population. Appendix B contains the details of the post stratification scheme.

The manufacturing and services sectors combined to account for 71% of GDP in 2010. However, taking only into consideration the subsectors that are covered in our interviews, our final sample is representative of firms that produce around 25.2–27 % of Pakistan's GDP. The under-representation of the services sector is noticeable but common in other international price related studies as well. This is because it is not straight forward to define the main product for some services sector firms. Services like financial services, construction, retail and trade were not included where product usually changes with every transaction. Also, in our case the sample frame for the services sector was not available. Given the list of subsectors in the manufacturing and the services sectors, on aggregate we believe to have captured a true picture of 'price-setting' in Pakistan with identifiable products.

TABLE 2
The Overall Representation (percentages)

	<i>Manufacturing</i>	<i>Services</i>	<i>Total</i>
Pakistan GDP 2009-10	18.6	52.4	71.0
GDP represented by our sample [†]	12.2	13-15	25.2-27
Sector distribution in our sample	86	14	100

Source: Author's calculations & Pakistan Economic Survey 2010-11

[†]: This percentage is used for reweighting sector estimates

3 The Environment

To a great extent, price determination and its adjustment depends on the market structure. The structured interview approach addresses this issue by asking about firm size, importance of the main product for the firm, firm's position in the market, and the nature of firm's relationship with customers.

TABLE 3 ^a
Market and Competition of the Main Product (weighted percentages)

	<i>Manufacturing</i>	<i>Services</i>	<i>Euro Area</i> †
<i>Reference Market</i>			
i. International	5	14	27 ^b
ii. Local Market (City and Surrounding Areas)	33	37	
iii. National Market excluding (ii).	62	49	
iv. ii+iii	95	86	73 ^b
<i>% of Turnover in Pakistan</i>			
41-60	16	6	
61-80	29	7	
81-100	45	74	
<i>Market Share</i>			
Top Firm	5	11	
Top Four Firms	13	22	
Top Ten Firms	17	22	
Not among the Top 10 Firms	37	41	
<i>Type of Main Customer and long-term relationship</i>			
Other Firms	79	34	75 ^b
Customers	20	58	21 ^b
Public Sector	2	8	3 ^b
<i>Firm-Customer relationships</i>			
Long term	56	36	70 ^b
Occasional	44	64	30 ^b
<i>Perceived Degree of Competition</i>			
Very High	47	56	26.2 ^c
High	26	24	35.2 ^c
Medium	22	15	21.5 ^c
Weak	2	3	17.1 ^c

Source: Author's calculations & Fabiani et al.(2007).

†: Weighted Average by country's GDP in Fabiani et al. (2007).

a: Rescaled figures excluding non-responses

b: Fabiani et al.(2007), pp 33

c: Fabiani et al.(2007), pp 202

The questions in our structured interviews focused on the dominant product of a given firm in terms of turnover in Pakistan. In manufacturing and services sector, we found that on average turnover generated by the main product is 77% and 85% respectively. Furthermore, the national market was the main market for 95% of manufacturing and 86% of services sector firms for their main product in our sample. This implies that our survey results present a representative picture of pricing pattern at the firm level in Pakistan. This suits our needs as we are primarily interested in understanding the pricing-pattern in Pakistan.¹⁴

As for the interaction with customers, the majority¹⁵ of manufacturing sector firms sell their main product to other firms. While in services sector 58% of the firms directly deal with final customers. This implies that the results of our interviews refer to producers prices for the manufacturing sector and customer prices for the services sector. Furthermore, for firms in our sample the majority of customers (56% manufacturing and 36% services) tend to be repeat customers. However, the share of repeat customers in our sample of Pakistani firms is less than Europe, where 70% of sales are based on long-term clients.

Table 3 eludes to the degree of competition in manufacturing and services sectors. Majority of firms perceive market competition to be high or very high in the industry. The share of firms claiming to operate in a medium or weak competition is 24% and 18% for manufacturing and services sector respectively. This implies that markets are more competitive in Pakistan than in Euro Area where 40% of firms perceive competition to be weak. This finding is further corroborated by the fact that 37% and 41% of firms in the manufacturing and services sector respectively place themselves not to be amongst the top ten firms.

In sum, it is possible to infer that there is a monopolistic environment in Pakistan with firms usually having long-term relationship with customers. However, this environment is more competitive than Europe and the proportion of firms with long-term relationship with customers is smaller.

4 A Profile of Price Setting

Most New-Keyensian economists believe that the slow adjustment in prices and wages play an important role for explaining short run economic fluctuations. However, New-classical economists argue that prices are flexible, even in the short-run, and that explanations for economic fluctuations must be found elsewhere in factors such as technology shocks and preferences. These differing views fundamentally affect the choice of the critical assumption of perfect vs. imperfect competition in product and labor markets for the purpose of building any general equilibrium model of the economy. Therefore, it is essential to get a solid empirical grasp on the extent and the nature of price and wage stickiness in Pakistan.¹⁶

This section is devoted to price-setting behavior of firms in our sample, namely, the basis on which prices are set, revised and frequency of price change. In the previous section, we found

¹⁴International penetration of the main product for formal sector firms in Pakistan is at least three times lower than the Euro Area.

¹⁵80%

¹⁶We deal with wage-stickiness in a separate paper.

some indication of imperfect competition in Pakistan. This result is further confirmed by the finding in Table 4 that 34% and 63% of firms in the manufacturing and services sectors reported applying the markup rule of pricing. Overall, 47% of formal sector firms in our sample use the markup rule.¹⁷ A further 44% and 29% of manufacturing and services sector firms reported following their competitors in setting prices. Overall, the numbers are not too different from the results in Europe, with the main difference being the relatively higher use of the markup rule in the services sector in Pakistan.

TABLE 4 ^a
Price Rules (percentages)

	<i>Pakistan</i>	<i>Euro Area</i>
<i>Markup</i> [†]		
Manufacturing	34	56 ^b
Services	63	46 ^b
Total	47	54 ^c
<i>Competitors Price</i>		
Manufacturing	44	27 ^b
Services	29	24 ^b
Total	37	27 ^c
<i>Other</i> [‡]		
Manufacturing	22	17 ^b
Services	8	31 ^b
Total	16	18 ^c

Source: Author's calculations & Fabiani et al.(2005).

a: Rescaled figures excluding non-responses

b: Fabiani et al.(2005), pp 41

c: Fabiani et al.(2005), pp 14

[†]: Include constant, variable and customer markups.

[‡]: Include prices determined by association and the government.

These results further support the existence of imperfect competition in Pakistan and the idea that firms set prices themselves. Next, we turn our attention to main reasons for price reassessments. To establish these features, we ignore prices determined by government. The academic literature identifies three main methods of price evaluation: (i) at regular time intervals Taylor (1980) and Calvo (1983) (ii) on the basis of specific events Barro (1972), Sheshinski and Weiss (1983) and Caplin and Leahy (1997) and (iii) a combination of the former two. It is also possible for firms to adopt both methods of price adjustment. Indeed, it is reasonable to expect firms to accommodate for specific changes even when they generally adhere to a time interval

¹⁷Surprisingly, 'markup' is commonly used in Pakistan to denote unit profit margin in the local language.

approach for price changes; this idea was first debated in Hall et al. (2000) then further taken by Apel et al. (2005).

TABLE 5 ^a
Price Assessments (percentages)

	<i>Pakistan</i>	<i>Euro Area</i> ^b	<i>US</i> ^b
<i>Purely Time-Dependent</i>			
Manufacturing	54		
Services	47		
Total	51	34	60
<i>Purely State-Dependent</i>			
Manufacturing	27		
Services	21		
Total	24	20	30
<i>Generally Time-Dependent but also Event Based</i>			
Manufacturing	11		
Services	7		
Total	9	46	10
<i>Purely Time-Dependent</i>			
Small	50		
Medium	52		
Large	57		

Source: Author's calculations; Fabiani et al.(2007) & Blinder et al.(1998).

a: Rescaled figures excluding non-responses

b: Fabiani et al.(2007), pp 192

In Table 5, the estimated weighted average of firms that review their prices at regular time-intervals is 51% and a further 9% of firms review prices generally at regular time intervals, while also accommodating for specific events. This implies that 60% of the firm change prices on the basis of time-dependent rules. These numbers are similar to Blinder et al. (1998) for US and Hall et al. (2000) for UK where the figures are 60% and 70% respectively. In contrast, European figures from Fabiani et al. (2007) of 34% and for Sweden of 44.8% in Apel et al. (2005) are far lower. This difference may be due to their market structure, with a significantly higher proportion of long term customers and also the fact that Sweden and Euro Area had lower inflationary environment at the time of their surveys. Therefore, for firms in their sample prices reviews were only necessary on specific occasions. In the case of Pakistan, 50 year trend inflation of 8% implies that it is imperative for firms to reassess prices more regularly. Table 5 also provides a breakdown of price reassessment approaches taken by manufacturing and services

sector and by firm size. Both sectors are similar in the way prices are reviewed. Moreover, the firm size is positively correlated with the regularity of price reviewing.

We now turn our attention to different measures of prices stickiness. This is crucial as it determines the extent to which monetary policy can have a real impact on the economy. As discussed earlier, frequent changes in prices lower the length of price spells by making the aggregate supply curve steeper. In Table 6, we discuss the key measure of price-stickiness by directly asking entrepreneurs about their actual number of price changes in a typical year.

The median¹⁸ number of price changes in Pakistan is 3 times a year. This is almost 3 times higher than what is found in the developed world. This implies that median spell of a price change is 4 months. Furthermore, 24% of the firms change their prices within a month; once again greater than what is found in studies on the Euro area and US respectively.

TABLE 6
Actual Price Changes

	<i>Pakistan</i>	<i>Euro Area</i>	<i>US</i>
Median Number of Price Changes in a Year	3	1 ^a	1.4 ^d
Implied Median Spell of Price Change in Months †	4	12	8.6
% of Firms that Review their Prices With a Month	73	26 ^b	25.6 ^e
% of Firms that Change Price Within a Month	23.9	16 ^c	20.9 ^d
Quarterly Calvo Probabilities using Median Duration ‡	0.25	0.75	0.65

Source: Author's calculations; Fabiani et al.(2007) & Blinder et al.(1998).

†: This is ratio of 12 and median of number of price changes in a year.

‡: The probability that firms do not re-optimize the prices they charge during a quarter

a: Fabiani et al.(2007), pp 191

b: Fabiani et al.(2007), pp 36

c: Fabiani et al.(2007), pp 223

d: Authors calculation based on results in Blinder et al.(1998), pp 84

e: Authors calculation based on results in Blinder et al.(1998), pp 90

We also discover in Table 6A, that at a disaggregate level, manufacturing sector prices are much more flexible than prices in the services sector and firm size positively impacts the median frequency of price changes. This implies that for manufacturing duration of price spells is no longer than 2 months. The latter results are also found in the developed economies but their significance is not as sharp. It is also noticeable that small and large firms have similar median

¹⁸The mean would be a misleading measure of central tendency in this case as some firms change their prices on continuous basis. For these firms we assume that prices change on daily basis to simplify our analysis.

number of price changes. The find that Pakistan, with a steady-state year-on-year inflation of 8%, has a greater frequency of price change than developed economies compares favorably with studies such as Cecchetti (1986), Kashyup (1995), Buckle and Carlson (1995) and Taylor (1999) which observe that during periods of high average inflation the duration of price-spells tended to be shorter in the countries of their interest.

TABLE 6A
Median Number of Price Changes in a Year

<i>Pakistan</i>		
Sector	Manufacturing	6
	Services	2
Firm Size	Small	3
	Medium	2
	Large	3

Source: Author's calculation

Price adjustments downward show a different pattern. In Table 6B, we can see that median price cuts happen once a year for the manufacturing sector, while for the services sector this is only true over a long period of five years. Overall, for both manufacturing and services sector price cuts tend to occur after two and half year showing considerable amount of downward price rigidity.

TABLE 6B
Median Number of Downward Price Changes in 5 Years

<i>Pakistan</i>	
Manufacturing	5
Services	1
Total	2

Source: Author's calculation

In sum, there are price rigidities in Pakistan, but far less than what is found in developed economies. There is a higher degree of price rigidity in the services sector compared to the manufacturing sector. The empirical evidence presented on price stickiness, with a higher frequency of price change, have important implications for policy-making in Pakistan.

First, monetary policy in such an economic environment would have a smaller impact on real economy than in an environment with a lower frequency of price change. This happens because a smaller proportion of firms will have their actual prices different from the optimal levels giving the policy maker a very small window of opportunity to affect output.

To reiterate this point further, let us make the unlikely assumption that all features of the Pakistani economy resemble that of the U.S. economy with the exception of the frequency of price change as reported in Table 6. We plug this information in a simple Dynamic Stochastic General Equilibrium (DSGE) model of the U.S. In our version, nominal price rigidity is the only source of friction with all other standard ingredients such as monopolistic competition in the product market, monetary policy and balanced budget. In Fig.1, we present the impact of a one standard-deviation interest rate shock on the output gap. The real impact of a policy shock on output for Pakistan is smaller, with the brunt of its effect dying out within three quarters. While on the other hand, for the US case output falls 17% below its potential and effects of policy shock dies out only after the 17th quarter. This simple exercise shows that only using assumption of price-rigidity to explain economic fluctuations and persistence in real variables in emerging markets such as Pakistan may not be the best idea.

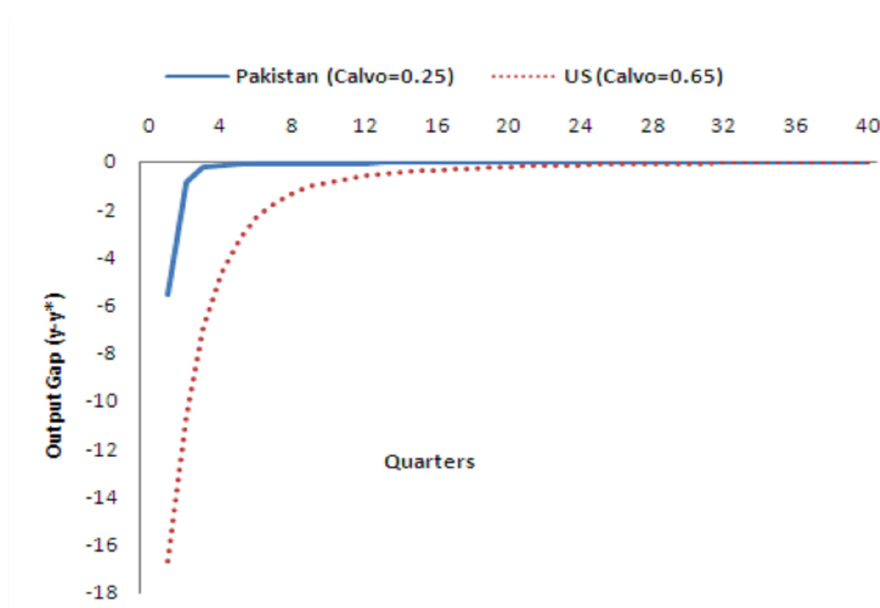


Figure 1: The impact of an interest-rate shock on the output gap ($y - y^*$).

Second, the higher frequency of price change calls for policy-making and analysis to be based on data that is at a frequency better than quarterly and quarterly at worst. This is confirmed by the Calvo¹⁹ probabilities in Table 6 which show that prices are optimized within a quarter.

Third, the finding that time-dependent rules are also applicable to economies with high inflation and high frequency of price change has not been documented previously in the literature to our knowledge. The potential reason behind this puzzle is the frequency of price reviews. Price review within a month is the most common practice in the Pakistani markets, where for US and Euro area only 25% of firms review prices within a month. The time dependent firms with a high frequency of price reviews indicate that despite following a time-dependent rule for price

¹⁹Calvo probability refers to the probability that a firm cannot change its price during a given period.

change, the probability of re-optimizing prices increases with significant differences between original and optimal prices. The behavior of such firm is likely to resemble state dependent firms. Note that our pattern of pricing appears not to be conditioned by the choice of year as the firms provided similar answers to what they actually did in 2008 and 2009.

These results naturally raise an important question for developing economies such as Pakistan. Models based on time-dependent rules with fairly low frequency of aggregate price change and where these changes are staggered are the mainstay of monetary economics for explaining persistence in inflation and output. However, it seems not to be the most appropriate way to model behavior of Pakistani economy.

TABLE 7A ^a
Ranking Reasons for Price Stickiness

<i>Theories</i>	<i>Description</i>	<i>Pakistan</i>		<i>Europe</i> [†]	<i>US</i> [‡]
		<i>Manufac</i>	<i>Services</i>		
Coordination Failure	Firms watch what other firms will do first	1	1	4	1
Temporary Shocks	Firms avoid price changes if they perceive a shock (demand or supply) to be transitory	2	4	7	
Risking Customer Relations	Customer might take the price change as exploitative	3	2		1 *
Procyclical Elasticities	When times are good customers become more price sensitive	4	5		6
Habit Formation	When times are good share of non-habitual customers with higher price elasticities increases	5	6		

Source: Author's calculations; Fabiani et al.(2007) & Blinder et al.(1998).

a : It is important to note that we can't make a direct comparison between rankings from different countries as the number of theories and style of asking this question is different for different surveys. However, this comparison is still useful to get a general idea.

†: Unweighted average of national rankings; Fabiani et al.(2007), pp 196

‡: Authors calculation based on results in Blinder et al.(1998), pp 110

*: In US, firms were asked out of freewill to cite what in general stopped them from changing prices and the largest majority said customer's antagonism.

We have already learnt that formal sector firms in Pakistan change prices more frequently than firms in developed countries, but what stops them from changing prices even more frequently. To answer this question we presented firms with an extensive list of statements, based on a manifold of theories, and asked them to identify the ones that were used in the practical sense for delaying price adjustments.

Firms were asked to evaluate importance of different pricing theories for their pricing decisions on the scale of: very important, important, of minor importance and unimportant. The responses were coded from 1 to 4 respectively. The responses for the manufacturing and services sector were used to rank different theories. In Table 7A, we present the results of top five explanations for the manufacturing and the services sector. For comparison, we also present the results from U.S. and Euro Area.

The top three explanations for delaying price adjustment are: (i) firms prefer to act once they have observed how their peers behave (82% of the firms ranking this aspect important or better) i.e. firms care about relative prices (ii) the fear of customer retaliation (48% of the firms ranking this aspect important or very important) and (iii) the perception that shocks might be of temporary nature (44% of the firms ranking this aspect important or very important). Generally, our results are closer to the US than the Euro Area, Hall et al.(2000) for UK and Apel et al.(2005) for Sweden. This should be expected given that the median frequency of price change in the US is relatively higher than elsewhere. The ideas of implicit contracts, costly price adjustments and costly information appear at the bottom of our ranking. The latter two theories performed especially badly in other surveys as well. For details of mean scores see Table 7B in the Appendix.

We also asked firm owners separately if any of the relevant theories in Table 7A hindered them from marking down prices. In response, the top two explanations stayed the same as in Table 7A. However a different theory was ranked third (with 64% of firms choosing it) and it is that firms refrain from reducing prices during bad times as it hurts their cash flows.

These results are reasonable for Pakistan considering its higher frequency of price changes. For example, it is hard to imagine a formal price-agreement in the manufacturing sector when the typical price duration is only 2 months. However, in the services sector where the median price change is twice a year, explicit contracts make more sense and were also reported as the third most mentioned reason for price stickiness.

5 Factors Determining Price Adjustment

There are four key ingredients of price determination. First, what drives price changes. Second, differences in firm behavior when prices go up as opposed to when they go down. Third, the speed with which different shocks are incorporated into prices. Fourth, the type of information used during the decision making. We have briefly talked about points two and three in the context of demand and supply shocks but we explore each of these aspects in detail below.

TABLE 8
The Importance of Factors Driving Price Changes and Lags of Adjustment (mean score[†])

	<i>Pakistan</i>						<i>Euro Area^a</i>	
	<i>Manufacturing</i>			<i>Services</i>			<i>Overall</i>	
	↑ [†]	↓ [†]	p-value [‡]	↑ [†]	↓ [†]	p-value [‡]	↑ [†]	↓ [†]
Raw Material Cost	3.7*	3.4*	0.00	1.9***	1.8****	0.00	3.1	2.6
Energy Cost	3.1*	2.9**	0.00	2.5***	2.1****	0.00		
Competitor's Price	2.9*	2.9*	0.03	2.5***	2.3***	0.00	2.4	2.8
Exchange Rate	2.5**	2.4**	0.00	2.8**	2.6***	0.00		
Demand Changes	2.4***	2.6**	0.00	2.1***	2.0****	0.24		
General Price Level	2.2**	2.4**	0.18	1.9***	1.6****	0.00		
Labor Cost	2.2***	1.9***	0.00	2.5***	2.1****	0.00	3.0	2.1
Financial Cost	2.2***	2.1***	0.00	1.7****	1.6****	0.00	2.2	1.9
Labor Productivity	1.9***	1.9***	0.05	1.4****	1.3****	0.92		

Source: Author's calculations & Fabiani et al.(2007)

†: 1, 2, 3 and 4 denote unimportant, of minor importance, important and very important
 asterisk denote *incorporated within three months, **incorporated within six months,
 incorporated within nine months, * incorporated within a year.

‡:Refers to null hypothesis that the mean lag of price adjustment for a given factor for

‡: price increase is equal to price decrease.

↑ and ↓: Refer to increase and decrease in price respectively.

It is important to highlight that firms are more concerned with price increases rather than reductions. Indeed, the median frequency of price decreases for manufacturing and services sector firms over the last five years prior to the interview are 5 & 1 respectively. With this in mind, analysis on factors leading to price reductions should be taken with a pinch of salt.

In Table 8, we report causes of price changes and the approximate speeds with which these changes pass-through to prices. The top four reasons for prices to go up or down for the manufacturing sector are raw-material costs, energy costs, exchange rate movements and the competitor's price. For the services sector, raw-material cost matters less while labor cost matters more due to their cost structure. In Table 8, we also report how quickly important changes are incorporated in prices for these reasons. The most important reason for a price change gets incorporated in decision-making within a span of three months. Other less important

reasons are incorporated in pricing decisions within six months. In the case of the Euro area, costs are also more important but with the difference that raw material and labor cost rank higher when prices go up while raw-material costs and competitor's price matter more when prices decrease. These differences can be explained by the nature of market and cost structure of the manufacturing and service sector in Pakistan. We do not have equivalent speeds of adjustment available for other countries for comparison.

Table 8 also tests the asymmetry of mean lag of prices changes for given reasons. We find that for most of the reasons it takes significantly longer on average to markdown prices than markup except for general price level in the manufacturing sector, and demand changes and labor productivity for the services sector.

In Table 9, we present the breakdown of firms' cost structure in 2009. We find that local and imported raw-material costs account for 70% of total cost in the manufacturing sector, which explains the presence of exchange rate and local raw material costs as prime forces driving price changes.

TABLE 9
Breakdown of Total Cost in 2009 (average of percentages)

	<i>Manufacturing</i>	<i>Services</i>	<i>Total</i>
Local Raw Material Cost	60	8	39
Imported Raw Material Cost	10	8	9
Energy	13	12	13
Labor	11	40	23
Other	6	32	17

Source: Author's calculations

Next, we asked firms about the type of information they use for determining prices of their main product. We focused on finding out whether price setting is based on information referring to past, future or a combination of both past and future. This is important as it can shed light on the sources of inflation persistence from the point of view of businesses. According to Table 10, 46% of all formal sector firms use a combination of past and future information. Combining this information with firms using only historical data, 71% of the firm use backward-looking information as part of their price-setting mechanism. Furthermore, we find that 71% and 70% firms in the manufacturing and services sector respectively use backward looking rules. The predominance of backward-looking rules in our sample contrasts with that of Fabiani et al.(2007), where the fraction of firms practicing backward-looking pricing relative to those making price decision on the basis of forecasted data is the reverse of what we discovered in Pakistan.

TABLE 10 ^a
Information Type (percentages)

	<i>Manufacturing</i>	<i>Services</i>	<i>Total</i>	<i>Euro Area</i>
Historical Data	27	22	25	34 ^b
Forecast	29	30	29	48 ^b
An Average of Past and Future	44	48	46	

Source: Author's calculations & Fabiani et al.(2007)

a: Rescaled figures excluding non-responses

b: Fabiani et al.(2007), pp 37

These results on price determination have important policy implications. First, for an economy that reprices at least 12.2% of its GDP (manufacturing sector) six-times-a-year and has lower responsiveness to financial costs compared to exchange rate, inflation stabilization policies should pay more attention to exchange rate policies. This repricing reflects the cost structure, where one-quarter of the inputs (imported raw material and energy to some extent) have an exchange rate component. Second, frequent repricing by firms may also be a reflection of the lack of trust on the policy-makers to stabilize an economy that has gone through an IMF programme no less than 11 times over the last two decades.

6 Linkages with the Informal Economy

An innovative part of our survey is that we ask formal firms about their existence in the formal sector and their connections with the informal sector. As mentioned before, In Pakistan employment in the informal sector accounts for 70% of the non-agriculture labor force, with 21% of these jobs belonging to manufacturing type activities. Meanwhile, formal sector employment for the manufacturing sector is 20%. Given the size of the informal economy and its overarching presence in the manufacturing sector, it is important to understand the linkages that might exist between the product markets of formal and informal sector.

The literature on the informal sector is mostly concentrated on the labor market (see Perry et al. (2007) for a comprehensive review). The literature reveals four dominant views on the existence of the informal sector: (i) dualist view, which argues that informal sector is comprised of marginal activities Hart (1973), (ii) structuralist view in Moser (1978) and Castells and Portes (1989), which says that firms in the informal economy are subordinates to large enterprizes in the formal sector allowing the latter to cut costs and hence improve competitiveness, (iii) the legalist view of de Soto (1989 and 2000), which says that cost, time and effort of legislation is at the source of informal sector and (iv) voluntarist view akin to Hirschman (1970), in which entrepreneurs make a conscious decision to remain in the informal sector having done a cost-benefit analysis.

These differing views lead to a variety of interplay between the formal and informal sector to explain labor market issues in developing countries. We think that these theories are equally important for the product market behavior; a connection largely ignored in the literature. The price-setting behavior in the formal sector, and hence its consequences for inflation and output, would be different for structuralist view as opposed to dualist view. The structuralist view of informality allows the formal sector to be more competitive, whereas in the dualist approach the link between formal and informal sector is nonexistent.

Therefore, realizing the importance of the interplay between the formal and informal sectors in determining prices, we asked formal firms in our interviews about their views on the existence of the informal sector. In addition, we also asked them about the extent and nature of their interaction with firms in the informal sector.

In Table 11, the top three reasons for firms operating in the formal sector are: (i) customer preferences, (ii) economies of scale and (iii) market power. Together these imply that a Dixit-Stiglitz type setup is most relevant for modeling the formal sector. Surprisingly, seeking access to formal financial and overseas market appears to be of little importance.

TABLE 11
Why be part of the Formal Sector? (mean score)

	<i>Manufacturing</i> [†]	<i>Services</i> [†]	<i>Total</i> [†]	<i>Importance</i> [‡]
Economies of Scale	3.4	3.3	3.4	91%
Customer Preferences	3.2	3.4	3.3	87%
Market Power	2.8	2.9	2.8	79%
Favorable Government Policies	2.6	2.7	2.7	66%
Access to Bank Credit	2.4	2.8	2.5	67%
Access to International Market	1.8	2.8	2.1	48%

Source: Author's calculations

†: 1, 2, 3 and 4 denote unimportant, of minor importance, important and very important

‡: Percentage of firms rating the factor as important or very important.

Similarly, we presented firms with a list of possible concerns that they face in the formal sector. The mean scores are presented in Table 12. The top three concerns for both the manufacturing and the services sector are: (i) product standardization, (ii) costly entry and exit and (iii) discriminatory electricity charges.

TABLE 12
Concerns with Staying in the Formal Sector (mean scores)

	<i>Manufacturing</i> [†]	<i>Services</i> [†]	<i>Total</i> [†]	<i>Importance</i> [‡]
Product Standardization	3.2	2.6	3.0	74%
Entry-Exit is Costly	2.9	2.5	2.8	62%
Discriminatory Energy Charges	3.1	2.3	2.8	62%
Labor Regulations	2.9	2.2	2.6	63%
EOBI Contributions	2.8	2.2	2.6	58%
Bureaucratic Hurdles	2.5	2.0	2.3	43%
Price Regulations	2.4	2.0	2.2	46%
Rental Charges	2.0	1.8	1.9	30%

Source: Author's calculations

†: 1, 2, 3 and 4 denote unimportant, of minor importance, important and very important

‡: Percentage of firms rating the factor as important or very important.

* Employment and Old Age Benefit

We now move on to one of the most interesting parts of the interview, where we asked formal firms about their linkages with the informal sector. In Table 13, we find that 58% and 22% of firms in the manufacturing and services sector respectively interact with the informal economy. To put it in the aggregate context, approximately half of firms that produce one quarter of Pakistan's GDP are affected through demand or supply channels of the informal economy. Naturally, it is important to find out the nature of this interaction. There are three channels of interaction (i) demand channel in which informal firms compete for market share with their formal counterpart, (ii) supply channel in which informal firms supply inputs to formal firms and (iii) combination of (i) and (ii).

For the manufacturing sector, 58% of firms are affected by the informal sector through demand and supply channels. The nature of interaction with the informal sector is weaker for the services sector, with only 22% of the firms reporting an interaction with the informal firms through demand or supply channels. The results for the services sector are expected as the informal sector may find it tough to reproduce and/or co-produce intangible goods provided by their formal counterparts.

Looking at these results from the viewpoint of firm-size reveals that, overall, formal firms of different size have similar level of interaction with the informal sector through demand or supply channels. But there are subtle differences in the type of interaction. In particular, small

and medium sized firms have much bigger supply-side interlinkages when compared with larger firms while the opposite is true for demand-side interactions.

TABLE 13
Linkages with the Informal sector (percentages)

	<i>Manufacturing</i>	<i>Services</i>	<i>Total</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>
No interaction	41.5	77.8	56.3	56.3	56.1	57.4
Demand Only	32.1	16.0	25.5	24.2	23.2	37.4
Supply Only	7.7	3.8	6.20	6.9	6.1	0.9
Demand and Supply	58.5	22.2	43.7	43.7	43.9	42.6
Market Share	24.8	30.0	26.2			
Share in Total Cost	35.8	15.3	30.2			

Source: Author's calculations

On the demand side, we find that on average the market-share of the informal firms in the manufacturing is one quarter, while for the services sectors it is close to one-third. On the supply side, informal sector provides input worth one-third of costs for all those firms using informal economy inputs. When we asked formal firms about why they use the informal sector as a partner in their supply-chain, the top most reply was their 'flexibility' as input suppliers.

Finally, we asked firm owners to rank a list of reasons for the existence of the informal economy. According to formal entrepreneurs, the top four reasons for the existence of informal sector are lack of taxes, poor compliance (hence enforcement), simple production process and costless entry and exit respectively for the manufacturing sector. For the services sector, the top two reasons are same but cheap labor is ranked third. The result on lack of enforcement is in line with Dabla-Norris, Gradstein and Inchauste (2008). Surprisingly, the least important factor for the firms to exist in the informal sector according to formal sector firms is the lack of resources.

TABLE 14
Factors Contributing to the Existence of the Informal Economy (mean scores)

	<i>Manufacturing</i> [†]	<i>Services</i> [†]	<i>Total</i> [†]	<i>Importance</i> [‡]
Lack of Taxes	3.4	3.1	3.3	84%
Tax Compliance/Enforcement	3.1	2.8	3.0	82%
Simple Production Process	3.1	2.4	2.9	74%
Costless Entry and Exit	3.0	2.4	2.8	67%
Low Labor Cost	2.9	2.7	2.8	68%
Corruption	3.0	2.2	2.7	62%
Lack of Resources	2.8	2.3	2.6	61%

Source: Author's calculations

†: 1, 2, 3 and 4 denote unimportant, of minor importance, important and very important

‡: Percentage of firms rating the factor as important or very important.

Given the above results, one can conclude that according to formal firm owners, the informal sector entrepreneurs are thriving both as producers and as input suppliers. This finding is especially relevant for the manufacturing sector. Furthermore, formal firms with the highest level of interaction with the informal sector also display greater degree of nominal price-rigidity.

These results tend to support the structuralist view of informality, the idea that there are input-output linkages between the formal and informal sector, and the voluntarist view, the idea that entrepreneurs are choosing to stay out of the formal sector, as possible explanations for the existence of the informal economy.

However, this can not be conclusive, as the results presented here only reflect the view of formal firm owners about the informal sector. The robustness of these findings can only be confirmed with our forthcoming paper on price-setting in the informal sector.

7 Econometrics of Pricing

To test the robustness of some of our results, we now examine how the number of price changes per year depends on certain features of the market structure using simple OLS regressions. The features we incorporate rest on earlier discoveries and also well-known textbook theories namely: (i) firms with higher share of market are less likely to change their prices (ii) firms claiming to be in highly competitive markets, 'mark-to-market' and hence adjust their prices more frequently (iii) customer-markets, where firms with a larger proportion of direct sales to clients on regular basis, have stickier prices, (iv) firms with flatter marginal cost curve are less

likely to change their prices, (v) less commonly known works of Moser (1978) and Castells and Portes (1989) argue for the structuralist view that firms in the informal economy assist larger enterprises in the formal sector enabling them to improve competitiveness and (vi) Hirschman (1970)'s voluntarist idea that firms stay out of the formal sector out of choice.

To reflect these discoveries in our empirical model we use a variety of variables. To capture the size of the firm, we introduce two dummies for firm size, *MEDIUM* (set to 1 if number of employees are between 51 to 250 for the manufacturing sector and paid-up capital between Rs.15-50 mln for the services sector) and *LARGE* (set to 1 if firm has more than 250 employees for the manufacturing sector and paid-up capital more than Rs.50 mln for the services sector). The type of economic activity is captured by *MANUF* dummy which is set to 1 for firms belonging to manufacturing sector and zero otherwise. The dummy *PROVINCE* is set equal to 1 for province of Punjab. The dummy variable for market share *MARKET* takes the value 1 if firm is among top four firms and 0 otherwise. The share of turnover generated through direct sales to consumers is captured by variable *HH*. The dummy *INF* takes the value 1 if firm has some interaction (either from demand or supply sides) with informal sector of economy. The dummy for exporting firms *EXP* takes value 1 if firm is exporting its main product and 0 otherwise. The Ordinary Least Square regression with frequency of price changes on the left-hand-side, y , yields the following results.

$$y = \begin{matrix} 36.6 \\ (15.24^{**}) \end{matrix} - \begin{matrix} 9.9 \\ (6.35) \end{matrix} \text{MEDIUM} - \begin{matrix} 1.5 \\ (13.02) \end{matrix} \text{LARGE} + \begin{matrix} 23.4 \\ (15.8) \end{matrix} \text{MANUF} - \begin{matrix} 5.3 \\ (11.2) \end{matrix} \text{PROVINCE} \\ - \begin{matrix} 17.3 \\ (8.7^{**}) \end{matrix} \text{MARKET} - \begin{matrix} 14.2 \\ (6.80^{**}) \end{matrix} \text{EXP} - \begin{matrix} 18 \\ (8.25^{**}) \end{matrix} \text{INF} - \begin{matrix} 0.22 \\ (0.16) \end{matrix} \text{HH} + \text{error} \quad (1)$$

R²: 8.4% Number of Observations= 1099 S.E.= Brackets.

The number of changes in price are significantly less for firms with higher market share. We also find weak evidence (p-value: 0.16) for customer market theory (Phelps and Winter, 1970) that reckons that firms with higher share of consumers tend to have stickier prices. In a similar vein, firms exporting their main product also tend to change prices less frequently as well as those interacting with the informal sector. We estimated different combinations of eq.(1) using the given set of variables, our results appear to be robust to these modifications. The explanatory power of the regression remains very low (8.4%) due to the diversity of market environment in our economic activities.²⁰

Previously, in Table 8, we showed that cost related factors topped the explanations for upward price adjustment.

Next, using a probit regression we estimate the extent to which this key decision²¹ is influenced by the set of independent variables in eq.(2). The left-hand-side variable in this scenario is the decision to change prices upwards due to a positive cost shock. This is captured by the dummy, c , set to 1 if firms ranked overall cost as either very important or important for adjusting price upwards.

²⁰Apel et al. (2005), also faced similar difficulties.

²¹For positive cost shocks only, with downward rigid prices positive cost shocks are more relevant compared to negative ones

$$\begin{aligned}
c = & \underset{(0.32)}{0.5} + \underset{(0.21)}{0.20} \text{ MEDIUM} + \underset{(0.53)}{0.45} \text{ LARGE} + \underset{(0.25^*)}{0.43} \text{ MANUF} - \underset{(0.219)}{0.24} \text{ PROVINCE} \\
& - \underset{(0.28)}{0.01} \text{ MARKET} + \underset{(0.35^*)}{0.62} \text{ EXP} + \underset{(0.2)}{0.32} \text{ INF} - \underset{(0.003^*)}{0.001} \text{ HH} - \underset{(0.25^{**})}{0.5} \text{ MC} + \text{error} \\
& \text{R}^2: 16.3\% \quad \text{Number of Observations} = 1167 \quad \text{S.E.} = \text{Brackets}
\end{aligned} \tag{2}$$

The above probit results show that the probability of changing prices upwards, given a positive cost shock, is higher for firms belonging to the manufacturing sector as well as for those that export their main product. This result mainly reflects the composition of their cost structure. The probability of changing prices upwards due to cost shocks tends to decrease for firms coming into direct contact with consumers in their overall customer base, supporting the customer market theory with (p-value = 0.06). This is contrary to the last model. Furthermore, flatter marginal costs imply a lower probability of pass-through to prices where the variable, *MC*, is a dummy set to 1 for those firms indicating costs being rigid as output expands. Finally, in terms of pass-through of cost shocks to prices, any type of interaction with the informal sector is unimportant. This result does not bode well with the structuralist view of the informal sector which emphasizes the role of informal sector on the cost side of formal sector firms.

Next we consider the same exercise as in eq.(2) but for a positive demand shock, i.e. factors that determine the probability of revising prices upwards given a positive demand shock. This effect is captured by the dummy, *d*, which is set to 1 for firms ranking demand shocks as being either important or very important for upwards price revisions and zero otherwise. The results are as follows:

$$\begin{aligned}
d = & \underset{(0.28)}{0.15} - \underset{(0.19^{**})}{0.45} \text{ MEDIUM} + \underset{(0.31)}{0.22} \text{ LARGE} + \underset{(0.241)}{0.12} \text{ MANUF} + \underset{(0.2)}{0.12} \text{ PROVINCE} \\
& - \underset{(0.22^{***})}{0.85} \text{ MARKET} + \underset{(0.28)}{0.33} \text{ EXP} - \underset{(0.2^{**})}{0.49} \text{ INF} - \underset{(0.003^{***})}{0.01} \text{ HH} + \text{error} \\
& \text{R}^2: 12.7\% \quad \text{Number of Observations} = 1167 \quad \text{S.E.} = \text{Brackets}
\end{aligned} \tag{3}$$

Eq.(3) indicates that the probability of price-increments fall significantly following a positive demand shock when firms have higher market share, interact more with consumers directly and the informal sector and belong to the medium-size firm category. The above evidence tends to support the voluntarist view of the informal economy in that influence on formal sector firms' prices is being exerted by competition from firms in the informal economy.

8 Caveats

Despite all the interesting results, this study is subject to shortcomings. One of the most important caveat of this study is the possibility that questions in our structured interviews were answered by respondents in the context of current high inflation²² environment prevailing in the economy.

²²We have already mentioned that during the survey, inflation was 4-6% above its historical average of 8% and continues to persist at higher level.

However, this possible bias in responses due to prevailing economic conditions at the time of survey was partially addressed in two ways. First, we asked only few questions with reference to any specific year, most of the questions were asked about general pricing behavior without specification of time. Furthermore, for questions that did involve time, enumerators probed the respondents about whether their responses would have been different in 2007 and 2008.²³ Second, it is reasonable to expect lower price-stickiness in a country with such a high steady state inflation of 8%. This assertion is further supported by pricing surveys in other countries.²⁴

Therefore, most of the results presented in this paper should also apply to normal times. Nevertheless, a fool-proof method of meeting this concern would be to conduct a panel survey in normal times which the central bank is committed to do in the future.

Another caveat of this study is the population frame of the services sector. The frame for the services sector was manually constructed using a database²⁵ that lacks information on number of employees and standard economic classification code, but has data on paid up capital.

We excluded firms that have not reported in last ten years. By excluding firms that have not reported recently, we probably missed out on some live firms. However, it would not matter if the missing services sector firms are distributed evenly across different economic activities.

Furthermore, we only selected firms with paid up capital of more than Rs.2,000,000. This might have introduced a bias for larger services sector firms. However, note that given our small sample size for services sector it would have been almost impossible to make statistically significant inferences for a very large population of small firms.

Finally, during our survey another group of researchers came up with a similar study for Pakistan. Shahid, Satti and Saghir (2010) conducted the survey for price setting behavior for only four cities of the province of Punjab. However, their study, had many shortcomings such as lack of national representation, no proper customization and ignoring the existence of informal economy. However, we take this study as a pilot for our survey in Punjab and find that most of our results were consistent with Shahid et al (2010).

9 Conclusion

We presented results of 1189 structured interviews of formal sector firms in the manufacturing and services sectors in the provinces of Punjab and Sindh. The sample for the manufacturing sector is fully representative while the services sector, which is 14% of the total sample, is less so.

We find that although imperfect competition is a good representation of firm's behavior, frequency of price changes are high enough to question the role of nominal rigidities in explaining business cycle fluctuations in Pakistan. The exchange rate is more important than financial costs in price-setting and generally cost shocks matter more than demand shocks. Most of the firms in our sample use some kind of backward-looking information, while making pricing decisions.

²³We found little difference in responses between different years.

²⁴Canada, UK and Turkey displaying higher inflation rates at the time of their surveys also reported higher frequency of price change.

²⁵Securities and Exchange Commission of Pakistan's listing of registered firms

Also, majority of formal firms interact with firms in the informal sector, however manufacturing sector have a higher level of interaction with the informal sector than the services sector. Finally, formal firms with greater interaction with the informal sector firms tend to increase their prices less frequently.

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Appendix A: Comparative Analysis

TABLE A1
The Individual Surveys

	<i>Pakistan</i>	<i>Euro Area</i> ^a	<i>United States</i> ^a
Main source	Author's calculations	Fabiani et.al (2008)	Blinder et.al (1998)
Form of survey	Structured face-to-face interviews	mailed questionnaires, phone, face-to-face, internet	Structured face-to-face interviews
Date or timing	Dec 2009 - June 2011	Feb 2003 - Nov 2004	Apr 1990 - Mar 1992
Conducted by	Central Bank (SBP) & 2 Statistical Agencies (BOS Punjab) (BOS Sindh)	4 National Central Banks & (BE, FR, LU, PT) 5 external agencies (DE, ES, IT, NL, AT)	Princeton graduate students
Firms contacted	1,189 ^b	24,248	350
Firms interviewed	2,100 ^b	11,039	200
Response rate	57% ^b	46%	61%
Random sample	Yes: sample was stratified according to size & economic sector	No	Yes
Sectoral coverage	Manufacturing 86% Services 14%	Manufacturing 62% Services 21% Trade 13% Others 4%	Manufacturing 35% Services 27% Trade 18% Others 20%
Representative of the firm size distribution	Yes	No	No
Reference price	Main product	Main product	Not specified

Source: Author's calculations & Fabiani et.al (2007)

a: Fabiani et al.(2007), pp 186-187

b: This number is provisional, it will be updated after all the surveys have been completed.

Appendix A: Comparative Analysis

TABLE A2
Macroeconomic Data

	<i>Pakistan</i> ^{a,b}	<i>Euro Area</i> ^c	<i>United States</i> ^c
Survey period	Dec 2009 - June 2011	Feb 2003 - Nov 2004	Apr 1990 - Mar 1992
Data reference period	2009 - 2010	2003 - 2004	1990 - 1992
Inflation (GDP Deflator)	11.9 / 18.8 ^a	1.9 / 2.1	2.3 / 3.9
Real GDP growth	2.4 / 3.8 ^a	0.6 / 1.7	- 0.2 / 3.3
Unemployment rate	5.5 / 5.6 ^a	8.8 / 8.9	5.6 / 7.5
Exchange rate variation	-0.6 / -4.8 ^b	11.3 / 3.4	-0.9 / -5.7

Source: Pakistan Economic Survey 2010-11 & SBP Statistics Department & Fabiani et.al (2007)

a: Pakistan Economic Survey 2010-11, Government of Pakistan, Ministry of Finance

b: Author's calculation on exchange rate data from SBP.

c: Fabiani et al.(2007), pp 188

Appendix B: Post-Stratification and Weighting Scheme

Following Kwapil et al (2005) and Martins (2005) for Austria and Portugal, manufacturing sector weights were redefined to sub-sector of economic activity and size of firm. The weight w_h represents the weights of hth stratum

$$w_h = \frac{\frac{P_h}{P}}{\frac{S_h}{S}} \quad (4)$$

where, P_h is the number of employees in stratum h in the population, P is the total number of employees in the population. Similarly, S_h is the number of employees in the firms interviewed in stratum h and S is total number of employees for all the firms in our sample.

For services sector, the information set available is not enough to justify post-stratification for firm-size on the basis of employment. However, we have information on paid-up capital. We use this information to post stratify for firm size and therefore allowing us to treat both selected economic sectors consistently. We divided firms in services sector on the basis of paid-up capital (in local currency) as small, medium and large firms according to $< \text{Rs.}15,000,000$, $15,000,000-50,000,000$ and $> 50,000,000$ respectively.²⁶ The responses for the services sector in this paper are reported after post stratification, the weight of hth stratum is given by

$$w_h = \frac{\frac{C_h}{C}}{\frac{o_h}{o}} \quad (5)$$

where, C_h is the paid-up capital of firms in stratum h , C is the total paid-up capital of population frame of firms in services sector. Similarly, o_h is the paid-up capital in the firms interviewed in stratum h and o is total paid-up capital of all the firms interviewed.

The above individual weighting schemes for the manufacturing and services sectors do not account for their share in the economy. This means that to make inferences about price-setting for the aggregate economy, especially for those results²⁷ that can be aggregated, we must reweigh the results on the basis of economy-wide sector weights in Table 2.

Therefore, we post-stratified the data of manufacturing and services sectors by their respective weights in the total GDP, these results are reported under the nomenclature of ‘total’ in our analysis.

²⁶We can draw comfort from the fact that this categorization has a correlation coefficient of 0.5 with employment categorization used earlier on the basis of employment data we collected from the ‘surveyed’ sample.

²⁷Note that not all questions can be aggregated since they may simply be sector specific. For example costs breakdown in manufacturing sector are naturally different from that of services sector and therefore can not be aggregated. Similarly, cost specific shocks and their ramifications for pricing can not be aggregated in a sensible way.

Appendix C

Table 7B:
Reasons for Price Stickiness

<i>Theories</i>	<i>Manufacturing</i>			<i>Theories</i>	<i>Services</i>		
	<i>Mean</i> [†]	<i>p-val</i> [*]	<i>Imp.</i> [‡]		<i>Mean</i> [†]	<i>p-val</i> [*]	<i>Imp.</i> [‡]
Coordination Failure	3.2	0.00	84	Coordination Failure	3.1	0.00	79
Temporary Shocks	2.5	0.00	55	Risking Customer Relations	2.2	0.23	41
Risking Customer Relations	2.3	0.89	46	Explicit Contracts	2.1	0.17	44
Procyclical Elasticities	2.3	0.03	44	Temporary Shocks	2.0	0.66	39
Habit Formation	2.2	0.89	40	Procyclical Elasticities	2.0	0.38	40
Constant Unit Cost	2.2	0.20	40	Habit Formation	2.0	0.00	31
Delivery Time	2.1	0.07	41	Thick Markets	1.8	0.01	29
External Financing	2.0	0.00	39	Constant Unit Cost	1.6	0.53	22
Using Inventories	1.9	0.84	30	Informal Sector	1.6	0.42	22
Explicit Contracts	1.9	0.88	31	Coordination Failure			
Thick Markets	1.8	0.49	27	Implicit Contracts	1.5	0.57	19
Informal Sector	1.8	0.00	28	External Financing	1.5	0.09	19
Coordination Failure				Costly Information	1.4	0.54	12
Implicit Contracts	1.6	0.00	22	Gathering			
Costly Information	1.4	0.00	13	Menu Costs	1.4	0.02	5
Gathering				Delivery Time	1.3	0.00	12
Menu Costs	1.3	0.00	8	Using Inventories	1.2	0.00	6

Source: Author's calculations

†: 1, 2, 3 and 4 denote unimportant, of minor importance, important, and very important

*: This p-value refers to the null hypothesis that theory's mean score is equal to the theory

*: ranked below

‡: Percentage of firms rating the theory as important or very important.