Online Appendices

Price setting with observation and menu costs

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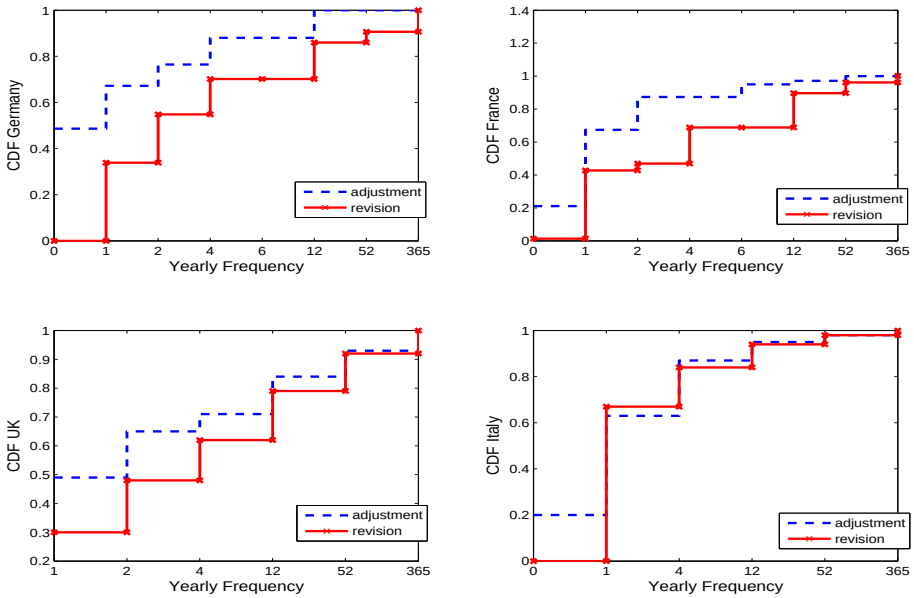
D More detailed information on country surveys

Figure OA-1 plots the CDF for the frequencies of review and adjustment. The source of the data are Stahl (2005) for Germany, Loupias and Ricart (2004) for France, Fabiani et al. (2004) for Italy and Greenslade and Parker (2008) for UK. We tossed those observation that were either missing or reporting an irregular frequency of review or adjustment.

Figure OA-1: Cumulative distribution of frequency of price adjustment and review



Note: Frequencies are measured on a per-year basis.

D.1 Table 1

Table OA-1: Price-reviews and price-changes per year: medians and means

	AT	BE	FR	GE	IT	NL	PT	SP	EURO	CAN	UK	US
						Medians						
Review	4	1	4	3	1 2	4	2	1	2.7	12	4	2
Change	1	1	1	1	1 1	1	1	1	1	4	2	1.4
						Means						
Review	12.3	1.2	23.2	4.9	27.7	52.4	3.6	1.89	16.9	99.7	39.2	30
Change	2.6	0.9	3.5	2.1	5.1	2.3	1.9	1.85	3.3	61.3	33.5	27

Number of changes and reviews per year. The sources for the medians are Fabiani et al. (2007) 2003 Euro area survey, Amirault et al. (2006) 2003 Canadian survey, Greenslade and Parker (2008) 2008 UK survey. The sources for the means are discussed below.

D.1.1 Computation of the means

Austria: The source of the data is Table 2 and Table 3 in Kwapil et al. (2005). In order to compute the means, we assigned a yearly frequency of 0.5 to frequency smaller than a year, and took the midpoint of all intervals; we assigned a value of 75 to the group of firms reporting a frequency of price adjustment higher than 50. Then we averaged across the different frequencies, using the fraction of firms at each frequency as a weight.

Belgium: The source of the data is Section IV in Aucremanne and Druant (2005). From Aucremanne and Druant (2005), we have information on the average time between consecutive price reviews to be 13 months and the average number of consecutive price changes to be about 10 months. From section IV.1.2 "Overall, the average duration between two consecutive price reviews is 10 months." From section IV.2, "...This implies that the average duration between two consecutive price changes is almost 13 months..."The following table is from section IV.3. counts the number of firms in the sample that review and adjust prices in a given pair of durations. Below we copy Table 17 - Duration of prices from these authors:

Table OA-2: Belgium: Duration of prices (number of firms in each bin)

	Price change			
	$<= 1$	> 1 and < 12	12	> 12
Price review				
$<= 1$	**31**	12	8	1
> 1 and < 12	1	**197**	72	21
12	2	15	**436**	37
> 12	0	1	5	**51**

Source: NBB, Aucremanne and Druant (2005). duration <= 1: price is changed/reviewed monthly or more frequently.duration > 1 and < 12 : price is changed/reviewed with a frequency from one month up to one year.duration = 12: price is changed /reviewed once a year.duration > 12 : price is changed/reviewed less than once a year.

France and Italy: The source is the raw data from Loupias and Ricart (2004) and Fabiani et al. (2004). We removed missing observations from both series of the frequencies of adjustment and review and averaged across the remaining observations. Notice that we are keeping those firms for which we only have observation of one of the two frequencies.

Germany: The source is the raw data from Stahl (2005). We removed missing observations from both series of the frequencies of adjustment and review. Then we averaged across the different frequencies, using the fraction of firms at each frequency as a weight. Notice that we are keeping those firms for which we only have observation of one of the two frequencies. In addition, the highest frequency of observation for price adjustment is monthly, while the highest frequency of price review is daily. In order to make the data comparable, we assigned a monthly frequency to all observations at a frequency higher than monthly.

Netherlands: The source of the data is Tables 4A-B in Hoeberichts and Stokman (2006). In order to compute the means, we assigned a yearly frequency of 0.5 to firms reporting of

adjusting occasionally. Then we averaged across the different frequencies, using the fraction of firms at each frequency as a weight.

Portugal: The source of the data is Char 15-16 in Martins (2005). In order to compute the means, we assigned a yearly frequency of 0.5 to firms reporting of adjusting/reviewing less than once a year, and a yearly frequency of 18 to firm reporting of adjusting/reviewing more than twelve times a year. Then we averaged across the different frequencies, using the fraction of firms at each frequency as a weight.

Spain: I order to compute the mean, we used data in Tables A10-A11 in Alvarez and Hernando (2005). We assigned a frequency of 6, 2.5 and 0.5 to firms reviewing/adjusting more than four times, between two and three times and less than once a year respectively. Then we averaged across the different frequencies, using the fraction of firms at each frequency as a weight.

Moreover, Alvarez and Hernando (2005) show that for Spain, quoting from their section 4.4:

When we compare the frequencies of price reviews and of changes, restricting the comparison to those firms that responded to both questions we observe that price changes occur only slightly less frequently than price reviews. The correlation between both frequencies is very high. For instance, among those firms reviewing their prices four or more times a year, 89% declare changing their prices at least four times a year, 4% change them two or three times a year, 6% once a year and 1% less than once a year.

The following table constructed from the first row of tables A10 and A11 in Alvarez and Hernando (2005)

Table OA-3: Spain: Frequency of price reviews and price changes (% of firms in each bin)

	At least 4 times per year	2 or 3 times per year	once a year	< once a year
Price change	13.9	15.1	56.8	14.3
Price review	14.0	15.6	63.1	7.4

Source: Alvarez and Hernando (2005)

Euro: We used the 2003 nominal GDP to compute the weights and averaged across the countries.

Canada: The source of the data is Figure 1 and Table 14 in Amirault et al. (2006). We assigned a frequency of 0.5 to firms reporting to review sporadically. We took the midpoint in each closed interval for the frequency of price changes (e.g. 3 for firms reporting between 2 and 4), and assigned 547.5=365*1.5 frequency of price changes to firms reporting to adjust prices more than 365 times a year. Then we averaged across the different frequencies, using the fraction of firms at each frequency as a weight.

UK: The source of the data is Table C on page 406 and chart 5 on page 407 in Greenslade and Parker (2008). In computing the mean, we excluded firms reporting "irregularly" and "other". Then we averaged across the different frequencies, using the fraction of firms at each frequency as a weight.

US: Source data from Blinder et al. (1998) 1992 US survey. To compute the means we use Table 4.1 and Table 4.7, interpolating the bins. Both means and medians are based on a small number of responses (186 and 121), and both are sensitive to details used for the interpolation.

D.2 Figure ??

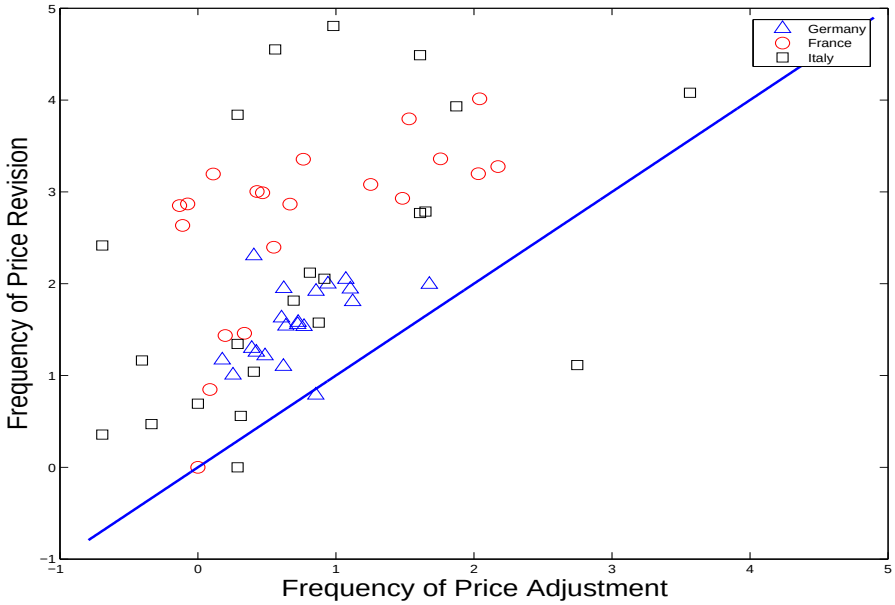
This figure includes data from Germany, Italy and France. The source of the data is Stahl (2005) for Germany, Loupias and Ricart (2004) for France, Fabiani et al. (2004) for Italy and Greenslade and Parker (2008) for UK. We removed from the raw data all missing information, i.e. mostly firms do not reporting any regular frequency of price review, or not reporting a frequency of price adjustment. Given that the highest frequency of observation for adjustment on the German data is monthly, we assigned a monthly frequency of review to those firms reviewing more than 12 times a year. We included in the analysis those secotors for which we have observations for at least 3 firms.

Section 3 clearly show that, in advanced economies, the median firm reviews its price more often than it adjusts.

D.3 Evidence about the distribution of price changes

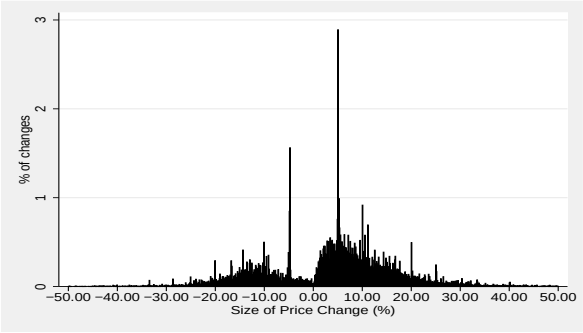
D.4 Evidence about the hazard rate of price changes

Figure OA-2: Frequency of review vs. frequency of adjustment: across sectors

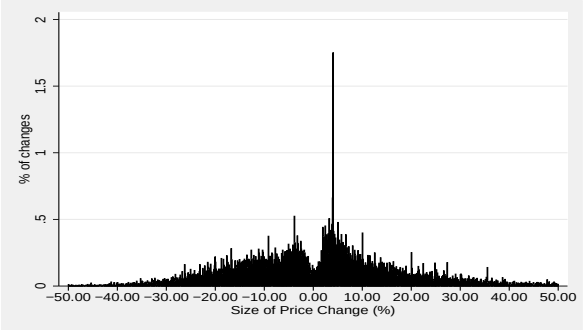


Note: Variables are intended as log-averages across firms in each sector. Sources: Stahl (2005), Loupias and Ricart (2004), Fabiani et al. (2004) and Greenslade and Parker (2008). Each point in the scatter plot refers to a NACE 2 digits sector; 01: crop and animal production, hunting; 10: food products; 11: beverages; 13: textiles; 15: leather products; 16: wood products; 17: paper products; 18: recorded media; 19: coke and petroleum products; 20: chemical products; 21: pharmaceutical products; 22: plastic products; 23: non-metallic mineral products; 24: basic metals; 25: fabricated metal products, except machinery and equipment; 26: computer, electronic and optical products; 27: electric motors, generators, transformers; 28: machinery and equipment; 29: motor vehicles; 30: other transport equipment; 31: furniture; 32: other manufacturing; 33: installation of machinery and equipment; 45: wholesale and retail trade and repair of motor vehicles; 46: wholesale trade, except of motor vehicles and motorcycles; 55: accommodation; 81: services to buildings and landscape activities; 98: undifferentiated goods- and services-producing activities of private households.

Figure OA-3: Distribution of price changes in Cavallo (2009)



(a) Argentina



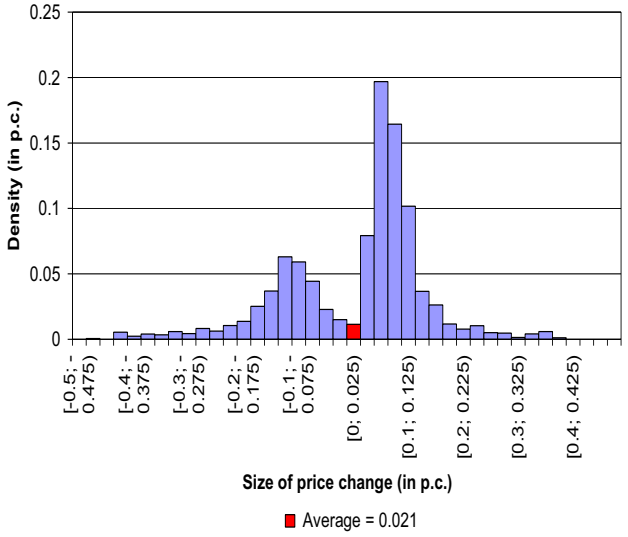
(b) Brazil

Figure 3: Size of Price Changes

Notes: Bin size is 0.1%. Brazil shown without changes on 15/12/07 and 29/12/07 (see Appendix for full distribution).

Figure OA-4: Distribution of price changes in Alvarez et al. (2005)

Figure 8 - Distribution of the average size of price changes in the euro area



Sources: NCBs calculations on NSIs data (Finland is not included)

Figure OA-5: Distribution of price changes in Klenow and Kryvtsov (2008)

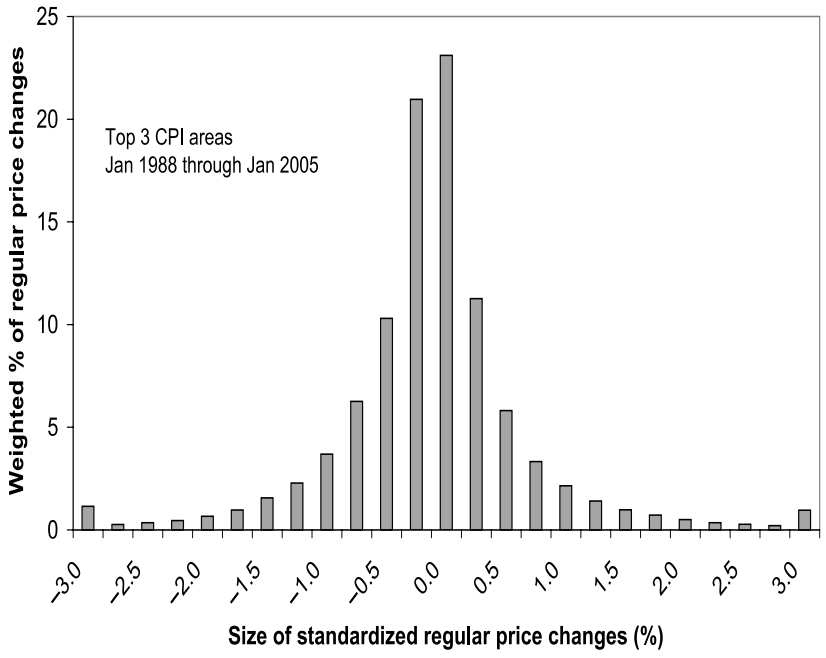
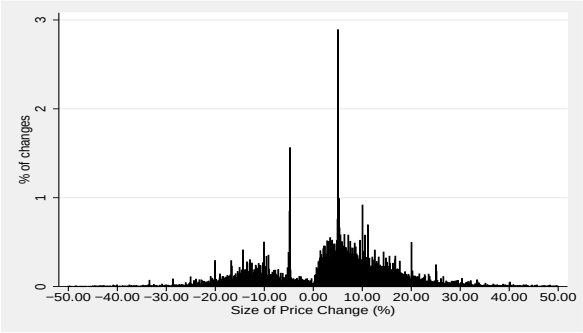
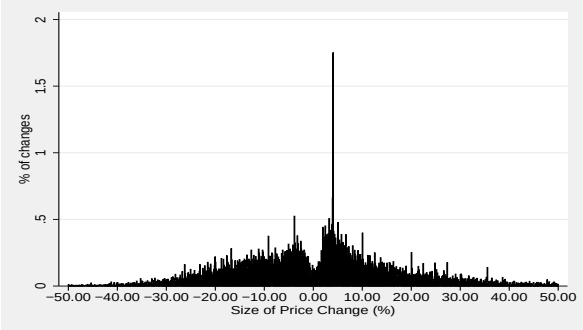


FIGURE III
Weighted Distribution of Standardized Regular Price Changes

Figure OA-6: Hazard rate in Cavallo (2009)



(a) Argentina



(b) Brazil

Figure 3: Size of Price Changes

Notes: Bin size is 0.1%. Brazil shown without changes on 15/12/07 and 29/12/07 (see Appendix for full distribution).

Figure OA-7: Hazard rate in Nakamura and Steinsson (2008)

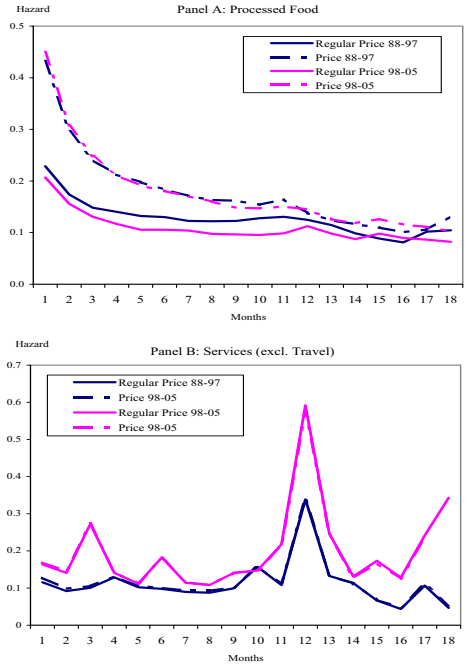


Figure VIII
Hazard Function for Consumer Prices

Figure OA-8: Hazard rate in Klenow and Kryvtsov (2008)

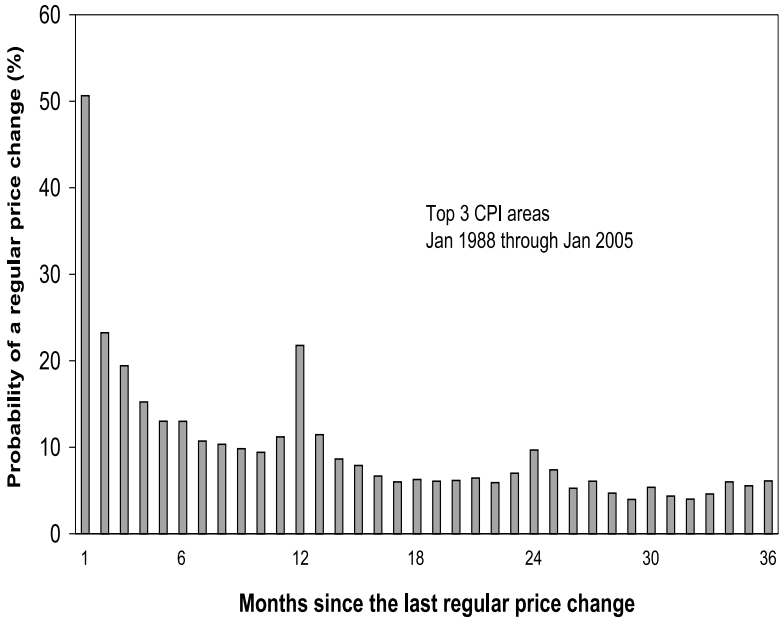


FIGURE V
Weighted Hazard Rates for Regular Prices

Figure OA-9: Hazard rate in Klenow and Kryvtsov (2008)

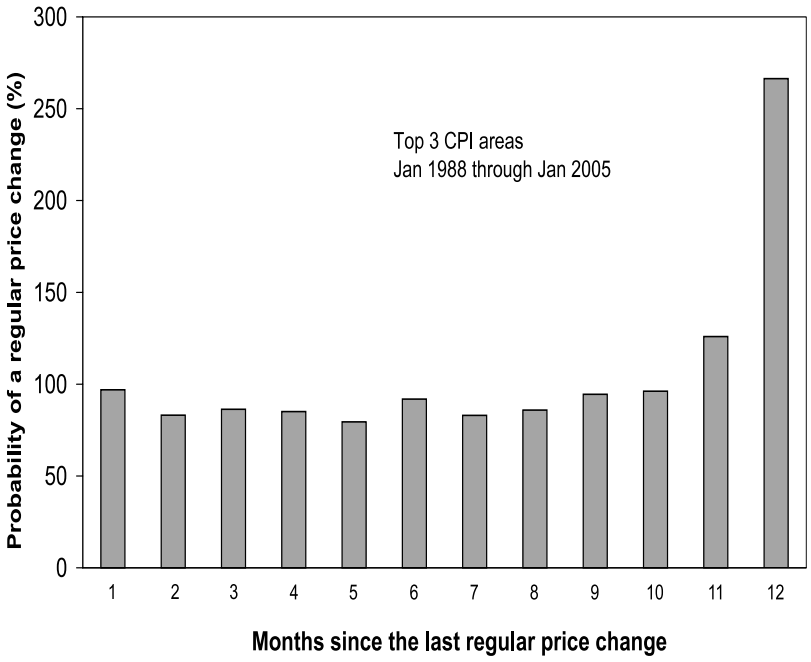


FIGURE VI
Weighted Hazards for Regular Prices vs. Decile Fixed Effects

Figure OA-10: Hazard rate in Alvarez et al. (2005)