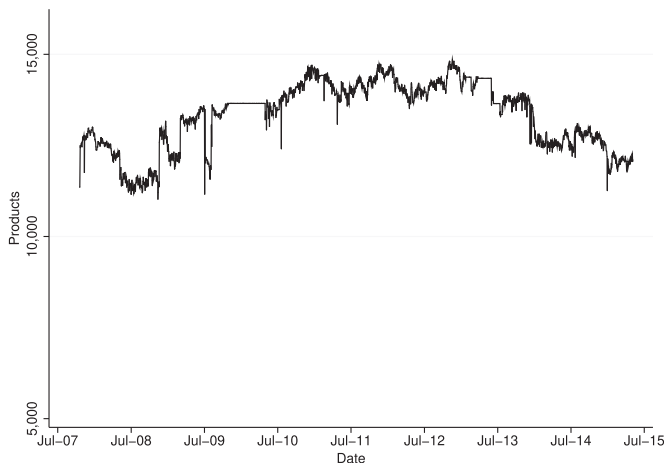
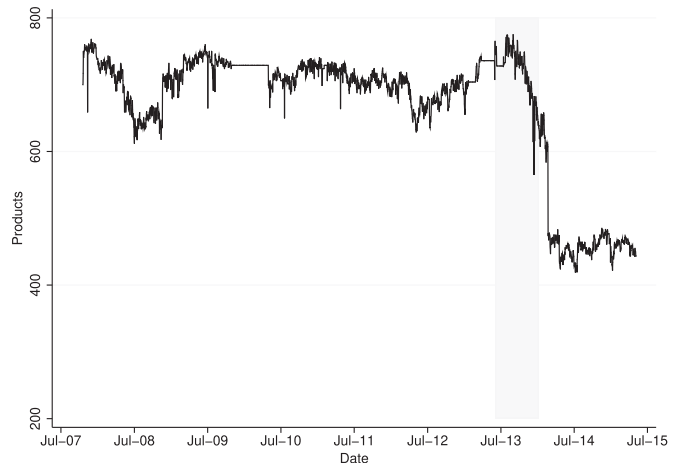


FIGURE 4.—PRODUCT AVAILABILITY



(a) All Goods



(b) Controlled Goods

Product availability index is defined as the number of distinct products available for sale online each day.

It is possible that as intensity and duration of price controls increased, retailers decided to discontinue products that were previously controlled.²⁷

A. Temporary Stockouts

Even if the government can prevent retailers from discontinuing goods, we might expect controlled goods to experience frequent stockouts. In this section, we use survival analysis to study the risk of stockouts across samples.

The onset of risk, or t_0 , is defined as the day each good received its first price control during the scraping period from 2007 to 2015. The end date, or failure event, is the day of the first stockout after the control is imposed. If the scraping package fails, no price observations are recorded for that date. We control for these cases and for right-censored observations (i.e., controlled goods that did not go out of stock by the end of the scraping period).

Figure 5a shows a histogram of the number of days until the first stockout, that is, we compute the number of days between t_0 and the failure event for each good. We find that controlled goods do experience a relatively faster stockout: one and a half months after the first price control, more than 50% of the goods have gone out of stock compared to 40% in the related noncontrolled varieties. Vertical lines depict average days for each sample.

We also estimate the survival function $S(t)$, defined as the survival probability (or in-stock probability) past time t , that is, the probability of failing after t , for both controlled

and related goods. We use the nonparametric algorithm from Kaplan and Meier (1958):

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(\frac{n_j - d_j}{n_n} \right),$$

where n_j is the number of goods at time t_j and d_j is the number of stockout events at time t_j , and where the product is computed over all observed failure times until time t .

Figure 5b shows similar estimated survival function for both controlled and related goods.²⁸ We find that the probability of being in stock is about 15% higher for (related) noncontrolled goods a month after controls were imposed. The magnitude of this probability seems small, particularly when we consider that the average duration of a stockout (defined as the number of days out of stock after each product's first control) is only 3 days for controlled good and 2.6 days for related goods

VI. New Varieties and Price Dispersion

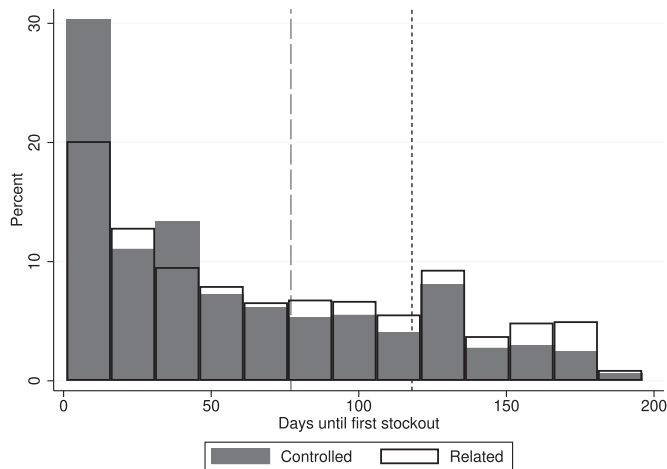
The previous sections show that targeted controls in Argentina do not significantly affect the aggregate inflation rate, though they do force some firms to sell goods at lower prices and keep them in stock most of the time. So how do firms cope with price controls?²⁹

²⁸Results remain robust to alternative functions, such as the nonparametric Nelson–Aalen cumulative hazard function (Kaplan & Meier, 1958).

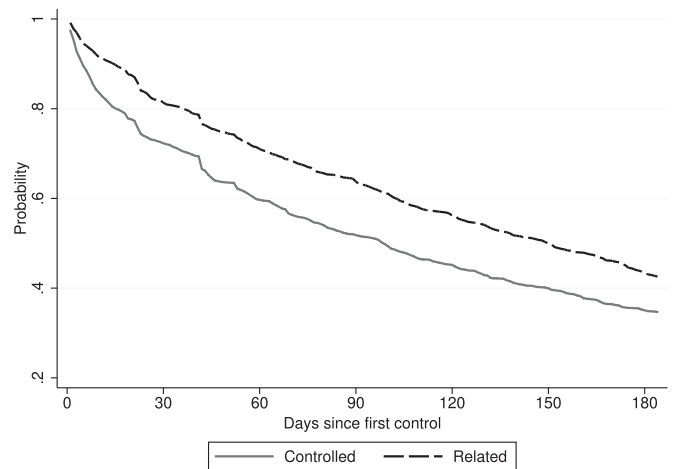
²⁹Some firms actually benefited from the price agreements by gaining market share. In principle, these price agreements provided advertising and facilitated product distribution to major retailers throughout the country. For example, an Argentine firm producer of vinegar, mayonnaise, and other dressings reported that 27% of its 2014 sales could be attributed to the Protected Prices program and that these products exhibited a 28% increase in gross sales. Participating in the price agreements allowed the firm to access new retailers and supermarket chains in segments that were previously restricted to major brands. See Sainz (2015) and Telam (2015).

²⁷These discontinuities explain why availability did not recover. It is also possible that as a new stringent, targeted program developed, firms preferred not to reintroduce controlled products for fear these would be the target of price controls again. In the appendix, we plot product introductions and discontinuities over time and show that these were more pervasive when the government increased the intensity of price controls.

FIGURE 5.—STOCKOUT BEHAVIOR



(a) Days Until the First Stockout



(b) Probability of Being In-Stock

Histogram computed for less than six months for better visualization. Median days until first stockout in vertical lines. Kaplan-Meier survival function is computed for all months, but axis is also restricted to six months.

For targeted price controls, an effective strategy might be to introduce new varieties at higher prices while implicitly suggesting to consumers that the older varieties have lower quality.³⁰ For example, in June 2013, Sancor's Dulce de Leche, 1 kg was controlled; a few weeks later Sancor introduced Dulce de Leche, Countryside Style, 400 grams at a size-adjusted 33% price increase. Examples like these are not easy to find, however, because firms obfuscate the comparisons with complicated product descriptions or package size changes. In the appendix, we show that this firm-level strategy is consistent with a vertical differentiation model in the presence of targeted price controls.

We document how the number of noncontrolled varieties increases by running the following regressions at the category-URL and month level:

$$\text{Varieties}_t^j = a + \beta D_t^j + \gamma_t + \mu^j + e_t^j, \quad (2)$$

where Varieties_t^j is the number of noncontrolled varieties (in logs) in category-URL j at month t ; γ_t and μ^j are time and category fixed effects, respectively; and D_t^j is an indicator that takes value 1 when category-URL j has at least one product under price controls at month t . The main estimate in column 2 of table 4 indicates that narrow categories subject to price controls experience a 33.7% increase in new noncontrolled varieties.³¹

Traditional matched-model price indices, such as those used in section IV, are unable to capture the price impact of new varieties. The reason is that they are based on the price changes of goods that are present in two time periods, and

TABLE 4.—EFFECTS ON NONCONTROLLED VARIETIES AND PRICE DISPERSION

	NC Varieties		Price Dispersion	
	(1)	(2)	(3)	(4)
$\mathbb{1}\{\text{Controlled this month}\}$	0.418*** (0.0866)	0.337*** (0.0708)	0.052*** (0.018)	0.083*** (0.019)
π_t				-0.002 (0.003)
Constant	2.497*** (0.0313)	1.404*** (0.0154)	0.466*** (0.010)	0.750*** (0.004)
Category FE	NO	YES	NO	YES
Time FE	NO	YES	NO	YES
Observations	65,276	65,021	68,077	67,771

Observations are aggregated to the category-URL and month level. In columns 1 and 2, the dependent variable is the log number of distinct (nonmissing) noncontrolled goods. In columns 3 and 4, the dependent variable is the coefficient of variation. We let $\mathbb{1}\{\text{Controlled this month}\}$ take 1 when a price ceiling affects any good on a certain URL-month. π_t is the online-measured monthly inflation rate. Coefficient remains similar if we control for inflation volatility and exchange rate depreciation. Categories are CPI subcategories. Standard errors clustered at the URL level in parentheses: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

therefore the price levels of new products are not included in the index computations.

A simple way of detecting the impact of new varieties is by constructing average price indices, which measure the average price level for all varieties sold each day in a narrowly defined category.³² We first compute average-price indices for both controlled and noncontrolled goods in the same subcategories and then build aggregate price indices using official CPI category weights. Our data are well suited for this analysis because the Web-scraping algorithm adds goods to our sample on the first day they appear on the store.

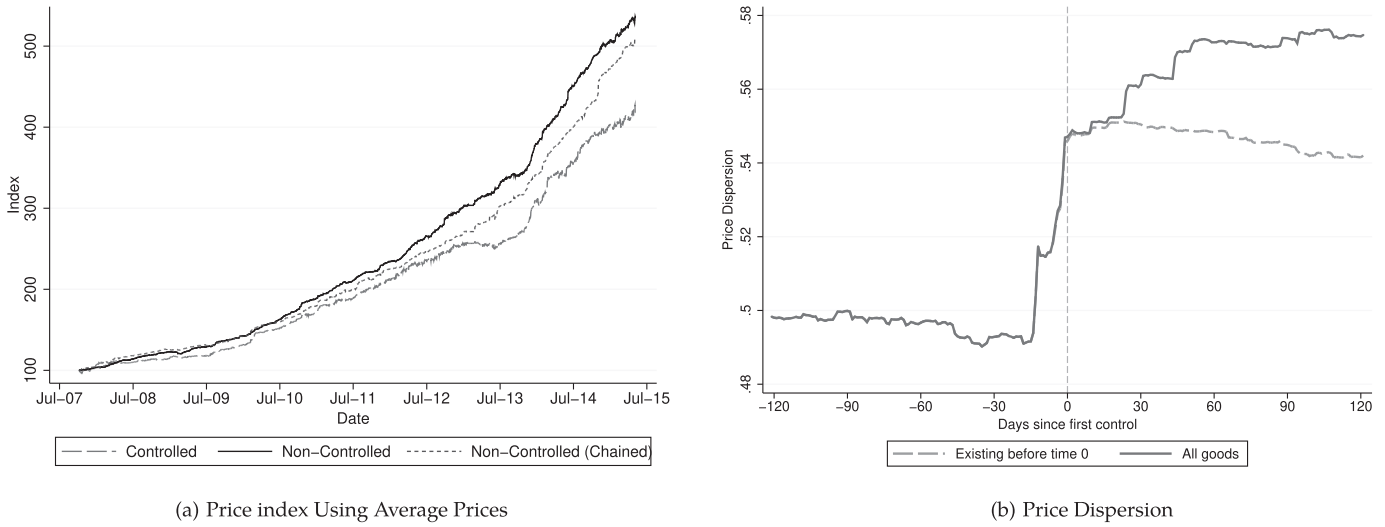
As figure 6a shows, the inflation rate for noncontrolled goods is higher once we account for the price levels of new varieties at the time of introduction. The average-price index

³⁰See Bourne (1919), Darby (1976a), Jonung (1990), and Rockoff (2004).

³¹See also visual evidence of increased activity of product introductions and discontinuities in the appendix.

³²Parsing out the product description string into grams and liters per item, we find no evidence that firms systematically reduced package sizes to cope with price controls.

FIGURE 6.—PRICE INDEX AND PRICE DISPERSION



(a) “Controlled” and “Non-Controlled” are average price indices as described in the text; “Non-Controlled (Chained)” is a standard chained or matched-model price index. (b) Price dispersion is measured in narrowly defined categories before and after products receive the first price control.

TABLE 5.—INFLATION, STOCKOUT, AND NEW VARIETIES BY STAGE

	Isolated Controls Stage 1	General Freeze Stage 2	Look to Care Stage 3	Protected Prices Stage 4	All Stages
A - Monthly inflation: ^a					
Products controlled	-0.78	2.37	-1.96	-0.43	-0.84
B - Probability of stockout: ^b					
30 days after	0.27	0.23	0.20	0.42	0.28
C - New varieties: ^c					
Products controlled	0.32	-0.28	0.49	0.51	0.34

^a Coefficient from the regression of product-specific monthly inflation rate (in percentage) on an indicator that takes 1 if the product received a price control during month t . Sample restricted to each stage period. The regression follows equation (1), which includes category and time fixed effects. All coefficients are statistically significant at the 1% level. Complete estimates for the entire period are shown in table 3. ^b Kaplan-Meier inverse probability of survival. This reproduces the survival analysis in of figure 5b. ^c Coefficient from the regression of category-URL noncontrolled varieties (in logs) on an indicator that takes 1 if the product received a price control during month t . Sample restricted to each stage period. The regression follows equation (2), which includes category and time fixed effects. All coefficients are statistically significant at the 1% level (except the coefficient from stage 2, which is not statistically significant).

has more inflation than the corresponding matched-model (chained) index that uses only price changes and significantly more inflation than the average-price index for controlled goods.

We also detect higher-priced varieties by looking at price dispersion before and after controls are introduced. This can be seen in figure 6b, which plots the price dispersion within subcategories for all goods and the subset of “continuing” goods.³³ Panel b shows that price dispersion increases by around 14% during the first weeks after control. Furthermore, dispersion is primarily driven by new goods following price ceilings and does not revert to its initial levels. In both cases, price dispersion rises a few days before the price control is introduced, but in the sample that includes new varieties (all goods), the dispersion continues to rise after the control is in place.

³³ We compute price dispersion as the coefficient of variation, that is, standard deviation of prices over average prices, per week and URL. We then averaged these URL-level time series for each week, six months before and after the first control.

We formalize the visual evidence of price dispersion using a similar regression to equation (2). In this case, the dependent variable is the category-URL price dispersion, defined as the coefficient of variation. The coefficient in column 4 in table 4 indicates that relative to the average price dispersion across all narrow categories, targeted price controls lead to 17.7% higher price dispersion.

VII. Differences across Stages

In table 5, we replicate the main empirical analyses for each of the price control stages to document their differences.

During the first stage, products under price controls experienced a temporary 0.78% decline in monthly inflation, a 27% probability of a stockout, and a 32% increase in price dispersion within subcategories, in line with the average across all stages.

Stage 2, the only nontargeted phase, was more successful in bringing aggregate inflation down temporarily (as shown in figure 2) but led to an increase of 2.37% monthly inflation for products that experienced targeted price controls at

some other time. This suggests that the retailers utilized the freeze as an opportunity to anticipate (and possibly obfuscate) price increases in goods that they expected to be controlled in the future.

Stage 3 was the targeted phase with the strongest enforcement, which significantly reduced the inflation rate of targeted goods while simultaneously reducing the probability of a stockout. This was, not surprising, also the period when a large fraction of goods were discontinued, as seen in figure 4.

Finally, stage 4 appears to be the least successful phase of targeted controls, suggesting that the ability to enforce price controls had fallen dramatically by this time. This period also coincides with a new president in office, changes to the basket of controlled products, and potential right-censoring for controlled products introduced toward the end of the data collection.

VIII. Conclusion

During the past ten years, Argentina has experienced various forms of targeted price controls in which the government set price ceilings for specific supermarket goods. We use Web-scraping technologies to collect online prices from one of the largest retailers in the country, and we construct a detailed micro panel data set with more than 50,000 goods, which we use to evaluate the impact of price controls.

We show that although targeted price controls focused on goods with high CPI weight, they had minor and temporary effects on aggregate inflation. While these controls were binding in both price and product availability, firms introduced new varieties at higher prices to compensate for reduced profit margins.

Our results suggest that new technologies, such as the Internet and mobile phones, allow governments to better enforce targeted price control programs, but this does not make them an effective policy to reduce aggregate inflation. The effects are small and short-lived, and they do not spill over to non-controlled goods. Furthermore, firms adjust to targeted price controls by using strategies that may obfuscate consumer options and increase price dispersion.

Future research should explore the welfare losses associated with additional search frictions, administrative enforcement costs, and price-obfuscation strategies in the retail industry.

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