Can VAT Cuts Dampen the Effects of Food Price Inflation?*

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Abstract

This paper shows that governments can use VAT cuts and tax incidence mandates to mitigate the effects of inflation on purchasing power. To do so, we use high-frequency retail scanner data from Argentina, along with a temporary 21 percentage point VAT cut on essential food whose pass-through to prices was mandated by the government to be 100% for the VAT cut and no more than 33% for some products after the VAT increase. We implement a difference-in-differences approach comparing goods that are subject to the VAT cut and/or to the pass-through mandates to those that are not. First, we find that $\approx 60\%$ of the VAT cut is passed through to prices, in contrast to recent empirical findings that the pass-through of VAT cuts tends to be very limited. Second, we show that the tax incidence mandates were successful at ensuring gradual price increases when the VAT cut was repealed. Third, we assess the distributional effects of this policy. While its goal was to guarantee access to necessities for low income households in a period of high inflation, we find that the pass-through rate of the VAT cut in chain supermarkets was double that of independent supermarkets where, we show, low-income households are more likely to shop at. Therefore, while the government was successful at engineering a price decrease using the VAT cut, it partially failed to reach the target population.

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1 Introduction

With rampant inflation, many countries are either implementing or considering cutting Value-Added Tax (VAT) rates on basic necessities to help the vulnerable cope with the soaring cost of living.[1] These cuts are unprecedented in their magnitude and prevalence around the world. In fact, rising inflation has led the European Union to reverse course on its long-standing goal of harmonizing VAT rates across member states by allowing them to freely cut VAT rates on essential necessities. Even in the United States, pundits have been lamenting the absence of a federal consumption tax, which could have been used by the US Government in times of high inflation to dampen its effects.[2] These momentous decisions to cut VAT rates are especially attention grabbing because of the high fiscal cost of these cuts: given their magnitude and their broad base, they are likely to amount to a significant portion of revenue raised.

In spite of the potentially very high fiscal costs of these VAT cuts, governments have or are considering implementing them without any compelling evidence of their effectiveness at attaining their policy goals. There is growing body of literature estimating the effect of VAT cuts on prices and purchasing power, however (1) most of these estimates point to limited effects of VAT cuts on prices, thus contradicting the policy goals of these new VAT cuts; (2) none of the VAT cuts considered in this literature occurred during periods of high inflation; and, (3) most VAT cuts were either small or sector-specific. This lack of (relevant) evidence makes sense given that inflation has been low in most countries since the end of the 1980's.

This is why we focus on Argentina, which is a country that has struggled with rampant inflation over the past two decades and provides us with the perfect laboratory to estimate the effect of such policies. We analyze a temporary 21 percentage point VAT cut that was implemented on August 16th of 2019 and repealed on December 31st of the same year and applied to basic food necessities. The policy was implemented following a surprising presidential election result, which led to the collapse of the Argentinian Peso and fears that low-income households would no longer be able to

[1] Here are some examples of countries that have recently cut the VAT rate on foodstuffs to zero percent: Poland, Spain, Bulgaria, Lithuania, North Macedonia. Bosnia cut its rate from 17% to 5%, Croatia from 13% to 5%, Latvia from 21% to 5%, Turkey from 8% to 1% and Greece from 24% to 13%. Italy, Germany, Ireland, Austria and Slovakia are currently considering cutting the VAT rate on foodstuffs.

[2] See, for example, this Ezra Klein opinion piece from October 2022, in the New York Times.

afford basic food. For this reason, ensuring that most of the VAT cut was passed through to prices was essential. To achieve this goal, the Argentinian Government relied on three main tools: (1) informally urging supermarkets to pass through the VAT cuts to consumers; (2) legally mandating that prices could not rise more than a predetermined percentage following the repeal of the VAT cut, and; (3) a price monitoring infrastructure that only applied to large chain supermarkets which were required to report prices daily to the government.

Our empirical analysis relies on three main pieces of data. First, we use high-frequency barcode-level retail scanner data, from a private company called Scentia, which collects prices directly from the stores, weekly for large chains and monthly for small independent stores.[3] Importantly, this is not the dataset used by the Argentinian Government to monitor prices and so it is not subject to reporting issues aimed at avoiding price regulations. The dataset covers the period from January 2018 to June 2021. It spans 15,126 barcodes, which corresponds to 1,082 brands and 536 producers. The dataset reports the weekly (or monthly) price of a given barcode and its description. In addition, we also observe the quantity sold of each barcode for each period (weekly or monthly depending on the type of store). Information on quantities is seldom available in research analyzing the incidence of the VAT and thus allows us to further deepen our understanding of tax incidence. We also use detailed expenditure microdata from the 2017-2018 National Household Expenditure Survey to further assess the distributional effects of the VAT cut.

Using these novel data sources we estimate the effect of the VAT changes and complementary price regulations using a simple dynamic difference-in-differences framework. To do so, we leverage the fact that when the government implemented the VAT cut, it applied to certain goods but excluded other ones that were otherwise similar. For example, the VAT rate was cut for sunflower, corn and mixed oils but not for olive, soy, and canola oils. Similarly, the VAT rate on tea and sugar was brought down to zero but not for coffee and salt. We use this feature of the VAT reform to classify goods into treatment and control groups. For each good in the treatment group, there are very similar goods in the control group. Note that the main assumption for our empirical strategy

[3]The latter comprise Asian supermarkets and a few regional chains rather than "mom and pop" shops or convenience stores. The stores in our data typically offer a wide variety of food and household products organized into aisles, with stores size of 1,000 to 12,000 m2 in large chains and 300 to 1,000 m2 in small stores, and with two or more cash registers.

is not random assignment of goods into control and treatment groups, but rather that the control and treatment groups would have evolved similarly had there been no VAT changes. A common test of this assumption is to ensure that the pre-reform trends are parallel. We implement this test and find that both groups follow parallel trends. We also address the possibility of spillovers from the treatment to the control group, using two additional approaches, which we discuss below.

We have several findings. First, we estimate a substantial pass-through of the VAT cut to prices, of $\approx 60\%$, in contrast to the recent empirical VAT incidence literature, which mostly finds limited pass through of VAT *cuts* to prices.[4] Second, we show that the pass-through rate of the VAT cut is substantially smaller in independent stores relative to chain supermarkets.[5] Conversely, the pass-through rate of the VAT increase was larger for independent stores relative to chains. We estimate that large chains pass through most of the VAT cut to consumers ($\approx 85\%$) as well as most of the VAT increase ($\approx 82\%$). Small grocery stores behave very differently: (1) the pass through of the VAT decrease is limited and gradual as prices barely change immediately after the VAT is cut, and it takes several months to achieve a modest pass-through of the VAT cut of $\approx 35\%$; (2) the pass-through of the VAT increase, on the other hand, is much more sudden and larger than that of the VAT decrease, resulting in higher equilibrium prices once the VAT cut is repealed. Overall, our analysis shows that the majority of the VAT cut is pocketed by small grocery stores, while it is mostly passed on to the consumers of large grocery stores.

Third, we find that low-income households are substantially more likely to shop at the smaller stores than the large chain supermarkets. This finding highlights important distributional consequences of the policy, and how it likely benefited richer households more than low-income ones. It is important to note that, even within these two categories of large chains and small independent grocery stores, we detect substantial heterogeneity in the pass-through of the VAT cut and subsequent VAT increase. While there is bunching at zero pass-through and 100% pass-through, there are many goods with pass-through rates that fall in between these two extremes.

Fourth, we show that the government was successful at mitigating price increases in chain

[4]See, for example, Harju et al. (2018b) or Benzarti & Carloni (2019) and many others.

[5]This finding is consistent with Harju et al. (2018b) who show that a VAT cut on restaurants was mostly passed through in large chain restaurants but not in smaller independent ones.

supermarkets following the repeal of the VAT cut using pass-through mandates. We do so by comparing goods that were subject to caps on rate at which prices change versus goods that were not at the time of the VAT cut repeal but were otherwise both treated by the VAT cut. We show that goods with prices that are allowed to change freely experience a price increase that is almost double that of those that are subject to the cap. Moreover, the price gap between capped and uncapped goods persists in the medium-run, even after the caps become harder to enforce. This puzzling "hysteresis" effect ultimately led to permanently higher prices of some necessities in chain supermarkets when compared to independent grocery stores, which were not subject to the price caps. This suggests that, although governments can mandate VAT pass-through rates, unintended incidence effects call for caution when designing temporary VAT cuts.

Fifth, given that the policy goal of the temporary VAT cut was to ensure that households would still be able to purchase necessities, by cutting their prices, we assess the impact of this policy on quantities of goods sold. We observe a sharp and persistent increase in the sales of goods that were subject to the VAT cut in chain supermarkets. This large increase is short-lived and rapidly reverts back to the original level. In contrast, we estimated a muted response of the quantity of treated goods in independent supermarkets. These results suggest that the VAT cut likely missed the target population, which mostly shops at independent supermarkets, since the government intended it as a policy tool to ensure that low-income households had steady access to basic necessities and not as a way to stimulate demand for richer households.

One important concern with our analysis is that our treatment effect might be biased because consumers can substitute goods in the control group with those in the treatment group.[6] For example, if the price of tea decreases because the VAT on tea is cut, some consumers may substitute tea consumption with coffee in order to take advantage of the lower prices. This would lead to a higher demand for the treated goods, and thus would presumably increase their prices, biasing our effects downwards. We address this concern using two main approaches. First, while it is true that some goods in the control group have plausible substitutes in the treatment group (such as

[6] Another bias threat is the quasi-simultaneous depreciation episode, which happened three days prior to the VAT cut. Using another depreciation in 2018, we show that the prices of basic necessities targeted by the VAT cut indeed responded more than the control group. However, the estimates are relatively small and imply that, absent the depreciation, our VAT pass-through rates would be 1.4 percentage points larger.

tea and coffee or cooking oils), most goods have not. This can be seen in Table 1, goods such as breakfast cereal, salt, herbs, dulce de leche and many others do not have obvious substitutes in the treatment group which mitigates this substitution concern. Moreover, when considering goods that have obvious substitutes, such as coffee and tea, we estimate that even then there is very little substitution occurring. Second, we re-estimate our main effects using an alternative control group, made of non-food items and thus very unlikely to be substitutes, since our treatment group is exclusively made of food items. Overall, our evidence suggests that substitution barely affects the treatment effects.

Our paper contributes to the literature analyzing Value-Added Taxes and their effects on the economy.[7] We have three main contributions. First, our main contribution is to show that VAT cuts can be effective at ensuring low prices and consistent access to basic necessities during periods of high inflation. However, we also show that they can have unintended distributional consequences. These may be due to three possible mechanisms: (1) the monitoring of prices by the government to ensure a enforce a given level of tax incidence (2) informality and incidence effects, (3) pricing effects due to chain vs independent stores. While we provide evidence consistent with (1), we do not test 2 and 3, which have been documented in the literature in different contexts. Bachas et al show that the incidence of the VAT is likely to fall less on poor households because they tend to shop more at small stores, which rely more on a cash transactions and thus are likely to evade VATs. While this may apply in our case, it is important to emphasize that that Argentina is substantially richer than the set of countries Bachas et al consider. It is also true that we do not consider small mom and pop shops which are the ones that Bachas al focus on. The third explanation of our findings could be price frictions inherent to chains supermarkets (see Harju et al and DellaVigna et al): because prices in chains are often set centrally for the entire chain of supermarkets, they tend to exhibit different patterns than those of independent supermarkets. However, this seems inconsistent with the fact both types of supermarkets respond similarly to unmonitored shocks (large devaluations of the Argentinian Peso). In summary, while we are confident that explanation (1) is at play in our setting, and provide evidence in support of it, (2) and (3) are also possible explanations albeit

[7] See, for example, Slemrod (2011), Benzarti & Tazhitdinova (2021), Pomeranz (2015), Naritomi (2019).

less likely than (1) for the reasons outlined above. Second, we contribute to the sub-strand of this literature that estimates the economic incidence of VATs and more generally of consumption taxes.[8] While the canonical model of tax incidence and the common wisdom in public finance is that tax incidence only depends on the relative magnitudes of supply and demand elasticities, we show that governments can affect tax incidence using political pressure and/or legislative mandates. While this had been hinted at (see, for example, Benzarti & Carloni, 2019), we are the first to provide empirical evidence supporting it. Second, we show that tax incidence can vary widely depending on the type of supermarket consumers shop at. This adds to a nascent body of literature that documents empirical tax incidence anomalies, such as Harju et al. (2018b) who show that restaurants respond differently to VAT cuts depending on whether they belong to a chain or are independent (which is related to DellaVigna & Gentzkow, 2019), and Benzarti et al. (2020) who show that incidence depends on whether taxes are increasing or decreasing. Third, we contribute to a sub-literature discussing VATs as a policy tool governments could use to affect economic variables, in this case prices in times of high inflation (see Blundell (2009) or Crossley et al. (2009), for example). D'Acunto et al. (2022), for example, consider the suitability of VATs as an alternative to conventional fiscal policy, especially in times when nominal interest rates are close to zero. Our paper shows that, while such policies can be effective at lowering prices, the distributional effects can be unintended, in part because we do not fully understand yet tax incidence, which calls for further investigation of its underlying mechanisms.

2 Institutional Setting

The main identifying policy variation that we exploit consists of a temporary 21 percentage point VAT cut on essential food whose pass-through to prices was mandated by the government to be 100% for the VAT cut and no more than 33% for some products after the VAT increase.

[8] See Sidhu (1971), Chouinard & Perloff (2004), Delipalla & O'Donnell (2001), Anderson et al. (2001), Doyle & Samphantharak (2008), Kopczuk et al. (2016), Poterba (1996), Kosonen (2015), Gaarder (2018), Benzarti & Carloni (2019), Benzarti et al. (2020), Carbonnier (2007), Besley & Rosen (1999), Genakos & Pagliero (2022), Buettner & Madzharova (2021) and Fuest et al. (2021). Kotlikoff & Summers (1987) and Fullerton & Metcalf (2002) provide a survey of the earlier empirical and theoretical tax incidence literatures.

Macroeconomic context and VAT holiday: The VAT change took place in a context of high inflation ($\sim$ 55% in 2019), presidential elections, and a sharp depreciation of the Argentine peso. The timeline of events is shown below. On August 11, President Macri lost the primary presidential elections to the left-wing candidate Fernandez by a 15.5 percentage point margin, which was much wider than expected. This triggered a strong (and negative) market reaction the following day, and led to the large decrease in the Argentinian Peso by 30% relative to the US dollar.[9] Three days later, on August 15, the government implemented a 4.5-month long VAT holiday on basic food, with the official goal of containing the impact of the depreciation of the Peso on prices (Executive Order 597/2019). As a consequence, the VAT cut was fully unexpected. It was also announced on that day that the VAT cut would be temporary, with a due date of December 31, 2019.

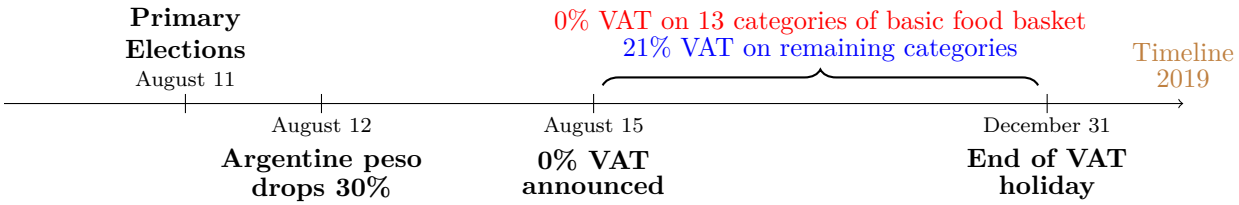


Figure 1 illustrates how the VAT holiday operated. The tax rate decreased from 21% to 0% on a list of 13 goods from the Basic Food Basket, while other basic food products remained taxed at the standard 21% rate.[10] Importantly, the VAT removal only applied to sales made to final consumers, and grocery stores could claim back any VAT credit generated from purchases to suppliers or use it against other tax bills. The left panel of Table 1 shows the list of goods targeted by the policy and the right panel of Table 1 shows other goods that were excluded from the holiday but are otherwise very similar. For example, the VAT rate was cut for sunflower, corn, and mixed oils but not for olive, soy, and canola oils. Similarly, the VAT rate on tea and Yerba Mate was brought down to zero but not for coffee. In our empirical analysis, we leverage this feature of the VAT change to estimate price and quantity responses using a simple difference-in-differences approach.

A regulated VAT increase: Although the new Fernandez administration did not extend the

[9] See Figure A.1. For more details, see this NY Times article.

[10] The Basic Food Basket is used to compute the Extreme Poverty Line and is part of the Consumer Price Index used to measure inflation. All the goods analyzed in this paper are normally taxed at the 21% standard rate, except wheat flour and bread, taxed at the 10.5% reduced rate. According to the National Statistical Institute, the categories with temporary 0% VAT accounted for 26% of total food expenditure from the Household Expenditure Survey.

VAT holiday, it regulated the re-introduction of the 21% VAT rate on those commodities that were treated by the VAT cut. In effect, the VAT rate was reverted back to its pre-VAT-holiday level of 21% but the government limited the price increase with caps that varied across categories, which is shown in Table 2.[11] The majority of products treated by the VAT cut were allowed to increase their prices, once the VAT cut was repealed, up to a maximum of 7%. However, some of the treated goods had no cap and could therefore increase prices up to 21% (e.g., canned fruits), and some others were required to keep prices unchanged (e.g., fluid milk). Importantly, this price regulation only applied to large supermarket chains, which means that local chains and independent stores could adjust their prices freely. This capped VAT increase therefore provides an unprecedented source of variation to analyze how governments can influence the pass-through of VAT changes.

Both the VAT cut and subsequent VAT increase were highly publicized in the media and in supermarkets, suggesting that both were very salient. For example, Figure A.2a shows the front page of the two main newspapers in Argentina one day after the VAT holiday was announced. In both cases, the front page articles are about the VAT cut. Similarly, Figure A.2b shows the front page of the same newspapers one day after the VAT cut was repealed. Here again, the main articles are about the VAT change and how price increases were regulated with different caps. Finally, Figure A.3 shows the way supermarkets communicated the VAT cut to their customers using flyers and price tags, which were mandated by the government.

Real-time price monitoring in supermarket chains: Another institutional feature that is relevant to the interpretation of our findings is the presence of real-time monitoring of prices in supermarket chains but not in small independent stores. This is because, in 2016, the government launched the Electronic Price Advertising System (SEPA) to monitor the prices of supermarkets in real time (Resolution 12/2016). This program, popularly known as "Precios Claros", is currently in place, and is administered and enforced by the Consumer Protection Office. The official goal of "Precios Claros" is to increase the visibility and transparency of prices so that consumers can compare prices across stores and make a more informed decision, especially in times of high inflation

[11] Anecdotal evidence from newspapers mentions that there was a heated meeting on December 31 that lasted 7 hours, where the government, producers, and supermarkets negotiated how the VAT increase would be passed on to prices.

when prices are constantly changing.

In practice, the government provides a processing software with detailed guidelines that grocery stores must use to report daily price data for every barcode and point of sale. Stores must complete and send the spreadsheets every day before 6am, which can be rectified until 10am. This information is then shared on an online platform where consumers can search for prices in individual stores using a computer or a mobile phone App.[12] Importantly, in the case of SMEs (such as small independent stores), participation in the program is optional due to its administrative burden (Art. 4, Res. 12/2016). For the tax reform analyzed in this paper, this means that VAT changes are easier to enforce in supermarket chains because they are under constant scrutiny, since both the government and the public can access price information in individual stores daily. Hence, the pass-through of the VAT cut is expected to be higher in large chains and lower in independent stores.

Taken together, the temporary and large VAT cut, the regulated VAT increase, and the pre-existing price monitoring system provide an ideal setting to understand how governments can influence, mandate, and enforce VAT incidence in contexts of rampant inflation.

3 Data

Supermarket Scanner Data. Our analysis is primarily based on food & beverage retail scanner data provided by the consulting company Scentia LLC. These data consist of high-frequency sales information generated by point-of-sale systems across Argentina. In particular, Scentia gathers all scanner-based price and quantity information from large supermarket chains and small independent grocery stores.[13] In the case of supermarket chains, the sample includes the top 12 retail chains who share data from all of their 2,317 stores (e.g., Walmart, Carrefour, Coto, La Anonima, etc.). In the case of independent stores, Scentia collects information from a sample of 800 points of sales (representative of 18,700 total stores in Argentina). These stores mostly comprise Asian supermarkets and a few regional chains owned by local merchants rather than "mom and pop"

[12] See Figure A.4 for an example of the salience of "Precios Claros".

[13] Scentia also collects scanner data from pharmacies and convenience stores located at gas stations. Nonetheless, these are not part of the data we purchased.

shops or convenience stores.[14] The stores in our data typically offer a wide variety of food and household products organized into aisles, with stores size of 1,000 to 12,000 m2 in large chains and 300 to 1,000 m2 in small stores, and with two or more cash registers. Note that because the data are all scanner-based, they include both sales made with and without receipts, the latter being a relatively common practice in smaller stores.

Scentia's database contains the following variables: time period, EAN barcode, unit price paid at the cash register (including discounts), purchased quantities, total volume, a detailed label describing the item, the brand, the producer, and the region. All products in the dataset are classified into broad categories (e.g., oil, coffee, rice, etc.), which are themselves subdivided into subcategories (e.g., sunflower oil, corn oil, olive oil, ground coffee, coffee beans, coffee pods, etc.) and contain very detailed descriptions (e.g., Nescafé Gold Intense Instant Coffee Jar 200g). This rich set of variables allows us to accurately classify products into treatment and control groups (since some treatments are at the barcode level), as shown in Table 1.

For confidentiality reasons, the database was aggregated at the barcode-region-time level. That is, for each region and time period, the data were aggregated across stores. For large chains, we observe weekly information from barcodes in 10 different geographic areas. For small independent stores, we observe monthly information from barcodes split into 5 regions.[15] Our dataset covers January 2018 through June 2021 (181 weeks for large chains and 42 months for small independent stores).

When aggregated to the region-by-barcode-by-month level, each month covers an average of US$170 million worth of grocery sales across 3,117 individual stores in more than 60 disaggregated product categories and across 19,304 barcodes belonging to 642 producers of 1,248 brands.

National Household Expenditure Survey. In addition to the datasets described above, we use detailed expenditure survey microdata from the 2017-2018 National Household Expenditure Survey (ENGHo), which is conducted by the National Institute of Statistics and Censuses (INDEC). This

[14] Some examples are: Cordiez, Buenos Dias, El Nene, Josimar, SuperMax, among others.

[15] The 10 regions are: Capital Federal, Periferia, Cordoba, Litoral Norte, Litoral Sur, Resto Pcia BSAS, Cuyo, NOA, Sur, Austral. The 5 broader areas are: Andina, Cordoba, GBA, Litoral, Resto Pcia BSAS + Sur. See Figure A.5 for more detail about geographic variables.

database provides product-level information on food and non-food expenditures, type of stores shopped at, forms of payment used, as well as various characteristics of households. The data were gathered through a questionnaire answered by the head of the household, and diaries that were kept for a week to record daily household expenditures. The survey was conducted between November 2017 and November 2018 in towns with 2,000 or more inhabitants throughout the country. The total number of households in the sample is 45,000, representing 86.7% of the total population. We use this cross-sectional survey dataset to better assess the distributional effects of the VAT cut. In particular, we use it to estimate the share of food expenditure in products subject to the VAT cut as well as the types of supermarkets where those purchases take place.

4 Empirical Strategy

Our empirical specification is a simple dynamic difference-in-differences specification. We split our data into treatment and control groups depending on whether a barcode is subject to the specific treatment we analyze (VAT cut, VAT increase with price caps, etc.).[16] First, we provide some graphical and non-parametric evidence by plotting the unconditional mean of the average price level for the control and treatment groups separately before and after the VAT cut and its subsequent repeal. In each case, we normalize every barcode series to 100 in the week (or month) before the VAT cut was implemented.

Our empirical specification is as follows:

$$Y_{it} = \alpha_i + \gamma_t + \sum_{t \neq 2019w32}^{2020w10} \beta_t D_{it} + \epsilon_{it} \tag{1}$$

where Y_{it} is our main outcome of interest and either represents the price of a given good (barcode) i at time t (weighted average across stores) or the total quantity of the good i sold at time t. Note that Y_{it} is normalized to 100 for each barcode i in week 32 of year 2019. D_{it} is equal to one if barcode i is treated in week t and zero otherwise. The main coefficient of interest is β_t which estimates the

[16] Note that because this is not an event-study design, the criticism of De Chaisemartin & d'Haultfoeuille (2020) does not apply.

average difference between the treatment and control groups across all barcodes at time t, relative to week 32 of year 2019. Finally, note that we restrict our dataset to a balanced panel of ≈5,000 barcodes with positive weekly sales between January 2019 and March 2020.

The treatment and control groups include all barcodes that are part of the food categories described in Section 3 and shown in Table 1. The control group includes all barcodes that fall under the following categories: Other cooking oils (olive, soy, canola); Rice-based meals; Breakfast cereal; Coffee; Salt; Herbs, Spices, & Seasonings; Dulce de leche; Jam and Jelly; Other flours; Crackers and Biscuits; Chocolate; Mayonnaise; Vinegar; Dried legumes and beans.

As seen below, the results from estimating this dynamic difference-in-differences specification mirror those of the unconditional means graphical evidence. This is reassuring and mitigates concerns that our results are significantly affected by the particular specification we use.

5 Results

We first show that, on aggregate, supermarkets pass through 60% of the VAT cut to prices. This response, however, masks substantial heterogeneity across supermarket chains and independent supermarkets, as well as across barcodes within these types of stores. The average pass-through of the VAT cut is 84% for supermarket chains and 35% for independent supermarkets. We also estimate dramatically different pass-through rates when the VAT was reinstated, which are mostly driven by the mandates the government imposed on how much prices could increase as a response to the VAT increase.

5.1 VAT Pass Through to Prices in Supermarkets

Figure 2a shows the non-parametric effect of the VAT cut and its repeal on prices, in the control and treatment groups. The dataset used in this Figure pools chain and independent supermarkets together, thus the observations are at the monthly level. Prices are normalized to 100 at the time of the VAT cut, i.e., July 2019. Four findings are worth highlighting. First, the trends for the

control and treatment groups are parallel as can be seen in the six months preceding the VAT cut. Second, there is a sharp break in the series immediately after the VAT cut is implemented, as prices in the treatment group grow at a substantially lower rate than those in the control group. Note that prices trend positively, since we are plotting nominal prices and inflation is high (about 50% in 2019).[17] Third, there is another break in the series when the VAT cut is repealed, i.e., January 2020. Here, prices in the treated group increase enough to match price levels in the control group, thus restoring the previous equilibrium. Fourth, prices follow parallel trends following the repeal of the VAT cut, suggesting again that the goods in the control and treatment groups are reasonably similar and thus comparable.

Figure 2b plots the result of estimating equation (1) on the exact same data as Figure 2a, which allows us to add standard errors and also precisely estimate the magnitude of the effect of the VAT cut on prices. Overall, the results we get from estimating (1) closely match those of the raw means plotted in Figure 2a. First, we find that the trends are indeed parallel with no substantial price effects estimated pre-reform. We also find that prices decrease on average over the four-month period following the VAT cut by 10.5 percentage points.[18] This corresponds to a pass through of the VAT cut to prices of 60% relative to the full pass-through rate of 17.4 percentage points.[19] Finally, our estimation confirms that prices respond to the repeal of the VAT cut in the treatment group enough to revert back to the levels in the control group. Nevertheless, this result masks differential responses to government mandates, as discussed below in Section 5.4.

5.2 Chains versus Independent Supermarkets

Figure 3a shows the average price levels in the treatment and control groups for supermarket chains and 3b for independent supermarkets. The empirical specification counterparts of these two figures are plotted in Figure 4a and 4b, respectively. When considering these two types of supermarkets separately, we estimate dramatically different pass-through rates of the VAT cut and its repeal.

[17] Interestingly, even nominal prices go down for treated necessities right after the VAT cut was implemented.

[18] We exclude the point estimate from August in this calculation as it is mechanically partially treated (the VAT cut was passed on August 16th).

[19] Note that the VAT rate is decreasing from 21% to 0% corresponding to a -0.21/1.21 x 100 = 17.4% decrease in prices in the case of full pass-through.

Similarly to Figures 2a and 2b which pool both chain and independent supermarkets, we find that the pre-trends are parallel and estimate a break in the series at the time of the VAT cut and when it is repealed as well. The main difference is that the response to the VAT cut is substantially larger when considering supermarket chains. This is true both in the unconditional mean figures (Figures 3a and 3b) as well as using our empirical specification (Figures 4a and 4b).

Overall, we estimate that the pass-through rate of the VAT cut is 84% for supermarket chains and 35% for independent supermarkets. Note that observations are at the weekly level for supermarket chains and at the monthly level for independent supermarkets. This is due to the frequency at which the data provider collects this information. To ensure that the level of aggregation is not driving this difference, we aggregate the price observations for supermarket chains at the monthly level and plot the estimates in Figure 4b. We find that aggregating the data at the monthly level barely affects the estimates or general trends. The price changes following the VAT cut are 14.7 percentage points at the weekly level and 14.9 percentage points at the monthly level for supermarket chains, a difference that amounts to approximately 1% of tax incidence and is therefore not meaningful.

While we do not know with certainty what could be driving these differences in pass through rates for independent versus chain supermarkets, our understanding of the political environment at the time of the VAT cut suggests that this might be due to two complementary facts: (1) the Government exerted significant political pressure on supermarkets to try and pass through as much of the VAT cut as possible. Government officials even had meetings with the executives of the four largest supermarket chains (Carrefour, Walmart, Jumbo, La Anonima) to try and have them cut prices as much as possible following the VAT cut. For this reason they may have been more receptive to the political pressure; and, (2) the government's price monitoring system (which is not the dataset we use in our analysis) mostly collects data from supermarket chains, hence, since independent supermarkets know that the government cannot easily observe the prices they charge, they can more easily avoid cutting prices without incurring much political fallback.

While this explanation for the differential response to the VAT cut is somewhat speculative, we are confident that this behavior is not driven by intrinsic differences in pricing strategies between chain and independent supermarkets. We show, for example, that chain and independent

supermarkets respond very similarly to other economic shocks when there is no government interference. In particular, we provide evidence that chain and independent supermarkets display similar pricing behavior when responding to changes in currency value which directly affect prices. Indeed, the Peso experienced a large and sudden devaluation in August 30th, 2018, causing a 24% increase in the exchange rate of the Peso against the US Dollar, which is plotted in Figure A.1. As a consequence, supermarkets had to adjust their prices, especially for imported commodities. In Figure, 6 we plot the distribution of price changes in supermarket chains in the upper panel and in independent stores in the bottom panel as a response to the large and sudden devaluation of the peso. The red distribution plots the differences in prices between September 2018 and July 2018, effectively capturing the pass-through of the devaluation to prices. As a placebo, we also plot, in gray, the difference in prices between July and May. The distribution of pass-through of the devaluation are very similar for chain and independent stores, suggesting that, when there is no political pressure exerted by the government, chain and independent supermarkets behave very similarly. In addition, Figure 10b reports the average effect of the depreciation on the prices of goods that were later subject to the VAT cut relative to those that were not. In contrast to the differential chain and independent supermarkets to the VAT cut, the figure suggests that supermarkets responded similarly to the currency depreciation shock.

Finally, we show in Appendix Figure A.18 that competition can explain some (but not all) of the differences in pass-through rates. Appendix Figure A.18 pools chain and independent supermarkets and breaks down pass-through rate estimates for goods at the barcode level that are sold in both types of supermarkets versus goods that are sold in either one of them but not both. Presumably, goods that are sold in both supermarket and independent chains will be more competitive, probably leading to higher pass-through rates of the VAT cut. This is indeed what Appendix Figure A.18 shows: the pass-through rate for goods that are present in both supermarket and independent chains is 9 percentage points, while that of goods that are only present in one of them is 12 percentage points. This suggests that competition is likely driving differences in pass-through rates.

5.3 The Distribution of Pass-Through Rates

In addition to chain and independent supermarkets responding differently to the VAT cut and its repeal, we uncover substantial heterogeneity, even within these two types of supermarkets. The canonical tax incidence implicitly assumes that responses should be homogenous simply because tax incidence depends on two aggregate parameters that are not firm (or individual) specific, thus resulting in homogeneous responses. However, several empirical papers find that firms display heterogenous tax incidence responses (see, for example, Harju et al. (2018b) or Benzarti et al. (2020)). Ex-post, this empirical finding may not come as a surprise, especially given related findings in non-tax subfields of economics, but it is a novel departure from the canonical tax incidence model and further questions its relevance.

We add to this body of empirical evidence by showing that supermarkets exhibit heterogenous responses even when controlling for supermarket types. Figure 5 plots non-parametric distributions of barcodes' price changes just before and after the VAT cut and its repeal for large grocery stores. The price change is a simple difference between prices in week t versus week t_{-1}, where week t represents one week after the VAT changed. The upper left panel shows the distribution of price changes around the VAT cut, while the bottom left panel shows the same distribution around the VAT increase. We also include, in the upper and bottom right panels, a placebo test, where we plot the distribution of price differences in week t_{-1} versus week t_{-2}, i.e., just before the VAT changes take place. Note also that we plot the distributions for both the treatment and control groups, as defined above.

Several patterns emerge from these figures. First, the distribution of price changes for the control and treatment groups look identical when assessing them prior to the reform in the placebo tests. This is reassuring and confirms that, even when considering distributions rather than time series, the control group is a suitable counterfactual for the treatment group we consider.

Second, while there is clear bunching at full pass-through both for the VAT increase and decrease, there is also substantial heterogeneity in pass-through rates. This adds a further dimension of heterogeneity: while the average price responses are different when comparing small versus large

grocery stores, it is also the case that price responses exhibit substantial heterogeneity even within these two categories. This can have important distributional effects and we plan on investigating the underlying causes of this heterogeneity further (stores located in low- versus high-income areas and regions, stores located in dense areas versus food deserts, etc.).[20]

We perform a similar analysis for small grocery stores in Figures A.6 and A.7 and find substantial heterogeneity in the pass-through of both the VAT cut and its subsequent repeal. Note that we also include the same placebo tests as we did for large grocery chains, which show no effects. And, since the data for small stores is monthly rather than weekly, we re-plot the price change distributions for large chains using monthly data, in order to make the two comparable.

5.4 Effect of the VAT Increase Mandates using Price Caps

While there was no formal government regulation of how much of VAT cut grocery stores should pass through, the Government imposed strict price controls for the VAT increase for some of the commodities that were subject to the VAT cut (see Table 2).[21] In particular, regular rice (long grain white), dried pasta, tea, yerba mate, mate cocido, sugar, canned vegetables and beans, corn and wheat flour and regular yogurt were subject to a 7% cap on how much a given grocery store could increase their prices. Furthermore, milk was subject to a 0% price increase, i.e., its price was held nominally fixed. On the other hand, corn oil, other rice (basmati, brown, and organic), canned fruits, and yogurts with fruits or cereals mixed in, were not subject to any price controls. Importantly, these price controls only applied to large grocery chains, but not to small independent stores; this was mostly due to the fact that the Government has limited capacity to enforce the regulation and monitor prices in the more than 18,000 independent stores around the country.[22]

While we do not claim that this is the optimal way governments should influence tax incidence, the experiment at hand certainly offers a unique opportunity to show that governments can affect

[20] Figure A.8 further breaks the average price effect in supermarket chains into 10 regions, as described in Figure A.5.

[21] We refer to price controls as *caps* on how much prices could increase to mitigate the VAT reintroduction. We do not refer to price controls as nominal price freezes. In a companion paper, we are separately analyzing the effects of price freezes in Argentine supermarkets, which were introduced in 2014 on a basket of about 500 barcodes.

[22] Figure A.10 shows no differential price increases between capped and uncapped items in small stores, which were not subject to these mandates when the VAT was reintroduced.

tax incidence directly in spite of tax elasticities. In order to assess the effect of these price controls at the time of the VAT increase, we break down the list of zero-rated commodities into a *capped* treatment (those commodities that are subject to price controls) and *flexible* treatment (commodities which price is fully flexible). Note that all of these commodities were previously "treated" by the VAT cut. We compare both groups relative to the original control group that was not part of the VAT cut.

We have four main findings. First, the price controls imposed by the government are effective at mitigating the degree to which grocery stores pass through the VAT increase. Indeed, Figure 7a compares the change in prices for those commodities that are subject to the 7% price increase cap, to those with no price caps. In both cases, the control group is the original set of barcodes facing a 21% VAT rate. This figure shows that the goods with no price caps experience a price increase that is almost double that of those that are subject to the 7% cap.[23] However, while the 7% cap is effective at mitigating price increases, Figure 7a shows that grocery stores are able to increase prices by more than 7%. This is likely due to the fact that monitoring percentage increases can be difficult. This is confirmed in Figure 7b, which shows that when price controls take the form of a price freeze, i.e., holding the nominal price fixed, as is the case for milk, prices experience no increase at the time of the VAT increase.

Third, we document persistent price effects of the VAT mandates, even after the caps no longer apply or become harder to enforce. Figure A.11 shows that the price gap between products with and without price caps is stable until the end of 2020. This "hysteresis" effect strikes us as remarkable because one would think that, in a context of inflation, supermarkets could game the regulation by simply staggering the price increases over several weeks, while ensuring that any increase in a given period is smaller than 7%.

Fourth, this gap only emerged in chain supermarkets subject to the caps but not in small stores leading to unintended incidence effects (Figure A.10). In other words, the government distorted the relative prices of the same products sold in small and large supermarkets, ultimately leading to a

[23]Figure A.9 provides two case studies that add credibility to the finding. The figure compares regular rice versus other rice, and canned fruit versus canned vegetables. Although prices respond similarly to the VAT cut, the response to the VAT increase is remarkably different.

permanent price wedge (Figure A.12).

Taken together, although the government was successful at mitigating price increases following the repeal of the VAT cut using pass-through mandates in large supermarkets, our evidence suggests that there might be several unintended incidence effects that can complicate reaching the policy goals of temporary VAT cuts.

5.5 Effect on Quantities

Our dataset allows us to dig further than most tax incidence studies, which often only focus on price effects, by estimating the quantity effects of the VAT cut and its repeal on each individual barcode. Since the price effects are very different for chain and independent stores, we estimate the quantity effects separately for each.

To do so, we estimate equation (1) using quantities as the outcome of interest, with the same definition of control and treatment groups. Figure 8a shows the difference in quantity responses in the control versus treatment group in supermarket chains. As the VAT is cut, there is a large increase in total quantities sold, which is sustained for two months and reverts back to its original level thereafter. When the VAT is reintroduced and prices increase, quantities sold decrease relative to the control group. This finding is in line with the intertemporal consumption models in which consumers take advantage of temporarily cheaper goods. The largest effect over the period of the VAT cut is a $\approx$10 percentage points increase in quantities sold in the treatment compared to the control group in supermarket chains. By scaling this effect relative to the first-stage decrease in prices, we obtain an elasticity of $0.1/0.15 = 0.66$.

This suggests that the policy, which was aimed at ensuring that low-income households would still be able to afford basic necessities was successful and, possibly, the government may have cut the VAT too much and could have achieved its goal by cutting it less. However, in order to precisely assess the success of the policy, we need to use household income data, in order to specifically estimate this for low-income households.

When it comes to independent stores, Figure 8b shows a null effect on quantities sold—or even a

small decrease. This result is not surprising in light of the limited pass-through to prices documented in Section 5.2.

Note also that both figures show a spike in March 2020. This response corresponds to the COVID-19 outbreak and the hoarding of necessities triggered by lockdown announcements. This result serves two purposes. It provides a check of the reliability of our data and it helps benchmark the consumption response to the COVID-19 against that of the VAT cut.[24]

5.6 Robustness: Substitution and Currency Depreciation

Substitution across products in treatment and control: One concern with our strategy is that our treatment effect might be biased because consumers can substitute goods in the control group with those in the treatment group. For example, if the price of tea decreases after the VAT cut, some consumers may substitute tea consumption with coffee in order to take advantage of the lower prices. This would lead to a higher demand of the treated goods, and thus would presumably increase their prices, biasing our effects downwards.

We address this "SUTVA (Stable Unit Treatment Value Assumption) violation" concern using two main approaches and we summarize our findings in Figure 9. First, while it is true that some goods in the control group have plausible substitutes in the treatment group (such as tea and coffee or cooking oils), most goods have no obvious substitutes. As can be seen in Table 1, goods such as breakfast cereal, salt, herbs, dulce de leche and many others do not have obvious substitutes in the treatment group which mitigates this substitution concern. We formalize this idea by redefining our control group by excluding the categories that are likely close substitutes of some of the treated goods— in this case, rice-based meals, coffee, cooking oils, dried legumes, other flours, soups and prepared pasta. We then re-estimate our dynamic difference-in-differences empirical specification on chain supermarkets simply because the effect of the VAT is significantly larger than in independent supermarkets thus providing the most opportunity for finding any substitution effects (there is no reason to substitute to other goods if the price of these other goods do not decrease).

[24] Figure A.13 further extends the period of analysis up to the end of 2020.

Figure 9a estimates that even when accounting for goods that have obvious substitutes, such as coffee and tea, the results barely change. The average decrease in prices after the VAT was cut is 15.2 percentage points in the specification that excludes close substitutes from the control group, with a pass-through rate of 87%. This price effect is slightly larger than the -14.7 decrease found using our original control group. Indeed, substitution operates in the expected direction slightly biasing our estimates downward. Nevertheless, the difference is very small and does not change the conclusions of the paper.[25]

Second, we re-estimate our main effects using an alternative control group constituted solely of non-food items (which were previously excluded from our approach), and thus very unlikely to be substitutes, since our treatment group is exclusively made of food items.[26] Note that, we only use scanner data from one region, namely *Periferia* because, we were only able to purchase non-food categories for this region. The results are shown in Figure 9b. We find that the average price of the treated goods decreased by 15.7 percentage points relative to this alternative control group made with non-food products. For comparison, we superimpose the effect estimated with the original control group, which was an estimated price decrease of 15.1 percentage points. Although substitution might be present in our setting, it barely affects the results. Indeed, the pass-through rates of the VAT cut are 90% or 87% depending on the control group used.

Pass-through of the Peso depreciation: Another threat to our research design is the quasi-simultaneous depreciation episode, which happened three days prior to the VAT cut was enacted (see Section 2). If the sharp depreciation of the Argentine peso against the US dollar affects basic necessities subject to the VAT cut more strongly than untreated food products then, ceteris paribus, one would expect the prices of goods in our treatment group to increase more than in the control group. Hence, the pass-through of the VAT cut to prices would be partially offset by this depreciation shock, thus making our pass-through rates a conservative estimate. In other words,

[25]For transparency, the left panel of Figure A.14 illustrates the anatomy of the substitution mechanism by comparing the price changes in tea and different types of coffee relative to the remaining categories in the control group. While instant coffee exhibits a decrease in prices, ground coffee does not. In contrast, the right panel shows that the average price of breakfast cereal (not affected by the VAT cut) does not seem to respond while the price of sliced bread decreases sharply during the VAT holiday.

[26]Non-food products include office supplies, body moisturizers, antiperspirants, hand soap, laundry detergent, bleach, surface cleaners, toilet paper, shampoo, and cleaning wipes.

absent the depreciation of the peso, the prices of the zero-rated goods would have decreased even more.

To address this concern, we leverage another depreciation episode that took place exactly one year before the VAT change and compare the evolution of prices in treatment and control. On August 30, 2018, Argentina experienced the second most important depreciation of the peso since the year 2002—similar in magnitude to the depreciation episode of August 12, 2019 (Figure A.1). Indeed, the exchange rate had been relatively stable during 2017 and the Peso slowly lost value against the US dollar starting in 2018. In Figure 10a, we run our dynamic difference-in-differences specification (1) in supermarket chains for the years 2018 and 2019 up to the week before the VAT was cut. We omit, from the regression, the first week of 2018 so that all the coefficients are measured relative to that week. As a reference, we overlay the nominal exchange rate which is measured on the right axis.

Figure 10a shows that the prices of basic necessities targeted by the government for the VAT cut indeed responded more to the depreciation of the peso back in 2018. Indeed, the price gap between treatment and control groups closely tracks the evolution of the exchange rate. Relative prices remain stable up to week 25 of 2018, then start to increase *pari-passu* with the exchange rate and stabilizes again after week 45. This evidence for 2018 strikes us as remarkable and suggests that the government might have been right in targeting necessities after the 2019 peso depreciation to alleviate the burden on low-income households.[27]

Nevertheless, in the terms of magnitude we argue that the effect of the depreciation does not pose a threat to our subsequent findings of the VAT holiday. On the one hand, according to Figure 10a, the nominal exchange rate roughly increased from 20 to 40 pesos per dollar—corresponding to a 100% increase. On the other hand, the prices of the (later) zero-rated goods increased by a modest 6% relative to the control group. By scaling this price change relative to the change in the exchange rate we obtain an elasticity of 0.06. By applying this elasticity to the depreciation of the peso of 24% in 2019 (Figure A.1), we conclude that—absent the VAT cut—prices of treated goods would

[27] To aid the interpretation of the exchange rate change as causal, we use aggregate data from INDEC, classify the categories of the CPI into treatment and control, and run our diff-in-diffs specification to estimate the effect back in 2017. Figure A.15 shows convincing evidence that the prices of treatment and control did not change differently in 2017 when the exchange rate was indeed very stable.

have increased by $0.06 \times 0.24 = 1.44\%$ relative to the control group. This means that, absent the depreciation, the price drop reported in Figure 4a would be 1.44 percentage points larger, getting closer to a full pass-through rate of the VAT cut.

6 Distributional Considerations of the VAT Cut

While there may be political reasons for why the VAT was cut, the policy goal was to ensure that low-income households would still have access to a basket of necessities during a period of higher-than usual inflation triggered by the depreciation of the Argentinian Peso following the surprising election results.

Ideally, one would be able to observe the income of every shopper at every grocery store, which would allow us to precisely track the distributional consequences of the VAT cut, given that different income households may shop at different stores and may purchase baskets of different composition. While we do not observe the income of shoppers for every transaction (or every barcode), we are able to observe the income decile of a panel of shoppers over time.

Notwithstanding, to shed light on the distributional consequences of the VAT cut, we complement our analysis with the household expenditure survey data described in Section 3. In particular, we use the consumption structure of Argentine families and estimate the share of food expenditure in products subject to the VAT cut as well as the types of grocery stores where those purchases take place.

Figure 11 reports the share of treated products in total food expenditure by income deciles. In other words, it shows how relevant zero-rated food items are for household budgets across the income distribution. This share decreases with income, with the lowest decile spending 27% of the food budget on the goods subject to the VAT cut and the richest decile spending only 15% (the national average is 20%). This pattern suggests that the government was right in its motivation to cut the VAT rate on those goods as they represent a higher share of expenditures in the food budget of low-income households. Nevertheless, the bottom panel shows that household expenditure on zero-rated goods (in absolute values) increases with income. This fact therefore suggests that the

program was poorly targeted as rich people possibly benefited the most (in nominal terms) from this subsidy.

We complement the previous fact by plotting the propensity to shop at chain versus independent supermarkets by income groups. The top panel of Figure 12 shows the share of money spent on food by income decile in independent versus chain supermarkets. The bottom panel shows the same statistic for specialized stores and street stalls.[28] The share of money spent on food items subject to the VAT cut by the lowest-income decile in independent stores is 48% as opposed to 22% in chain supermarkets. The relationship between income and money spent on treated food items at chain supermarkets is increasing, and decreasing for independent supermarkets. At the other end of the income distribution, the top decile of households spend 58% of the their food expenditure at large supermarkets and 25% at independent ones.

This finding, that the propensity to purchase food items at chain supermarkets increases with the income of households, coupled with the fact that the pass through of the VAT cut in chain supermarkets was more than twice that of independent supermarkets implies that the VAT cut likely benefited richer households more. And while there is no doubt that lower income households benefitted from the VAT cut, both because some of them shop at chain supermarkets and because independent supermarkets pass-through some of the VAT cut, this evidence implies that there was scope for the VAT cut to be better targeted.

7 Conclusion

Our paper estimates the effect of a large VAT cut aimed at ensuring that low-income households have access to a basket of necessities in times of unusually high inflation in Argentina. We find that a substantial portion of the VAT cut was passed through to prices, more than in previous studies of VAT incidence, which is likely due to the political pressure imposed by the government on supermarkets. We also estimate that pass through rates are more than twice larger in chain supermarkets compared to independent ones, which turns out to have important distributional effects since we

[28] The sum of the four bars for each decile adds up to 100%.

show that low-income households tend to shop more at independent supermarkets. This is further confirmed by the effect of the VAT cut on quantities purchased: we estimate a large and persistent increase in quantities sold of the goods that are subject to the VAT in chain supermarkets but a much more muted quantity response of the same goods in independent supermarkets. Overall, our paper shows that VAT cuts can be an effective tool to ensure continued access to basic necessities during times of high inflation, but may miss the targeted population due to unexpected incidence effects, which calls for future research to further estimate how tax incidence may diverge from the canonical tax incidence model.

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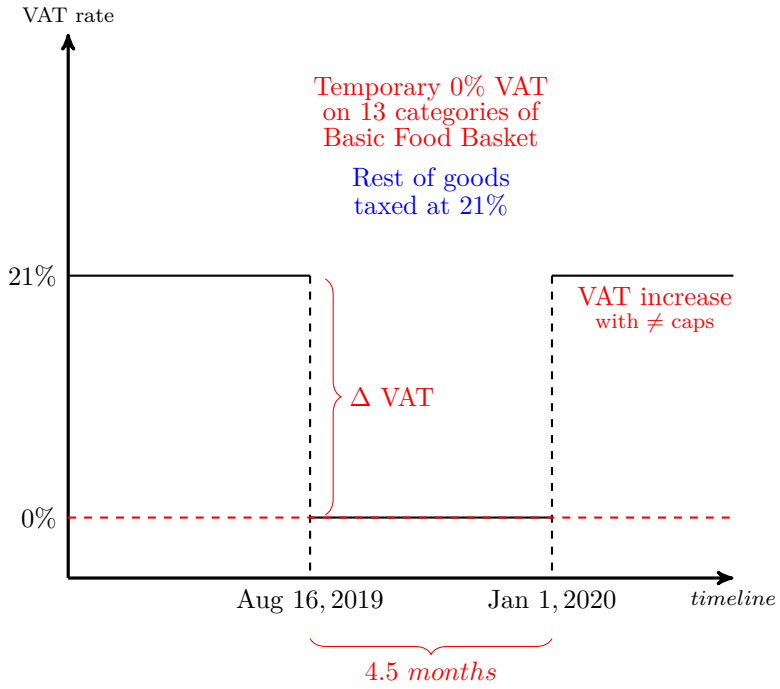
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Figures and Tables

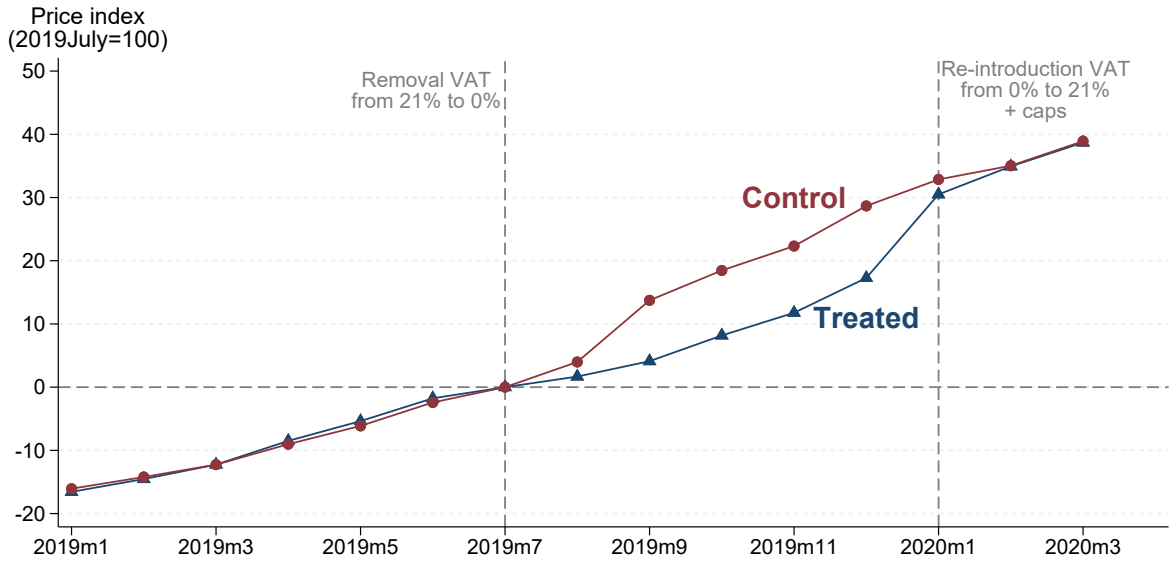
Figure 1: A 4.5-month long VAT holiday on basic food



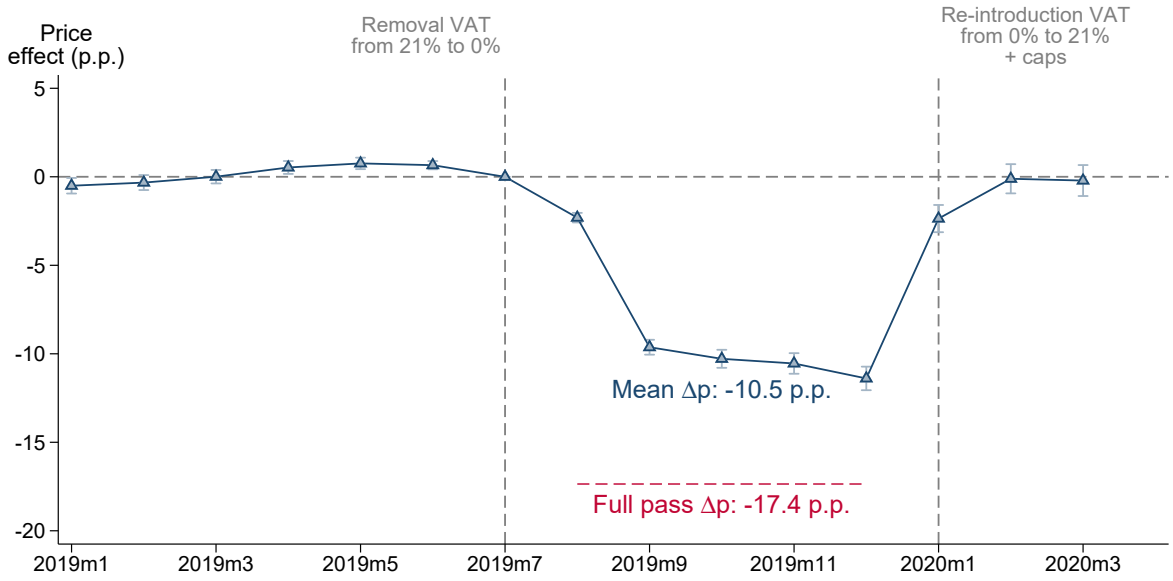
Notes: This figure shows the main identifying variation exploited in the paper: an unexpected temporary VAT cut on food necessities that was pre-announced to last for 4.5 months, from August 16 to December 31, 2019. The VAT rate decreased from 21% to 0% on a list of 13 categories from the Basic Food Basket. This is the basket used to compute the Extreme Poverty Line and the PCI. Although the repeal was anticipated, and the VAT rate went effectively back to 21%, the new administration limited the price increase for some categories but not others. For a list of treated and untreated products see Table 1.

Figure 2: Price levels and pass-through before and after the VAT cut and hike

(a) **Unconditional Means**



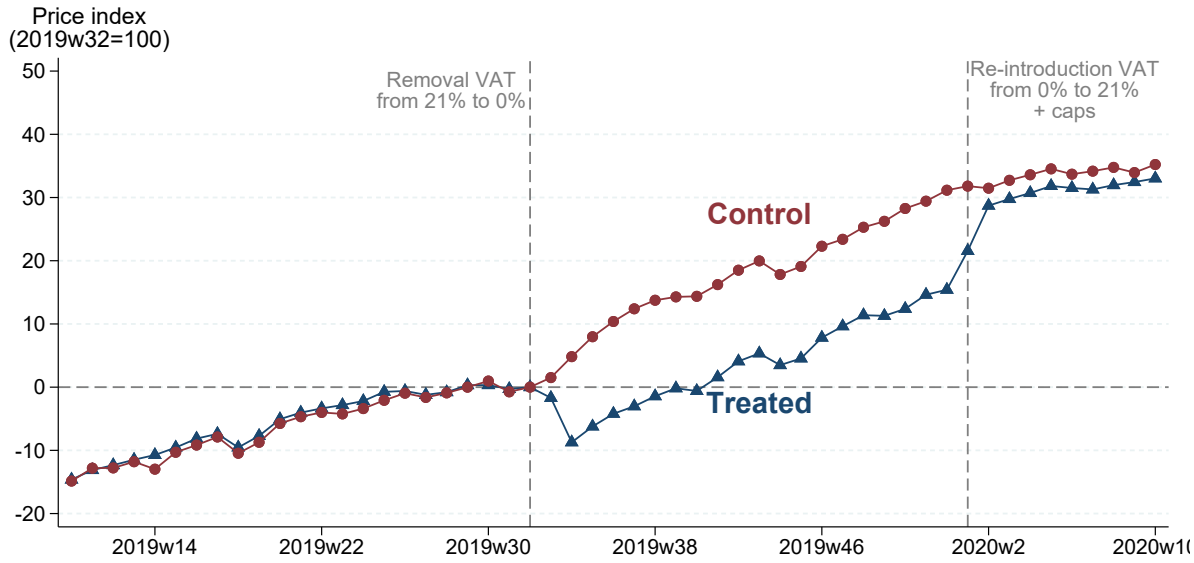
(b) **Price Change between Treatment and Control**



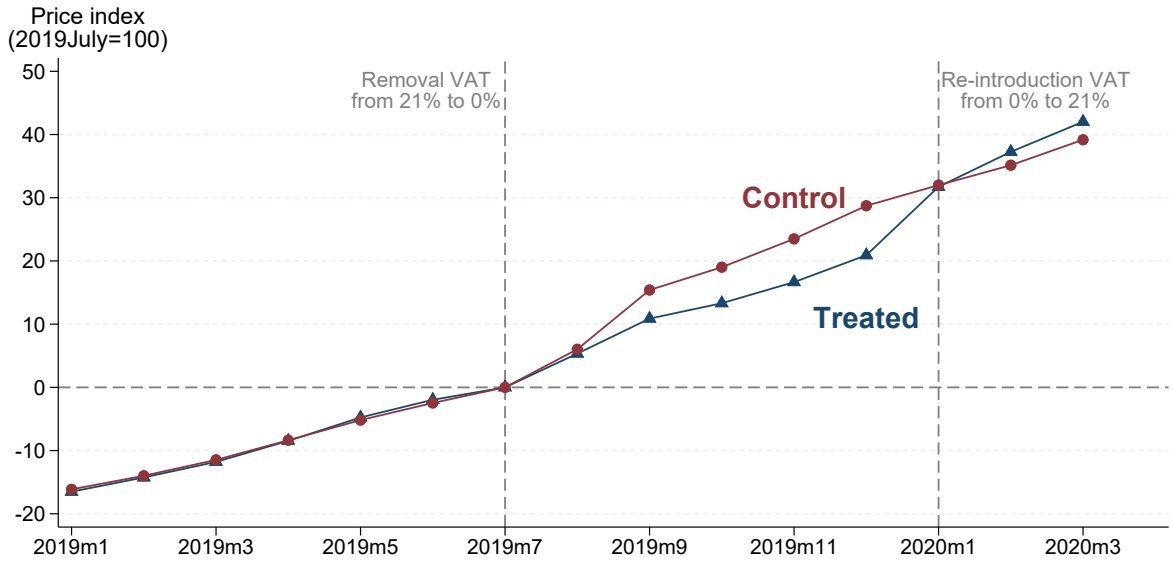
Notes: This figure shows the price levels and price pass-through of the VAT holiday pooling together large and small supermarkets. We group barcodes into treatment and control as shown in Table 1. The top panel plots the unconditional mean of the average price level for control and treatment food products separately before and after the VAT cut and its subsequent repeal. In each case, we normalize every barcode series to 100 in the month before the VAT cut was implemented (July 2019). The bottom panel shows the results of estimating the dynamic difference-in-differences specification (1). The first vertical dashed line indicates the time when the VAT was decreased to 0% for goods in the treatment group. The second vertical dashed line indicates the time when the VAT was reinstated at 21% for goods in the treatment group with differential caps in the allowed price increase. The red dashed line indicates the hypothetical situation with full pass-through to prices [(1-1.21)/1.21 x 100 = -17.4%].

Figure 3: Price levels before and after the VAT cut and hike: large versus small supermarkets

(a) **Large chains**



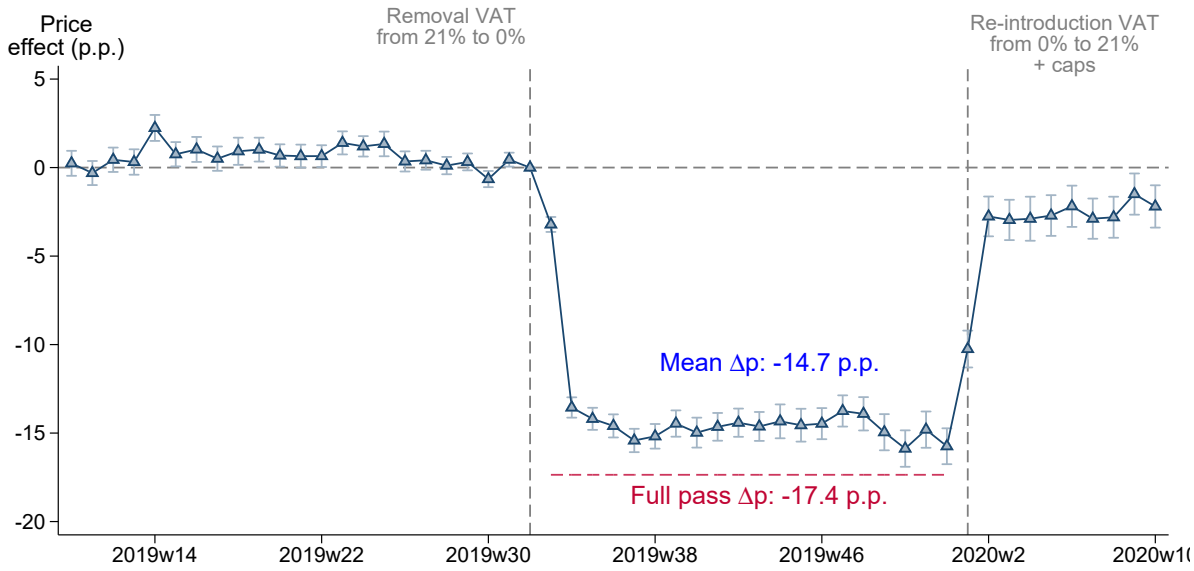
(b) **Small stores**



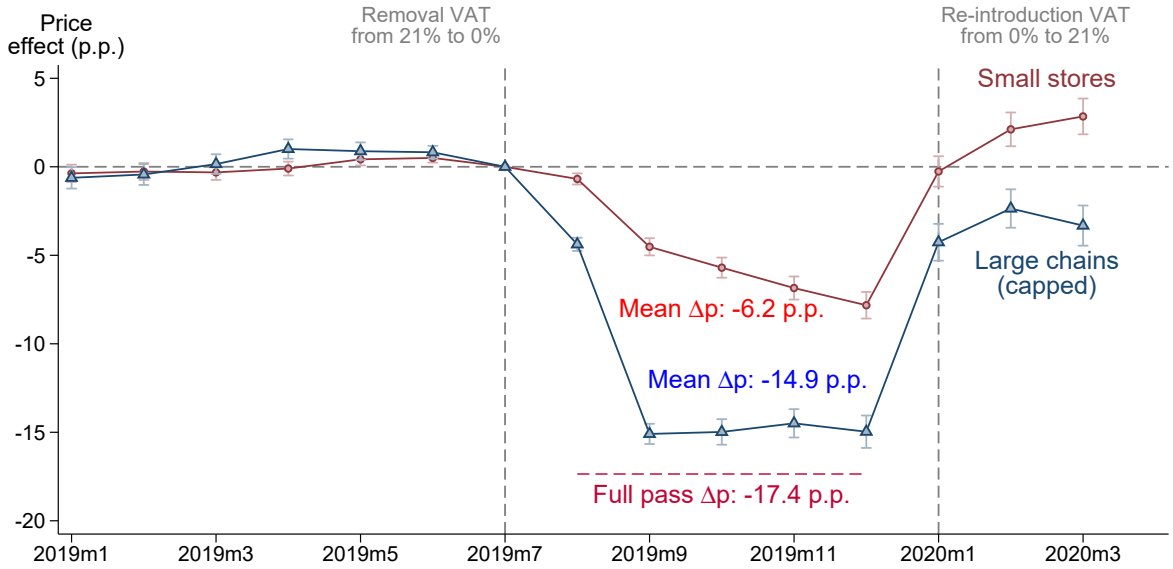
Notes: This figure plots the unconditional mean of the average price level for control and treatment food products separately before and after the VAT cut and its subsequent repeal. In each case, we normalize every barcode series to 100 in the week/month before the VAT cut was implemented. Panel (a) corresponds to large supermarket chains and panel (b) shows the series for small independent stores with retail scanner data collected at the monthly level.

Figure 4: Pass through of VAT changes to consumer prices in large and small stores

(a) **Large chains (weekly data)**

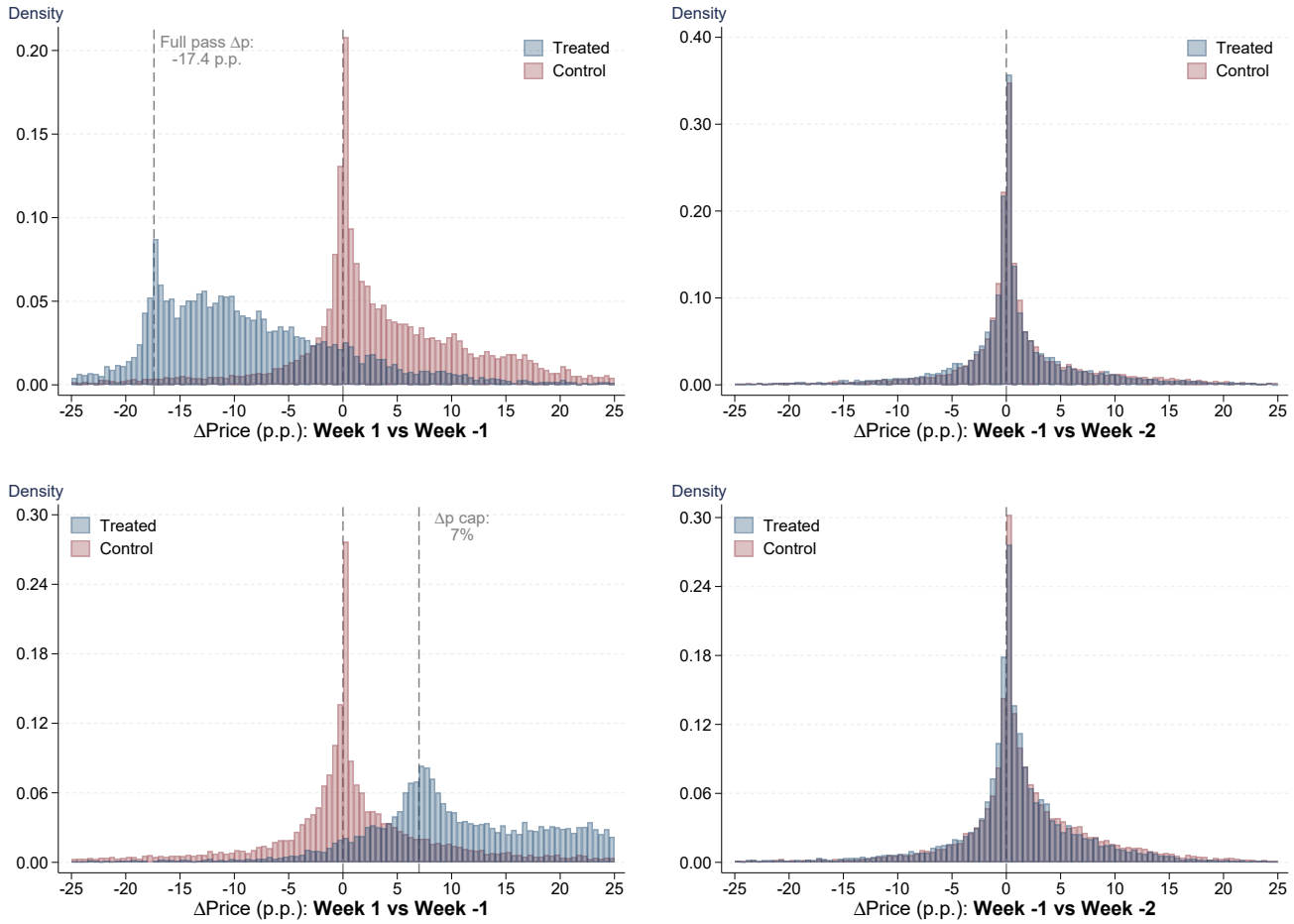


(b) **Small and Large stores (monthly data)**



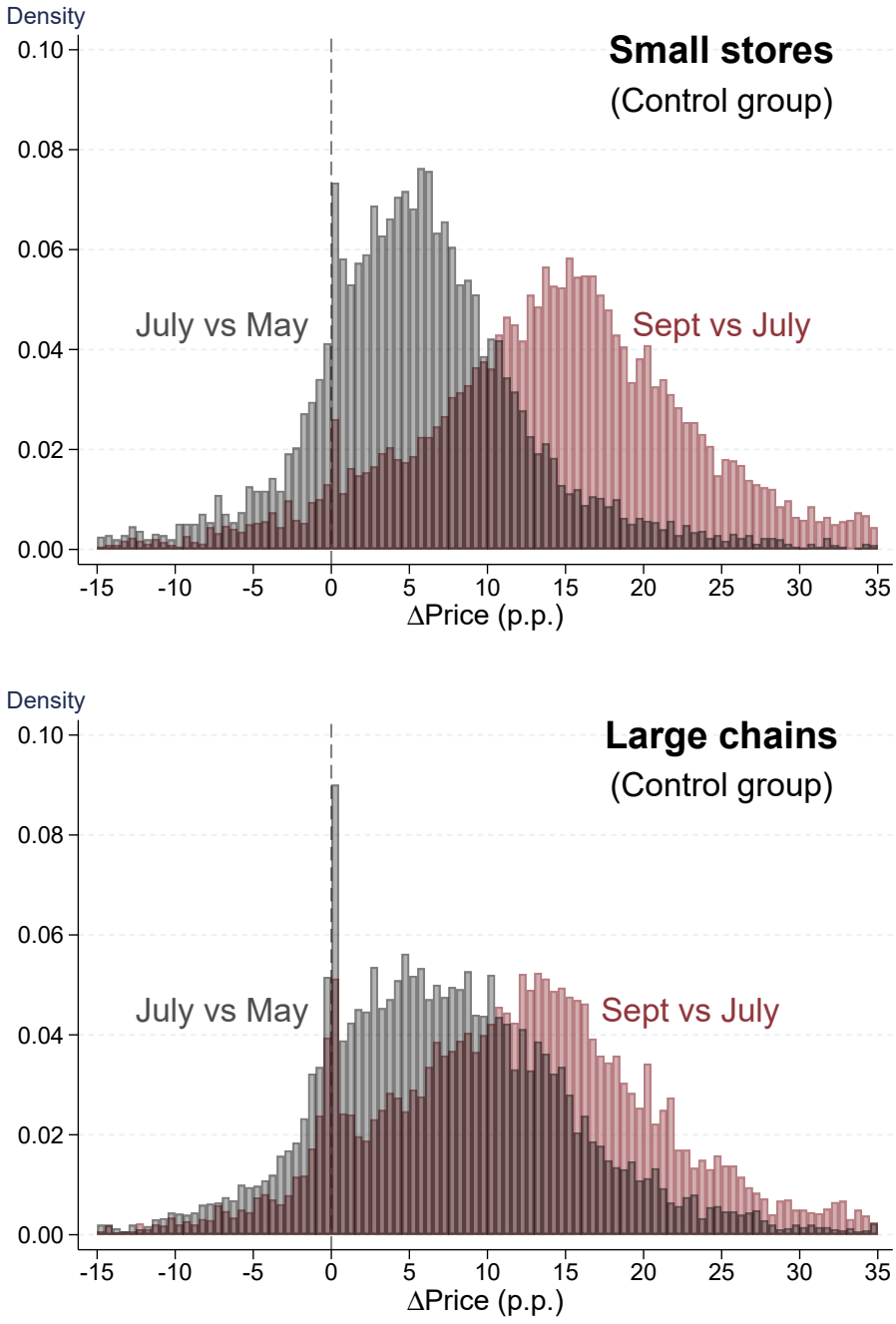
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) before and after the VAT cut and its subsequent repeal. We group barcodes into treatment and control as shown in Table 1. The dependent variable is the price of each barcode normalized to 100 in the week or month before the VAT was cut. Panel (a) shows the pass-through rate for large chains where we use weekly data. Panel (b) does this for small stores where we use monthly data. For comparison, in Panel (b) we also add the effect for supermarket chains where we collapse the weekly data at the month level. The first vertical dashed line indicates the time when the VAT was decreased to 0% for goods in the treatment group. The second vertical dashed line indicates the time when the VAT was reinstated at 21% for goods in the treatment group with differential caps in the allowed price increase. The red dashed line indicates the hypothetical situation with full pass-through to prices [(1-1.21)/1.21 x 100 = -17.4%].

Figure 5: Distribution of price changes in large stores (weekly data)



Notes: This figure shows the distribution of price changes in large stores between two consecutive weeks for treatment (blue area) and control goods (red area). The top left panel compares price changes one week before and after the VAT removal. The bottom left panel does this comparison one week before and after the VAT was reintroduced. The top and bottom right panels show a placebo comparison between two weeks prior to the VAT removal and reintroduction. These two serve to validate our strategy by showing no price differences between treatment and control two weeks before the tax change.

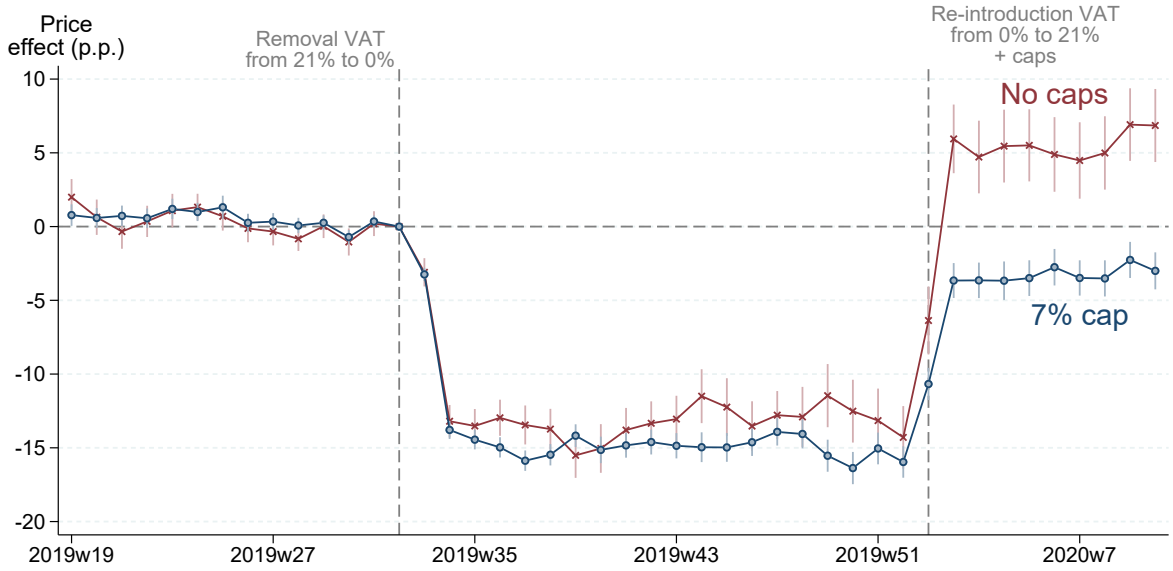
Figure 6: Distribution of price changes in small and large stores (Depreciation Episode)



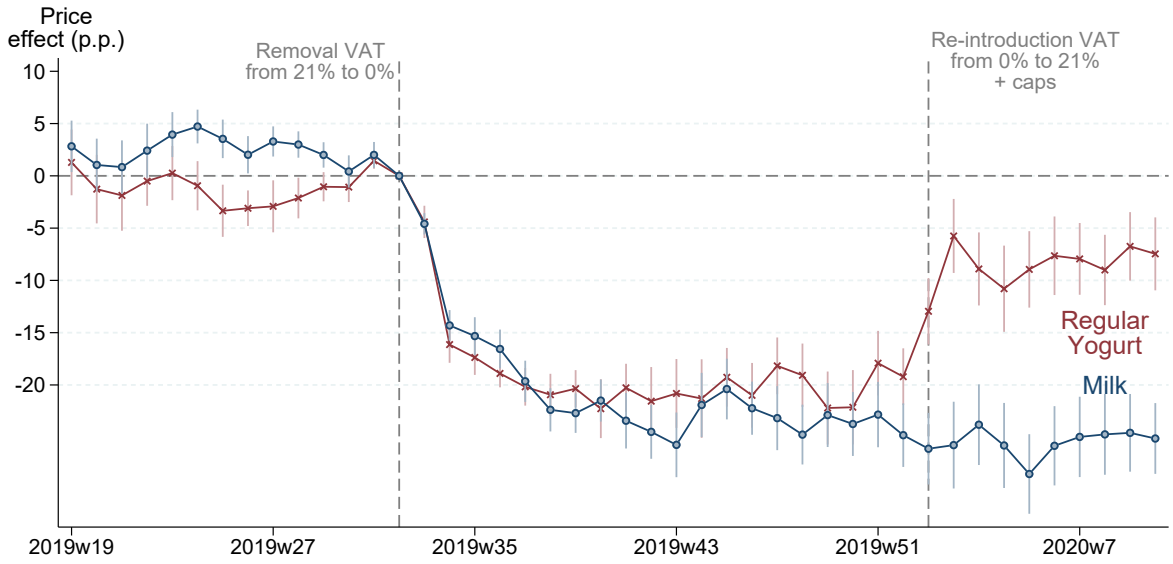
Notes: This figure shows the distribution of price changes in small stores (top panel) and large stores (bottom panel) for barcodes in the control group. The gray area displays the difference in prices between July and May 2019 *before* the peso depreciation. The red area displays the difference in prices between September and July 2019 *after* the peso depreciation. The figure shows that the prices of goods unaffected by the VAT cut respond similarly in large and small stores to other types of macro shocks (the depreciation, in this case).

Figure 7: Regulated VAT increase with capped pass-through rates

(a) **7% cap versus no cap**



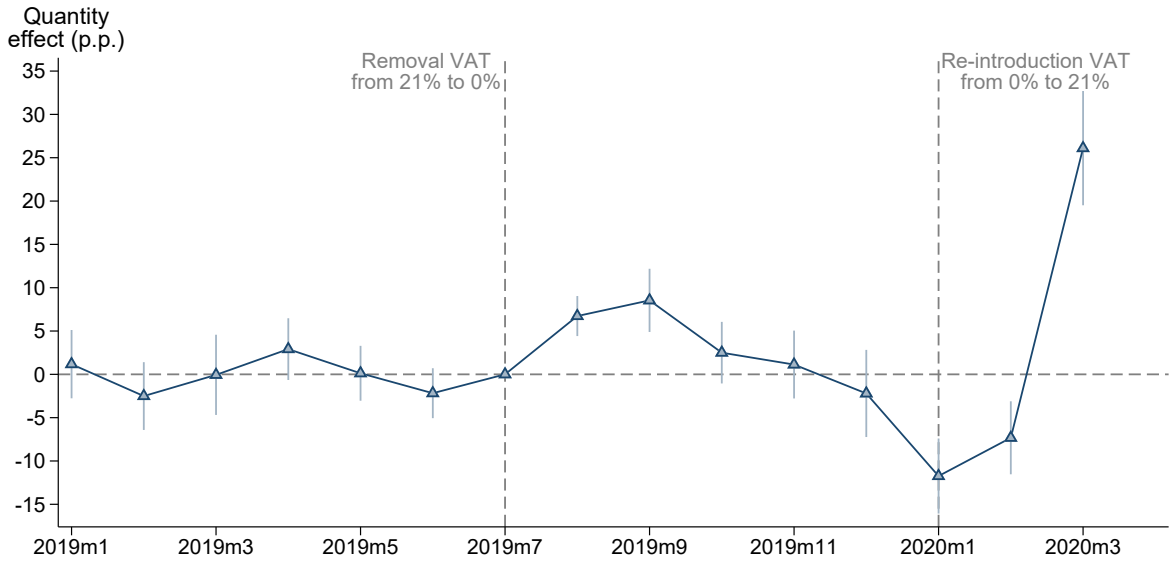
(b) **0% cap (milk) versus 7% cap (yogurt)**



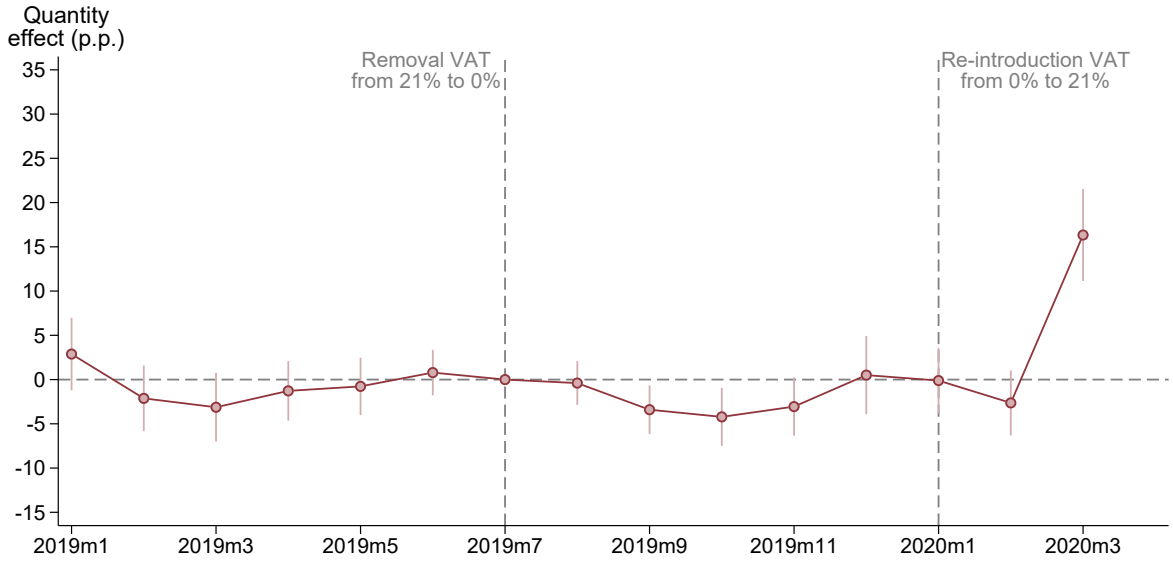
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) in large chains before and after the VAT cut and its subsequent repeal. We break down the list of barcodes from the treatment group into food categories that are subject to a capped price increase and food categories with no cap in their price increase (i.e., green light to flexibly increase prices). We compare each group relative to food products in the original control group. For a list of the different caps across categories see Table 2. The dependent variable is the price of each barcode normalized to 100 in the week before the VAT was cut. Panel (a) compares the change in prices for those commodities that are subject to the 7% price increase cap and those that are fully flexible (relative to the original control group). Panel (b) compares the change in prices for milk products which were not allowed to increase prices at all relative to goods in the original control group. For comparison, in Panel (b) we also add the effect for regular yogurt who faced the 7% price increase cap. The first vertical dashed line indicates the time when the VAT was decreased to 0% for goods in the treatment group. The second vertical dashed line indicates the time when the VAT was reinstated at 21% for goods in the treatment group with differential caps in the allowed price increase.

Figure 8: Quantity effects in large and small stores

(a) **Large chains**



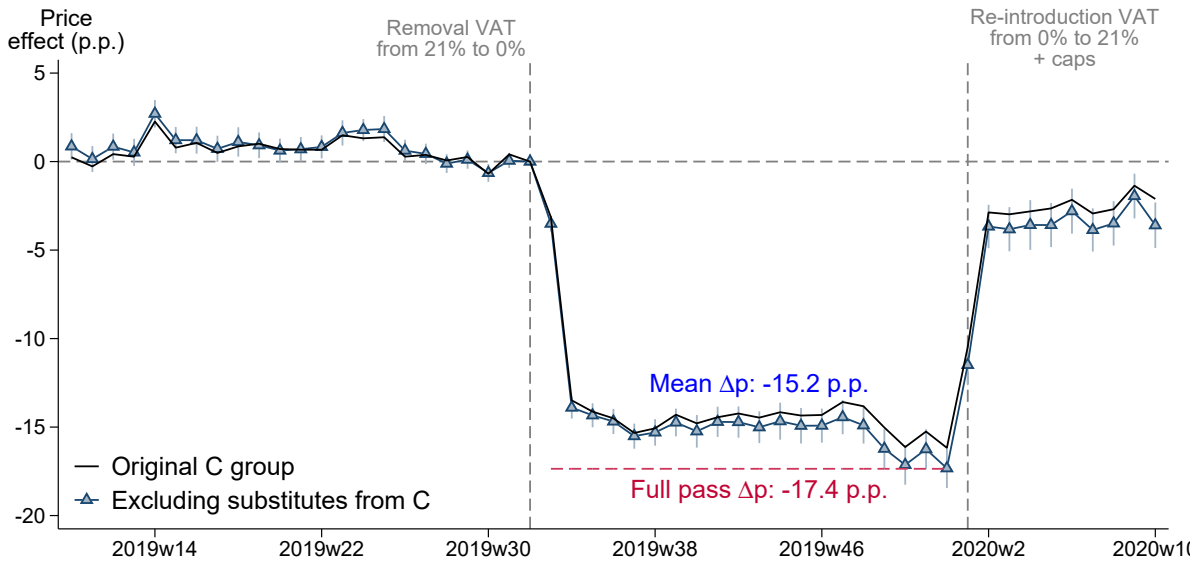
(b) **Small stores**



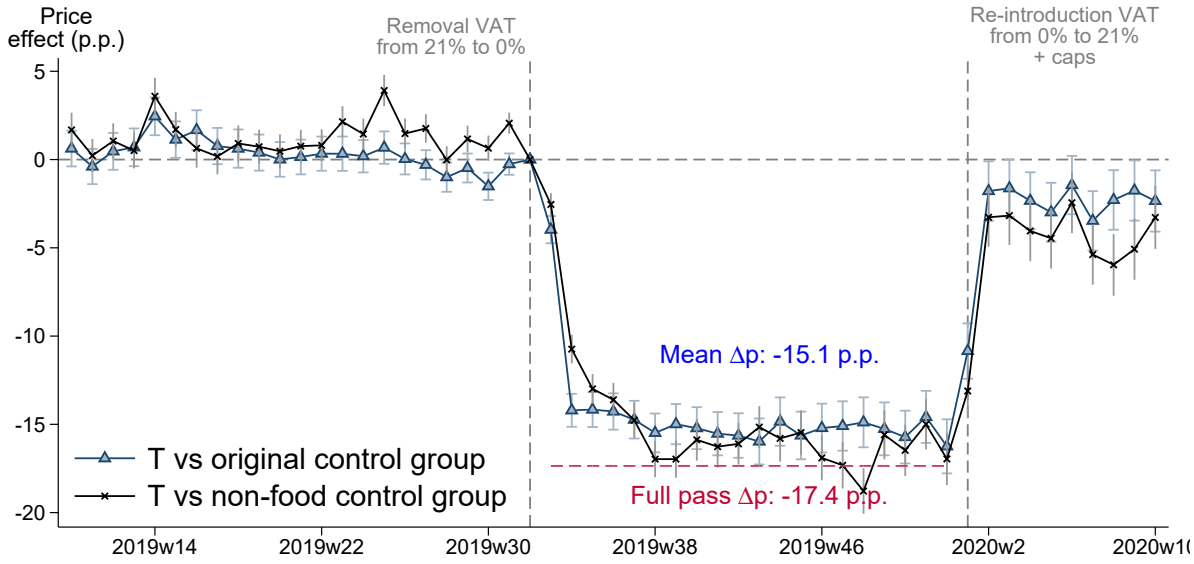
Notes: This figure shows the quantity effects of estimating the dynamic difference-in-differences specification (1) before and after the VAT cut and its subsequent repeal. We group barcodes into treatment and control as shown in Table 1. The dependent variable is the quantity sold of each barcode normalized to 100 in the month before the VAT was cut. The top panel corresponds to large supermarket chains and the bottom panel to independent stores. The first vertical dashed line indicates the time when the VAT was decreased to 0% for goods in the treatment group. The second vertical dashed line indicates the time when the VAT was reinstated at 21% for goods in the treatment group with differential caps in the allowed price increase. The consumption spike in March 2020 captures the stockpiling behavior when the COVID-19 pandemic broke out.

Figure 9: Does substitution across food products bias our price effects?

(a) **Including and excluding close substitutes in the control group**



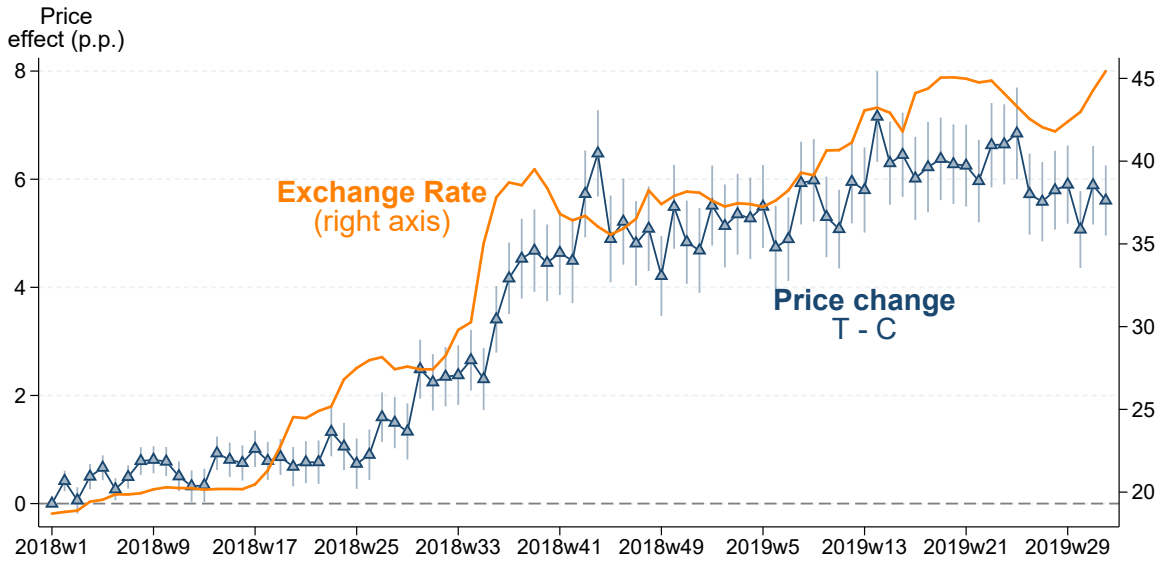
(b) **Using food and non-food products in the control group (region Periferia)**



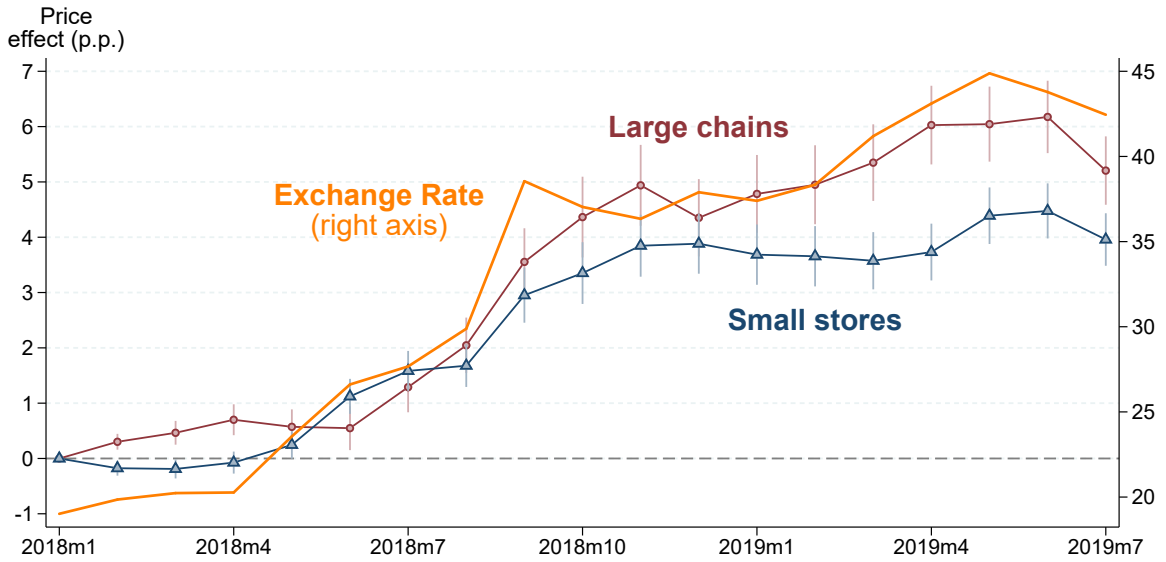
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) on prices. Panel (a): The black line corresponds to the estimation using the original treatment and control groups as shown in Table 1. The blue line uses the same treatment group and an alternative control that excludes close substitutes (cooking oil, rice, coffee, dried legumes, flour derivatives, soup and prepared pasta). Panel (b): The blue line corresponds to the estimation using the original treatment and control groups. The black line uses the same treatment group and an alternative control group comprised by non-food categories (office supplies, body moisturisers, antiperspirants, hand soap, laundry detergent, bleach, surface cleaners, toilet paper, shampoo, and cleaning wipes). The bottom figure is constructed using scanner data from the region Periferia because non-food categories were only purchased for that region. The red dashed line indicates the hypothetical situation with full pass-through to prices [(1-1.21)/1.21 x 100 = -17.4%]. In all, both figures suggest that substitution is not a big concern in our setting.

Figure 10: Pass-through of the 2018 peso depreciation

(a) **Prices of treatment and control in large chains**

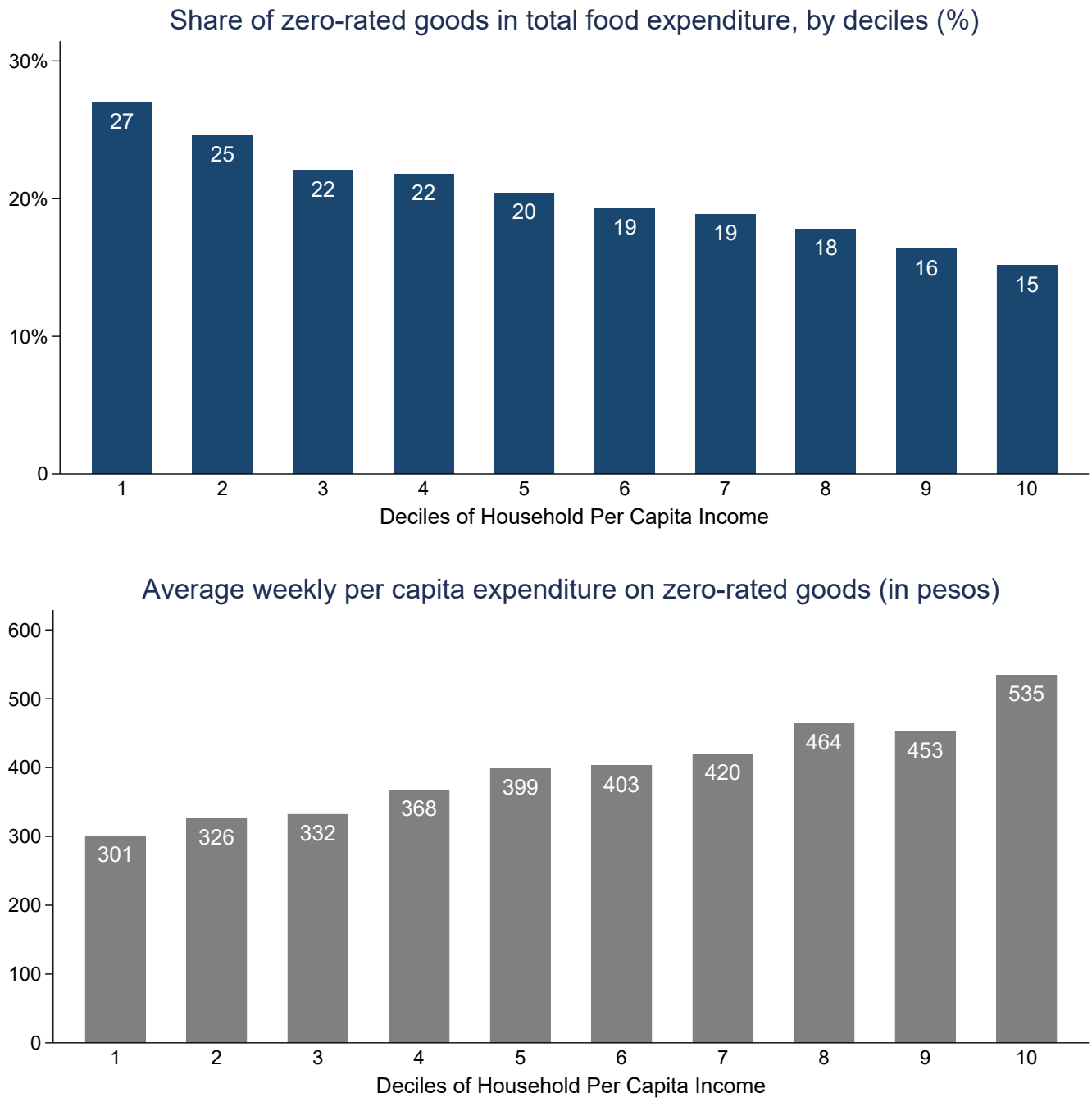


(b) **Prices of treatment and control in small and large stores**



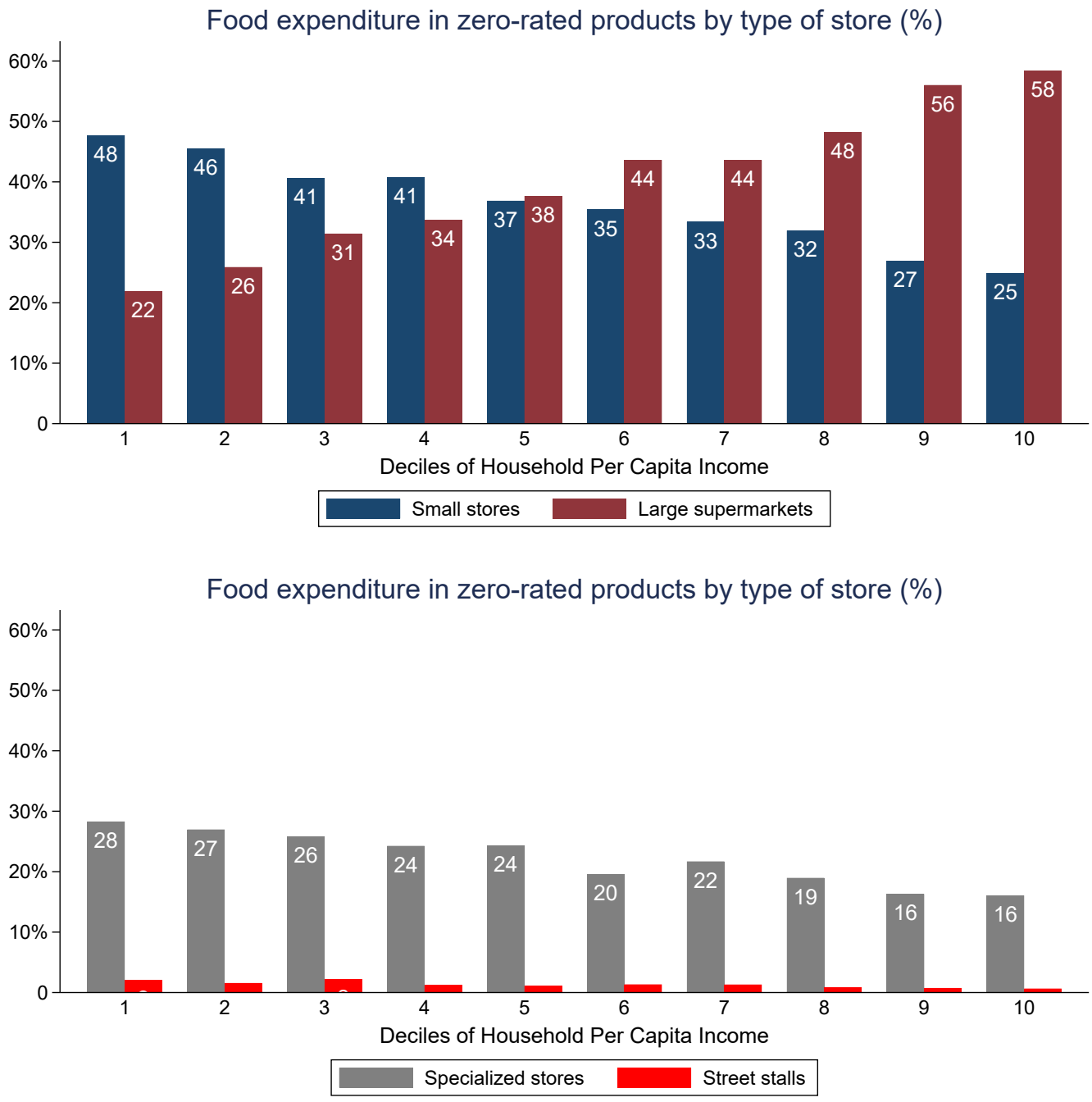
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) on the prices of large and small supermarkets. The orange line displays the nominal exchange rate between the Argentine peso and the US dollar (right axis). The blue line in the top panel shows the percentage change in prices relative to week 1 of 2018 between treated and control goods as classified in Table 1. The bottom panel runs the same regression using monthly data in large supermarkets (red line) and small independent stores (blue line). In Section 5.6 we explain that the effect of the depreciation does not pose a threat to our subsequent findings of the VAT holiday.

Figure 11: Participation of treated products in total food expenditure and weekly expenditure



Notes: This figure shows how relevant food items—whose VAT was decreased to 0% (treatment)—are across the income distribution (by deciles). The top panel displays the share of zero-rated goods in total food expenditure. The national average is 20%. The bottom panel shows the average household per capita expenditure on zero-rated goods (in pesos) for the reference week of the survey.
Source: authors' calculations using the 2017/2018 National Household Expenditure Survey (ENGHo).

Figure 12: Where do the poor and the rich shop for groceries?



Notes: This figure shows the food expenditure share of zero-rated goods by type of store and across deciles of household per capita income. The top panel displays the expenditure in treated goods in small stores (3 or fewer cashiers) and large supermarkets (4 or more cashiers). The bottom panel corresponds to specialized stores (i.e., butcheries, greengroceries, bakeries, etc.) and street stalls. For each decile, the fours bars add up to 100%.
Source: authors' calculations using the 2017/2018 National Household Expenditure Survey (ENGHo).

Table 1: Classification of data into treatment and control

Treatment Temporary 0% VAT	**Control** Standard 21% VAT
Categories	**Categories**
Cooking oils (sunflower, corn, mix)	Other cooking oils (olive, soy, canola)
Rice	Rice-based meals
Dried pasta	Breakfast cereal
Tea, Yerba Mate, and Mate Cocido	Coffee
Sugar	Salt
Canned vegetables and beans	Herbs, Spices, & Seasonings
Canned fruits	Dulce de leche (caramel)
Corn flour (*polenta*)	Jam and Jelly
Wheat flour	Other flours
Fluid milk (whole/skim)	Crackers, Biscuits, Toasts, Puddings
Yogurt (whole or skim)	Chocolate
Eggs	Mayonnaise
Bread	Vinegar
Breadcrumbs and/or batter	Dried legumes and beans

Notes: This table shows the split of our data into treatment and control categories. Wheat flour and Bread are taxed at the reduced rate of 10.5%. Source: Treatment categories are determined based on Decree 567/2019–Annex. Control products include the remaining categories in our data.

Table 2: Regulated VAT increase with capped pass-through rates

Treated: VAT back to 21%

Categories	Δp cap
Oil (sunflower & mix)	9%
Oil (corn)	No cap
Rice (regular: long grain white)	7%
Rice (other: basmati, brown, organic)	No cap
Dried pasta	7%
Tea, Yerba Mate, and Mate Cocido	7%
Sugar	7%
Canned vegetables and beans	7%
Canned fruits	No cap
Corn flour	7%
Wheat flour	7%
Fluid milk (whole/skim)	0%
Yogurt (regular)	7%
Yogurt (other: w/cereal, fruit chunks)	No cap
Eggs	7%
Sliced Bread (white)	7%
Sliced Bread (rest)	No cap
Breadcrumbs and/or batter	10.5%

Notes: This table shows the list of treated products (who suffered a VAT cut) with differential treatment when the VAT was reintroduced. Although the VAT rate went effectively back to the pre-holiday level of 21%, the new administration limited the price increase with different price caps. This mandate was enforced with the price monitoring app. "No cap" flags the uncapped food products with flexible prices (i.e., could increase up to 21%).

Table 3: Average price change between treated and untreated goods (monthly scanner data)

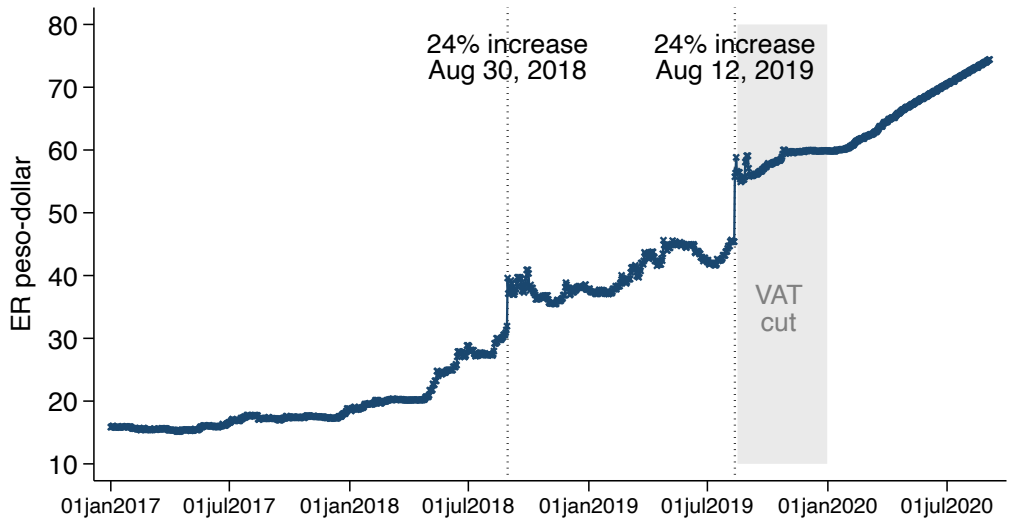
	Removal VAT (1)	Re-introduction VAT (2)
(a) Large and small supermarkets (pool)		
Average price change	-10.5***	-0.9*
	(0.26)	(0.42)
Observations	661,264	661,264
Pass-through rate	60%	59%
(b) Large chains		
Average price change	-14.9***	-3.3***
	(0.40)	(0.55)
Observations	353,497	353,497
Pass-through rate	85%	81.7%
(c) Small stores		
Average price change	-6.2***	1.6***
	(0.32)	0.47)
Observations	307,767	307,767
Pass-through rate	36%	38%

Notes: This table presents the point estimates of the pass through using monthy data for large chains and small stores. In particular, the proposed specification for this table, pools the individual coefficients identified by the original equation (1) in the following way: $P_{it} = \alpha_i + \gamma_t + \delta W_{it} + \beta W_{it} \cdot Post_{it} \cdot Treat_{it} + \epsilon_{it}$. In column (1), the window W_{it} includes the treated months of interest with 0% VAT from September to December 2019 as well as the pre-reform month, July 2019. We exclude August 2019 because it is partially treated. In column (2), the *window* variable equals one for July 2019 and for the first three months of 2020. The table presents the β coefficient which measures the change in prices relative to the pre-reform month. Standard errors are clustered at the barcode and regional level.

Supplementary Materials for: "Mandating Tax Incidence"

A Additional figures and tables

Figure A.1: Exchange rate (pesos per dollar)



Source: BCRA, Tipo de Cambio de Referencia - Comunicación "A" 3500 (Mayorista).

Figure A.2: Media coverage of the VAT cut and subsequent hike

(a) **Media coverage of the VAT cut**



Clarín

Un toque de atención para la solución urgente de los problemas argentinos

Viernes 16.8.2019

Spot
En la piel de Carlos Tevez
Balthazar Murillo, un chico de 15 años, interpreta al crack de Boca en la serie "Apache", que se estrena hoy.

Soldano, la nueva apuesta de gol en Boca
"Mi desafío más grande", afirma. Debuta el domingo.

Tema del día • Nuevas medidas económicas

Eliminan IVA en alimentos, congelan cuotas UVA y habría cambios de Gabinete

El Gobierno continuó con los anuncios para contener el impacto de la devaluación. Dispuso quitar los el impuesto del 21% a aceites, azúcar, leche, arroz y huevos, entre otros. Además quedará sin efecto el ajuste por inflación de las cuotas de créditos hipotecarios UVA, que alcanzará a unas 100 mil familias. Anoche Macri evaluaba cambios en el Gobierno para potenciar las nuevas medidas. Uno de ellos sería el reemplazo del ministro de Hacienda Nicolás Dujovne.

Del Editor
Ricardo Kirschbaum
El diálogo y un atisbo de tregua

Todos juntos. En el CCK, con Vidal, Larreta, Carrió, Pichetto y el resto de la "tropa", Macri relanzó la campaña.

En busca de la mística perdida

Ante más de mil funcionarios de Nación, Provincia y Ciudad, Macri reconoció que la derrota del domingo fue "un palazo". Y arengó: "Por más que el poder actúa como si ya no estuviéramos más, acá estamos". Y dijo que hay 70 días para cambiar la historia.

DOCUMENTOS SENSIBLES
Nuevo ataque del hacker que filtró datos de la Federal

Publicó una imagen de la ministra Patricia Bullrich en su casa, con una amenaza: "Te estamos observando". Y también reveló documentación sobre el policía Luis Chocobar, procesado por el asesinato de un ladrón en La Boca. Había ingresado en la base de datos de la Policía Federal y publicado, en las redes sociales, datos personales de agentes y escuchas sobre investigaciones criminales. Ahora amenaza revelar datos de Defensa.

BAJÓ MÁS DE $ 2 Y CERRÓ A $ 59,71
Para Alberto F. el dólar a $ 60 está bien y no hay razón para que aumente

El candidato del Frente de Todos habló ayer del valor de la divisa y dijo que le parece razonable. Pidió al Gobierno que se preserven las reservas del Banco Central y reiteró que va a ayudar "todo lo que pueda". Si es necesario, agregó, se reunirá con el presidente Macri.

ADVERTENCIA A ALBERTO F.
Diosdado Cabello: "Que no vaya a creer que lo están eligiendo porque es él"

El número dos del chavismo se refirió al resultado de las PASO. "Es un pueblo que le dice no al neoliberalismo. No lo defraudes", señaló y dijo que el único que lo entendió fue Néstor Kirchner.

En espera. Promueve acuerdos básicos.

POR LA CRISIS
Lavagna suspendió la campaña y pidió que lo imiten

El candidato de Consenso Federal culpó a la extrema polarización y llamó al Gobierno a renegociar la deuda con el FMI.



TEVEZ LLEGA A NETFLIX
SE ESTRENA HOY APACHE, VIDA Y OBRA DE CARLITOS
ESPECTÁCULOS

VILLA LA ANGOSTURA
TRABAJAN CONTRA RELOJ PARA REABRIR LA RUTA 40
SOCIEDAD | Página 25

EMERGENCIA AÉREA
UN AVIÓN ATERRIZÓ EN RUSIA SIN RUEDAS NI MOTORES
EL MUNDO | Página 9

LA NACION

Viernes 16 de agosto de 2019

Macri eliminó el IVA de 14 alimentos y congeló las cuotas de los créditos UVA

ECONOMÍA. Alcanza a productos de la canasta básica, como leche, pan, yerba, harina y arroz; regirá hasta diciembre, igual que la suspensión del aumento de los préstamos hipotecarios

El presidente Mauricio Macri anunció ayer la eliminación transitoria del IVA para 14 productos de la canasta básica y la suspensión del aumento por inflación de los créditos hipotecarios UVA. Las dos nuevas medidas de emergencia, que regirán hasta diciembre, se sumaron a las de anteayer y tienen como objetivo contrarrestar los efectos de la devaluación.

Página 10

Dólar: cayó por primera vez desde las PASO

Influyó una medida del Central, para Fernández, $60 es un precio lógico

Página 11

Presión militar china a Hong Kong

HONG KONG (AP).- En la mayor escalada militar en la crisis por las protestas prodemocracia en Hong Kong, China movilizó ayer blindados y tropas a Shenzhen, frontera con la excolonia británica. "Nosotros queríamos cruzados de brazos si la situación empeora", advirtió el régimen, que concentró las fuerzas de la policía en Hong Kong en un estadio. El presidente Donald Trump se mostró "muy preocupado" por el riesgo de una violenta represión.

Página 2

Permitirán estacionar junto a algunas bicisendas

CIUDAD. Habrá una prueba piloto para que sea legal dejar el auto en calles anchas

Página 38

Filtraron archivos de la Federal sobre Chocobar

HACKEO. Expusieron los rechazos a su pedido de ingresar en la fuerza

Página 30

Además

EL MUNDO
Trump se tiene por loco
En vacaciones, no para de publicar en Twitter y participa de reuniones políticas. Página 6

SOCIEDAD
Musticar, de festejo
La feria de gastronomía cumple diez años. Página 28

ESPECTÁCULOS
Todo es historia
Un alemán de bicicletas de madera celebra su viaje de Buenos Aires.

Ejecutaron a tres hombres en un búnker de drogas

NARCOTRÁFICO. Por el triple crimen en la capital santafesina, detuvieron a un sospechoso. Página 33

Devaluación. Cómo se protegen los clubes

La crisis de 2018 alertó al fútbol, que ahora pone topes en los pocos contratos en dólares

Los clubes del fútbol argentino notaron esta semana después de tantas malas experiencias y se protegieron ante eventuales problemas financieros, según los nuevos de la economía nacional. La mayoría de las instituciones tienen pocos contratos en dólares, solo reservados para los jugadores estrella, y las que los firmaron se reservaron cláusulas con un tope en la cotización.

Según pudo averiguar LA NACION, en general, los montos acordados están por debajo del fuerte repositamiento del tipo de cambio de los últimos días.

El impacto igual se siente en las tesorerías de las entidades. Será cada vez más difícil incorporar futbolistas de renombre también pretendidos en el exterior.

(b) **Media coverage of the VAT increase**



Notes: These pictures show the media coverage of the VAT removal (panel a) and VAT reintroduction (panel b) in the two main newspapers of Argentina. The left panels correspond to "Clarin" newspaper and the right panels to "La Nacion" newspaper. In both newspapers, the main news of the day discusses the VAT cut (panel a) and the regulated VAT reintroduction with capped price increases (panel b).

Figure A.3: Salience of the VAT holiday



Notes: These pictures illustrate the salience of the VAT holiday in supermarkets. The top left panel shows a banner displayed at the entrance of a store informing the 13 products that now face a temporary 0% VAT rate. The bottom left panel shows a large banner inside a store informing that more than 1,900 products (within the 13 treated categories) now face a temporary 0% VAT rate. The two right panels show mandatory tags that supermarkets had to display next to treated products.

Figure A.4: Salience of the monitoring app "Precios Claros"



Notes: These pictures illustrate the salience of the monitoring app "Precios Claros" launched by the government in 2016. The top left panel shows the front page of one of the main newspapers in Argentina informing that the government launched a monitoring system for consumers to control prices in supermarkets. The bottom left panel shows the official webpage where consumers can consult any price in any store of Argentina. The bottom right panel shows an example of how the query looks like. The top right panel shows that the same information can be accessed through an app.

Figure A.5: Geographic variables in the data

(a) **Large chains**

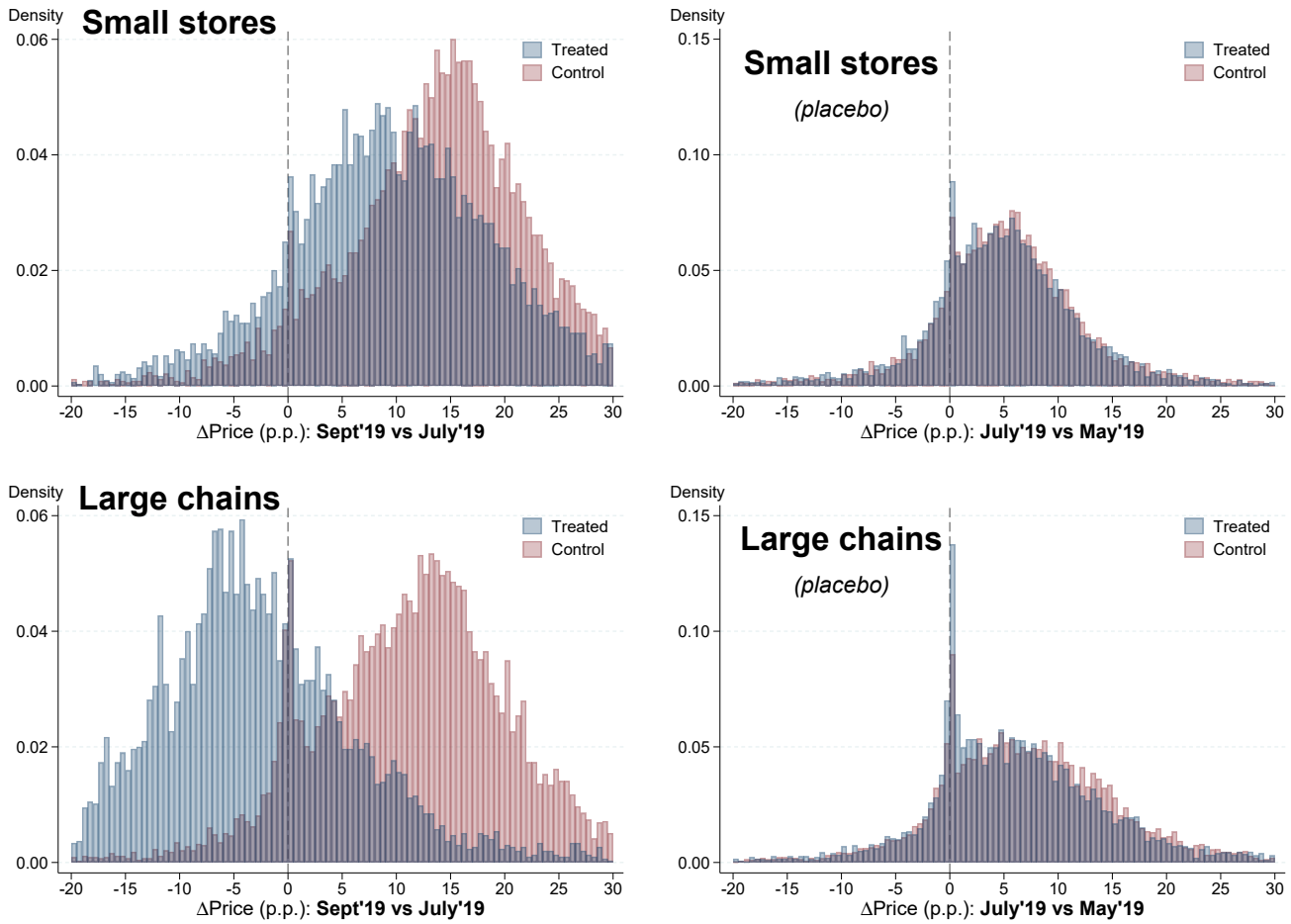
GBA	CAPITAL FEDERAL		Capital Federal
	PERIFERIA		Suburbio Norte, Suburbio Sur, Suburbio Oeste
INTERIOR	BS. AS. RESTO		Pcia Bs As NO incluídas en la periferia
	CORDOBA		Pcia Córdoba
	ANDINA	CUYO	Pcias Mendoza, San Juan, San Luis
		NOA	Pcias Tucumán, Catamarca, Jujuy, La Rioja, Salta, Santiago del Estero
	LITORAL	LIT NORTE	Pcias Corrientes, Chaco, Formosa, Misiones
		LIT SUR	Pcia Santa Fe y Entre Ríos
	SUR		Pcias La Pampa, Neuquen, Río Negro
	AUSTRAL		Pcias Chubut, Santa Cruz, Tierra del Fuego

(b) **Small independent stores**

GBA	GBA	Capital Federal, Suburbio Norte, Suburbio Sur, Suburbio Oeste
INTERIOR	BS. AS. RESTO + SUR	Pcia Bs As NO incluídas en la periferia + Pcias La Pampa, Neuquen, Río Negro, Chubut, Santa Cruz, Tierra del Fuego
	CORDOBA	Pcia Córdoba
	ANDINA	Pcias Mendoza, San Juan, San Luis, Tucumán, Catamarca, Jujuy, La Rioja, Salta, Santiago del Estero
	LITORAL	Pcias Corrientes, Chaco, Formosa, Misiones, Santa Fe y Entre Ríos

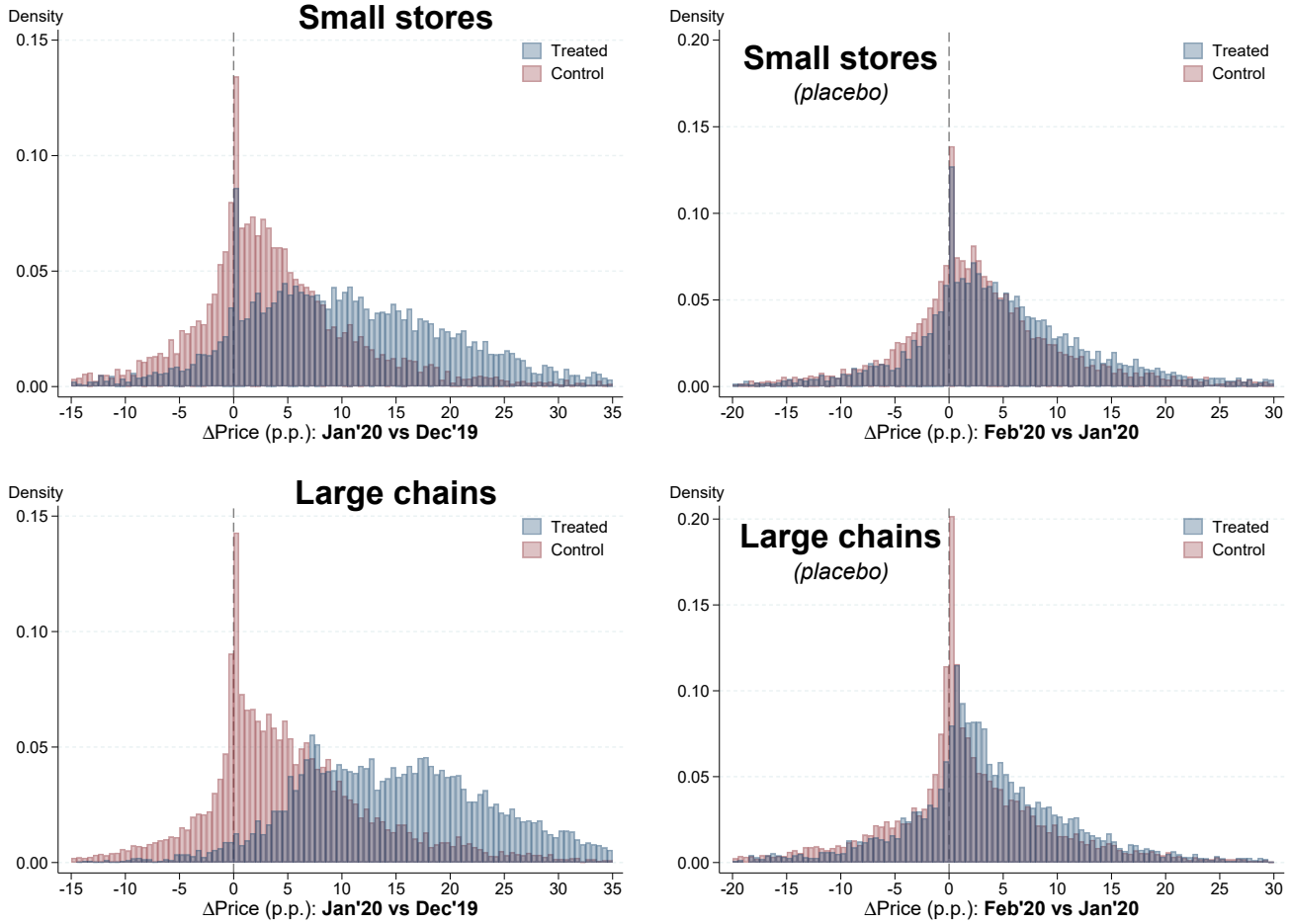
Notes: This figure shows the structure of our geographic variables in our databases. Overall, stores can be located in Gran Buenos Aires (GBA) or the rest of the country (Interior). Within GBA, they can be in the capital of Argentina (Capital Federal) or the rest of GBA area (Periferia). The Interior of the country is classified into: the rest of the province of Buenos Aires (BS AS Resto), Cordoba, Andina region (further split into Cuyo and Northwest NOA), Litoral region (north and south), South, and Austral.

Figure A.6: Distribution of price changes in small and large stores (VAT cut)



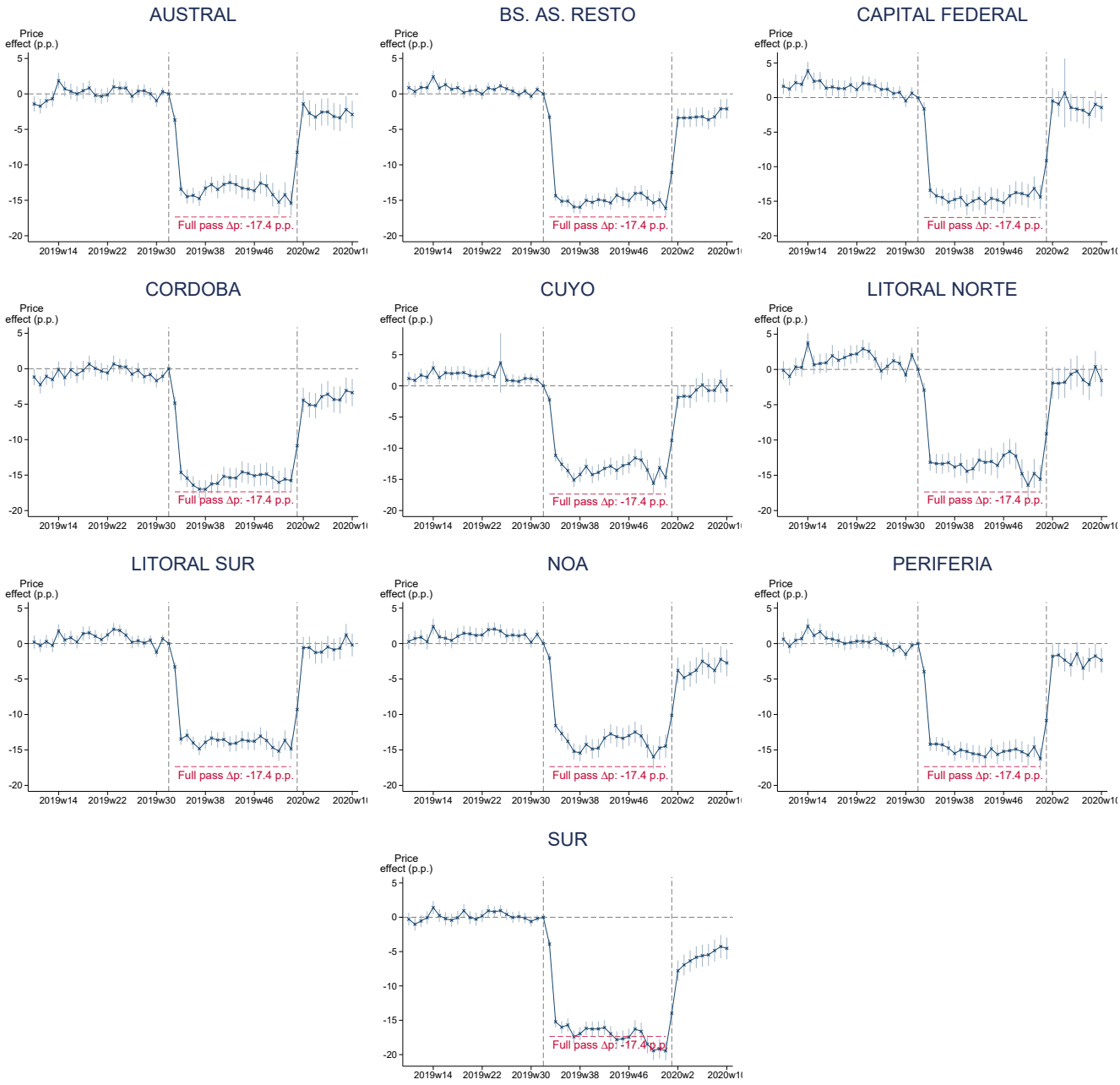
Notes: This figure shows the distribution of price changes in small and large stores for treatment (blue area) and control goods (red area) before and after the VAT was removed. The top left panel compares prices in September and July 2019 for small stores. The bottom left panel repeats this for large chains. We omit August because it is partially treated due to the timing of the reform. The right panels show a placebo exercise that compares prices between July and June 2019, before the VAT changed.

Figure A.7: Distribution of price changes in small and large stores (VAT reintroduction)



Notes: This figure shows the distribution of price changes in small and large stores for treatment (blue area) and control goods (red area) before and after the VAT was reintroduced. The top left panel compares prices in January 2020 and December 2019 for small stores. The bottom left panel repeats this for large chains. The right panels show a placebo exercise that compares prices between February and January 2020, after the VAT was reintroduced.

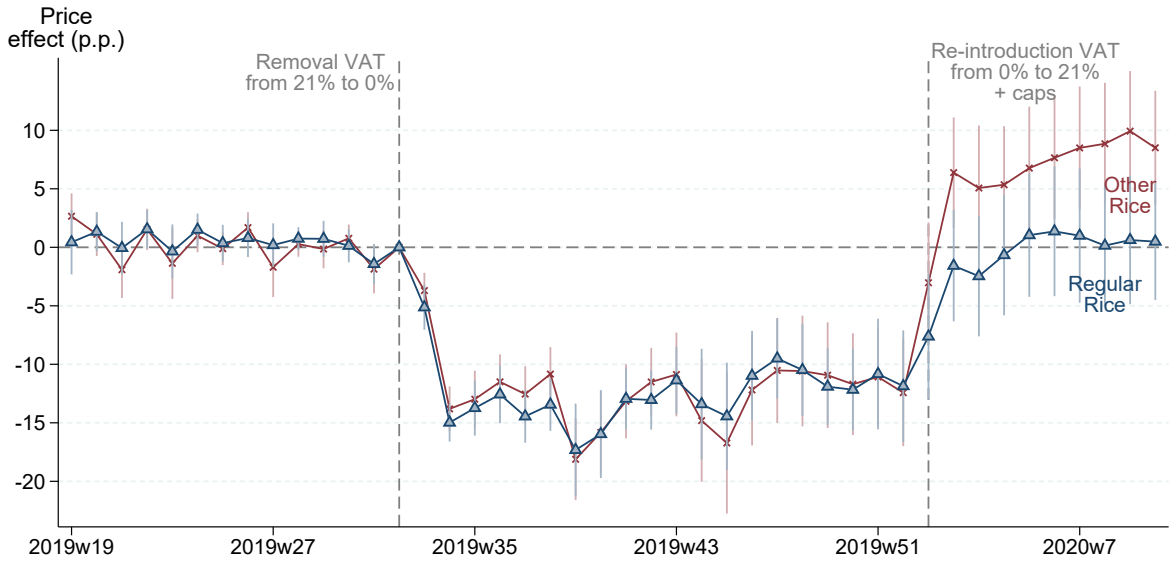
Figure A.8: Heterogeneities of pass-through rates by region



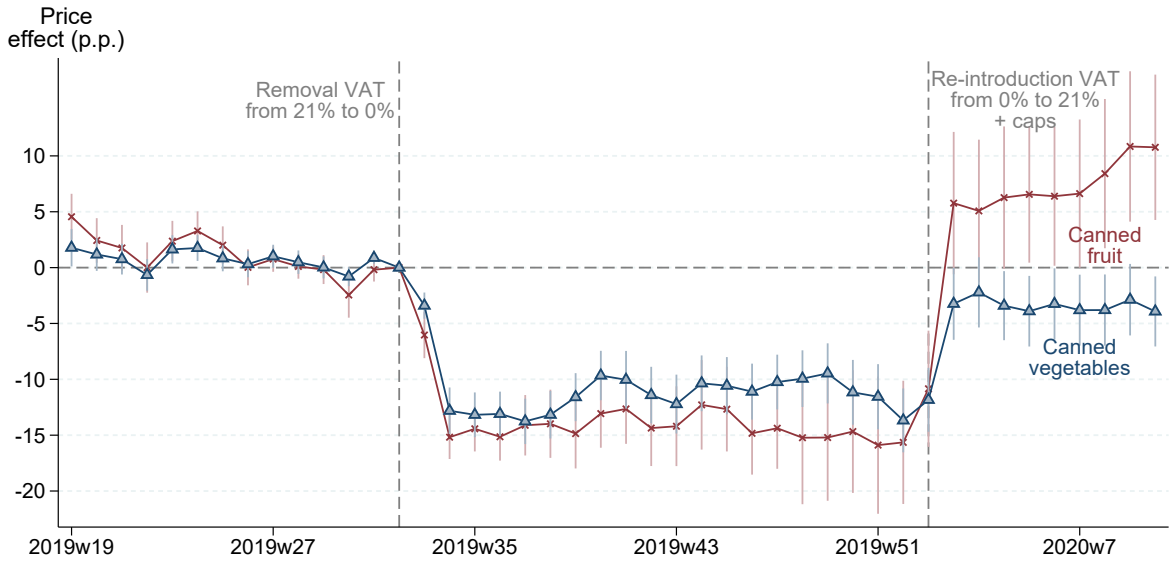
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) before and after the VAT cut and its subsequent repeal in large chains. We split the sample into 10 areas as described in Figure A.5 and re-estimate the price response to the VAT cut and subsequent hike separately for each of them.

Figure A.9: Regulated VAT increase with capped pass-through rates

(a) **7% cap (regular rice) versus no cap (other rice)**

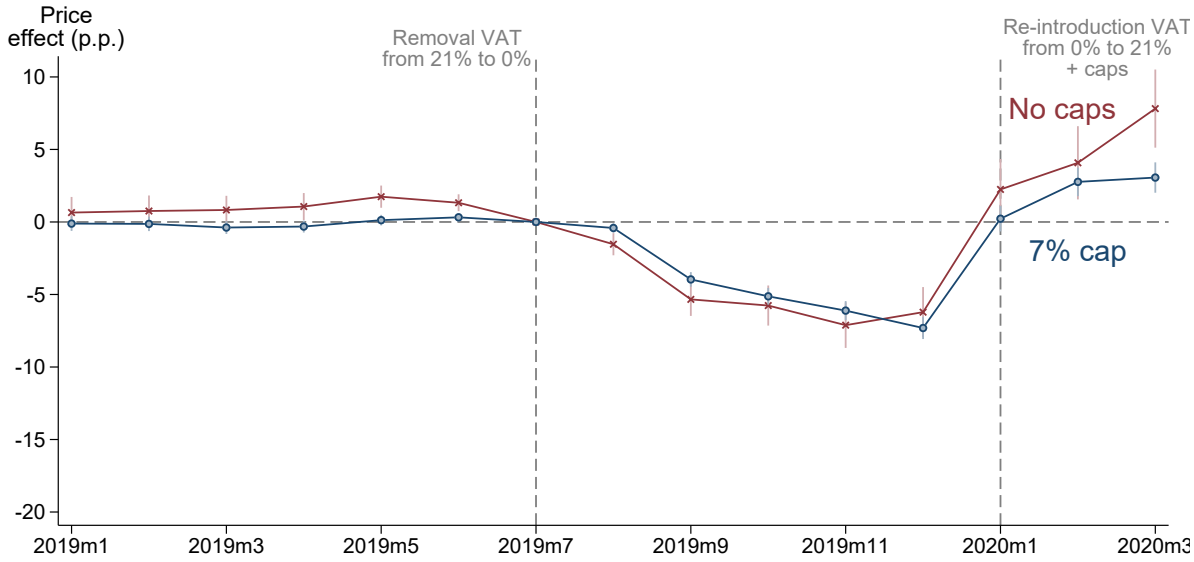


(b) **7% cap (canned vegetables) versus no cap (canned fruit)**



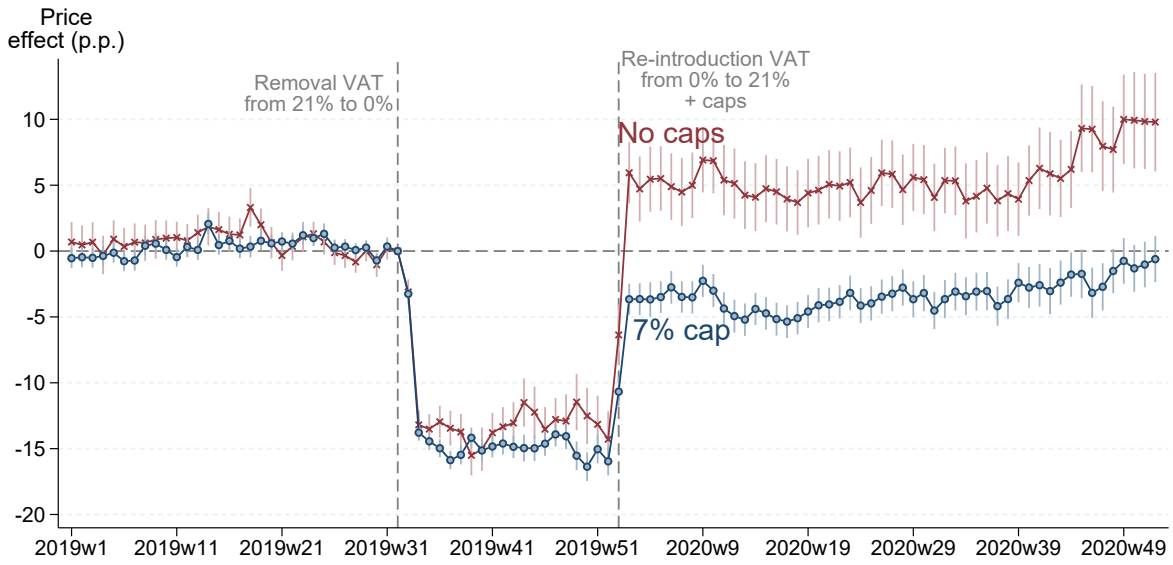
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) in large chains before and after the VAT cut and its subsequent repeal. We break down the list of barcodes from the treatment group into food categories that are subject to a capped price increase and food categories with no cap in their price increase (i.e., green light to flexibly increase prices). We compare each group relative to food products in the original control group. For a list of the different caps across categories see Table 2. The dependent variable is the price of each barcode normalized to 100 in the week before the VAT was cut. Panel (a) compares the change in prices for regular rice products subject to the 7% price increase cap and other rice products that are fully flexible (relative to the original control group). Panel (b) compares the change in prices for canned vegetables subject to the 7% price increase cap and canned fruit that are fully flexible (relative to the original control group). The first vertical dashed line indicates the time when the VAT was decreased to 0% for goods in the treatment group. The second vertical dashed line indicates the time when the VAT was reinstated at 21% for goods in the treatment group with differential caps in the allowed price increase.

Figure A.10: Do independent supermarkets comply with the capped pass-through rates despite not being subject to them?



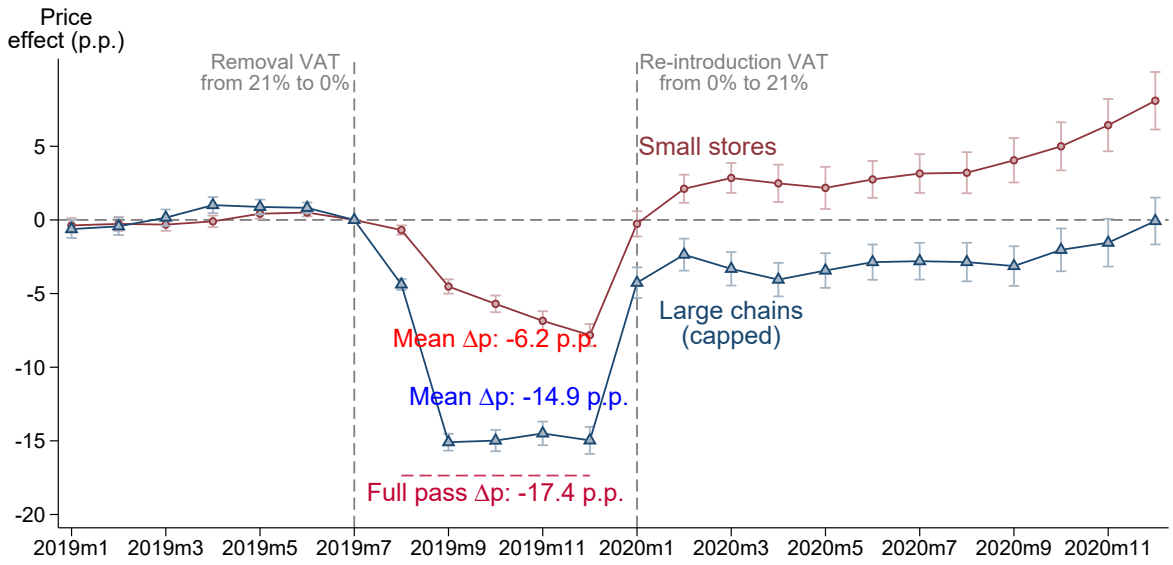
Notes: This figure shows that the prices of zero-rated goods with and without caps respond similarly in small independent supermarkets when the VAT was reinstated at 21%. Unlike large supermarket chains, in this case the government did not impose differential caps in the allowed price increase when the VAT was reinstated. The figure displays the results of our dynamic difference-in-differences specification (1). We followed the same strategy as explained in Figure A.11.

Figure A.11: Regulated VAT increase with capped pass-through rates (2019w1 to 2020w52)



Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) in large chains before and after the VAT cut and its subsequent repeal. We break down the list of barcodes from the treatment group into food categories that are subject to a capped price increase and food categories with no cap in their price increase (i.e., green light to flexibly increase prices). We compare each group relative to food products in the original control group. For a list of the different caps across categories see Table 2. The dependent variable is the price of each barcode normalized to 100 in the week before the VAT was cut. This figure extends the horizon of Figure 7 up to the end of the year 2020.

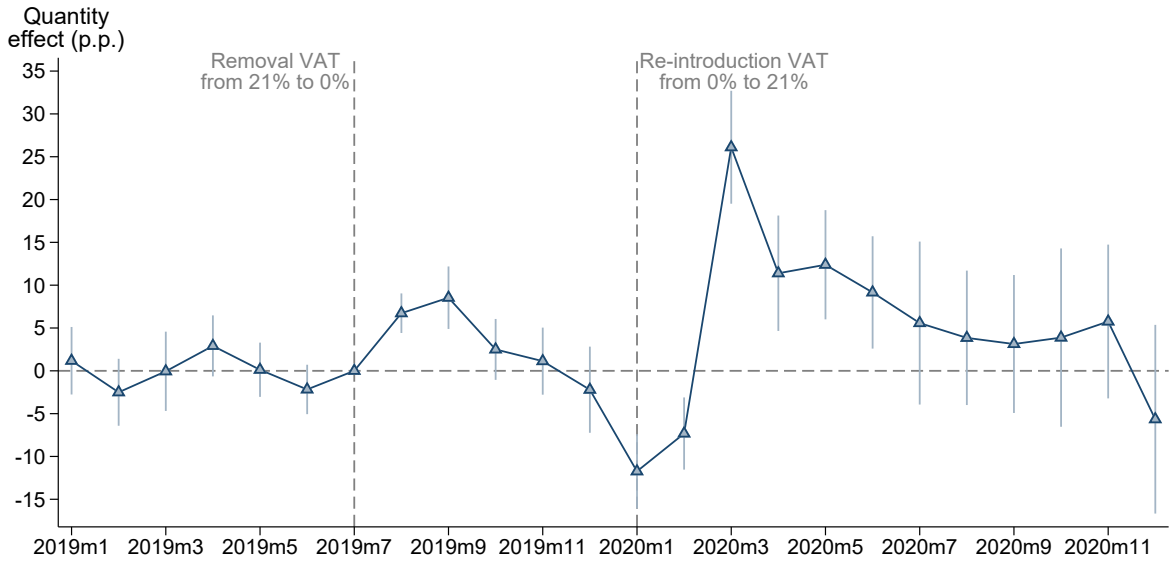
Figure A.12: Price effects in small and large stores in the longer run (hysteresis)



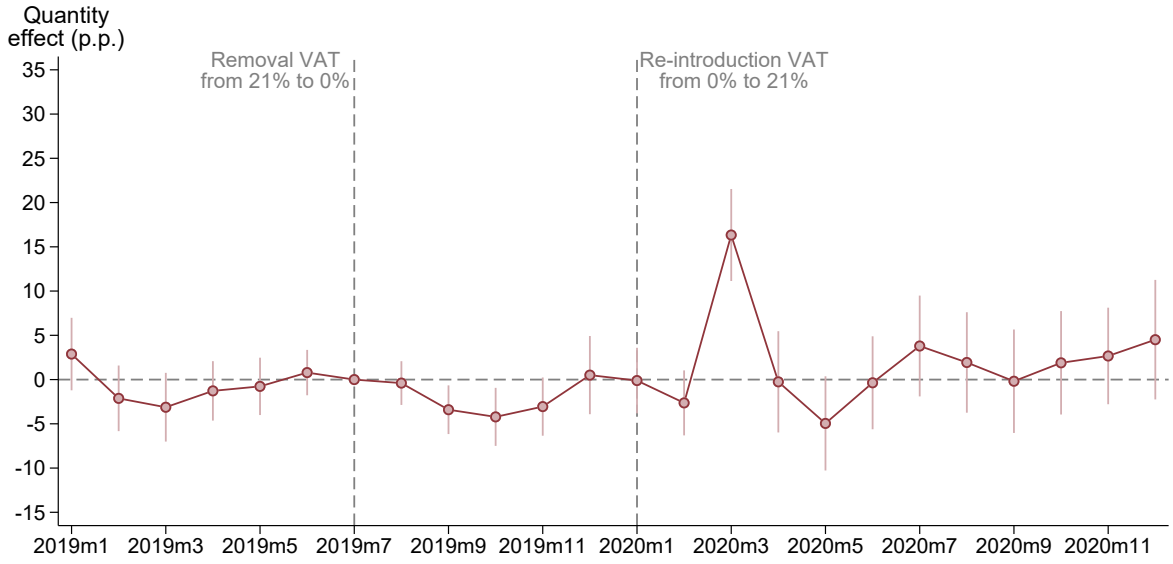
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) before and after the VAT cut and its subsequent repeal. We group barcodes into treatment and control as shown in Table 1. The dependent variable is the price of each barcode normalized to 100 in the week or month before the VAT was cut. The first vertical dashed line indicates the time when the VAT was decreased to 0% for goods in the treatment group. The second vertical dashed line indicates the time when the VAT was reinstated at 21% for goods in the treatment group with differential caps in the allowed price increase. The red dashed line indicates the hypothetical situation with full pass-through to prices [(1-1.21)/1.21 x 100 = -17.4%]. This figure extends the horizon of Figure 4b up to the end of the year 2020.

Figure A.13: Quantity effects in large and small stores including COVID-19 outbreak period

(a) **Large chains**

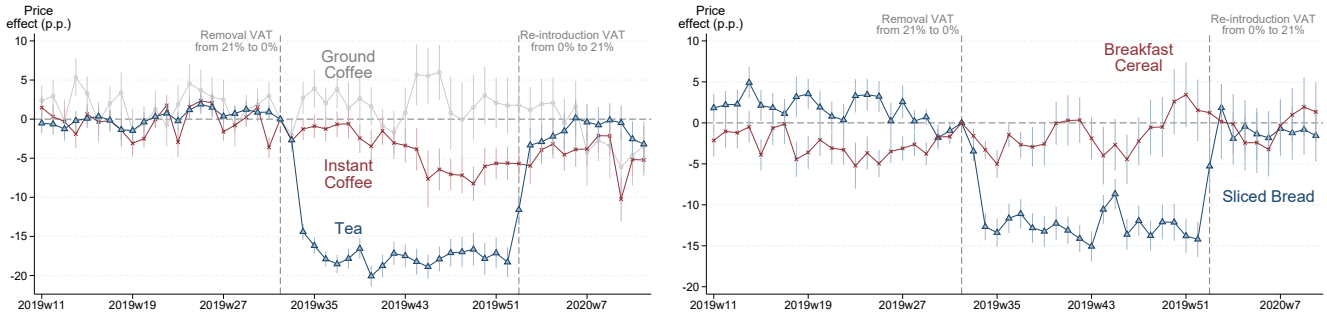


(b) **Small stores**



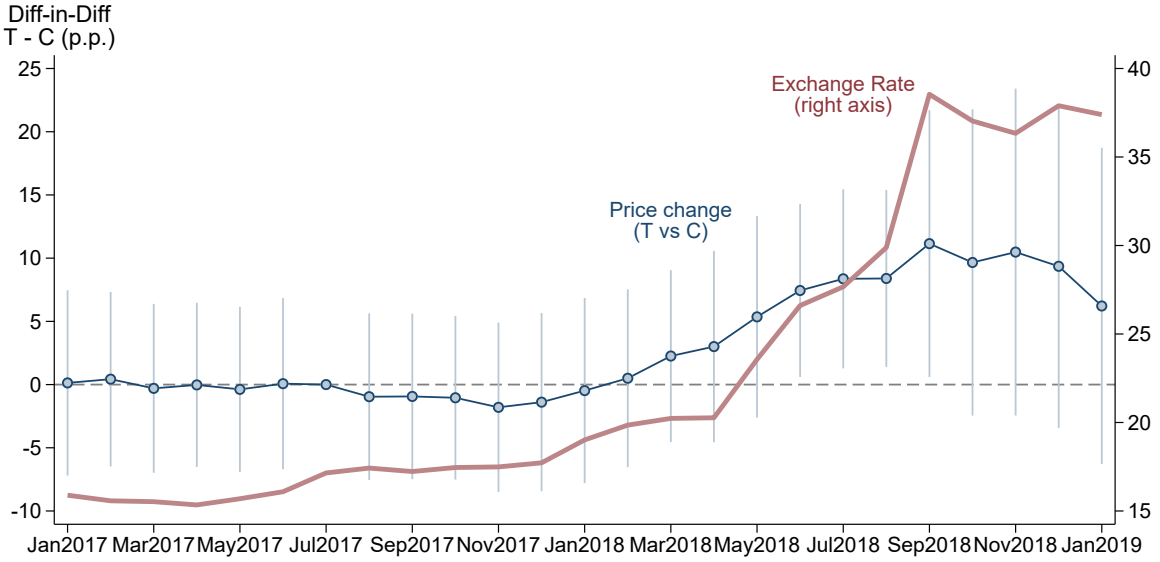
Notes: This figure shows the quantity effects of estimating the dynamic difference-in-differences specification (1) before and after the VAT cut and its subsequent repeal. We group barcodes into treatment and control as shown in Table 1. The dependent variable is the quantity sold of each barcode normalized to 100 in the week before the VAT was cut. The analysis is done for large supermarket chains. The first vertical dashed line indicates the time when the VAT was decreased to 0% for goods in the treatment group. The second vertical dashed line indicates the time when the VAT was reinstated at 21% for goods in the treatment group with differential caps in the allowed price increase. The consumption spike in March 2020 captures the stockpiling behavior when the COVID-19 pandemic broke out.

Figure A.14: The extent of substitutability in the control group (case studies)



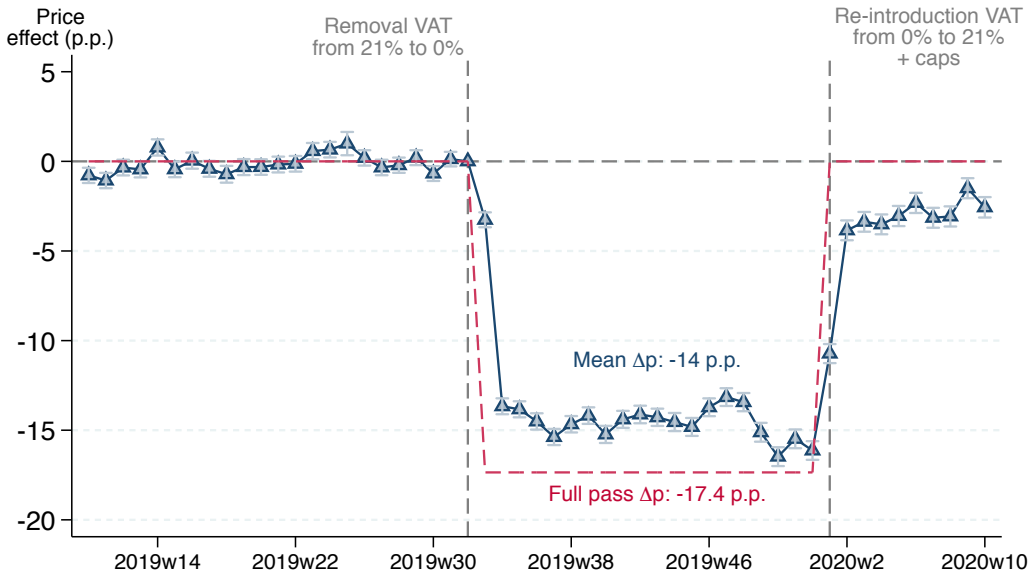
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1). We focus on specific treated goods (T) and related goods vis-a-vis the remaining categories in the control group. The left panel estimates the price change for barcodes in tea (T), instant coffee (C), and ground coffee (C). The right panel estimates the price change for barcodes in sliced bread (T) and breakfast cereal (C) relative to the rest of the control goods.

Figure A.15: Pass-through of the 2018 peso depreciation using aggregate data from INDEC



Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) using official aggregate price data from INDEC. The pink line displays the nominal exchange rate between the Argentine peso and the US dollar (right axis). The blue line shows the percentage change in prices relative to week 1 of 2018 between treated and control goods as classified in Table 1 (for the categories available in the basket used to construct the CPI).

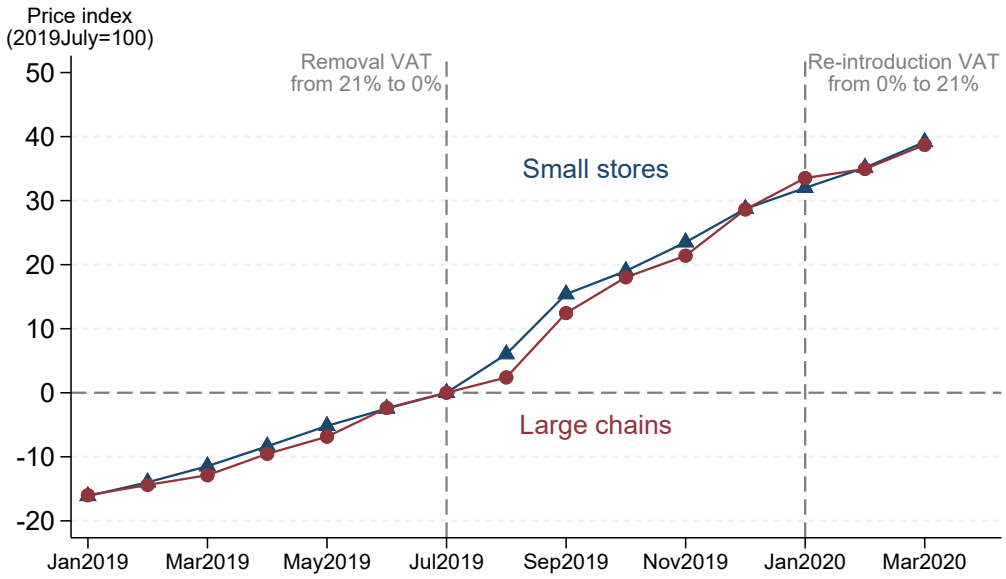
Figure A.16: Excluding imported goods



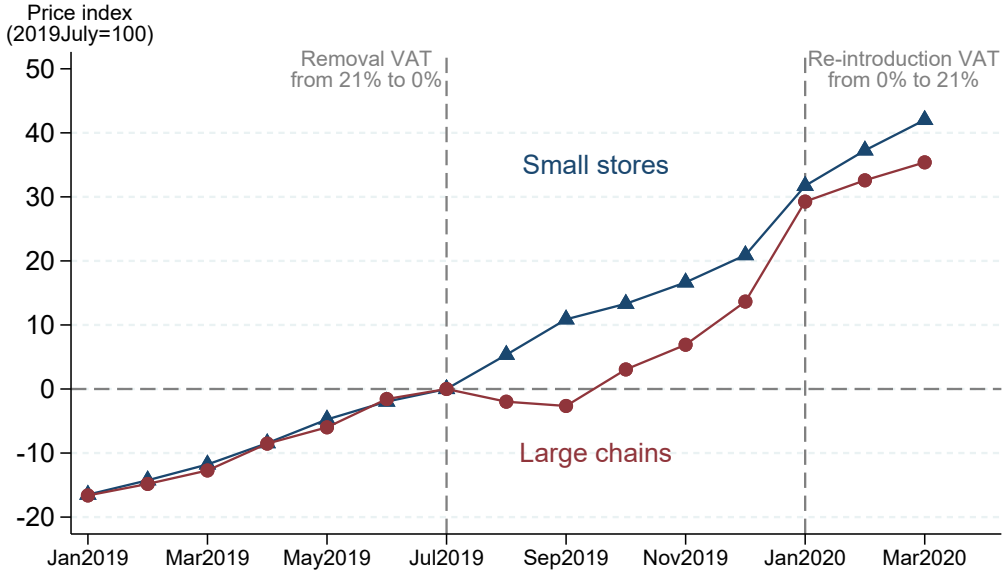
Notes: This figure shows the results of estimating the dynamic difference-in-differences specification (1) before and after the VAT cut and its subsequent repeal in large chains. In particular, we restrict the estimation sample to those goods that are locally produced and thus are less subject to the large depreciation that happened in mid August 2019. Considering the full estimation sample, only ten percent are not locally produced and, interestingly, this percentage is equally split in treated and control goods.

Figure A.17: Price levels before and after the VAT cut and hike (by treatment status)

(a) **Control goods**

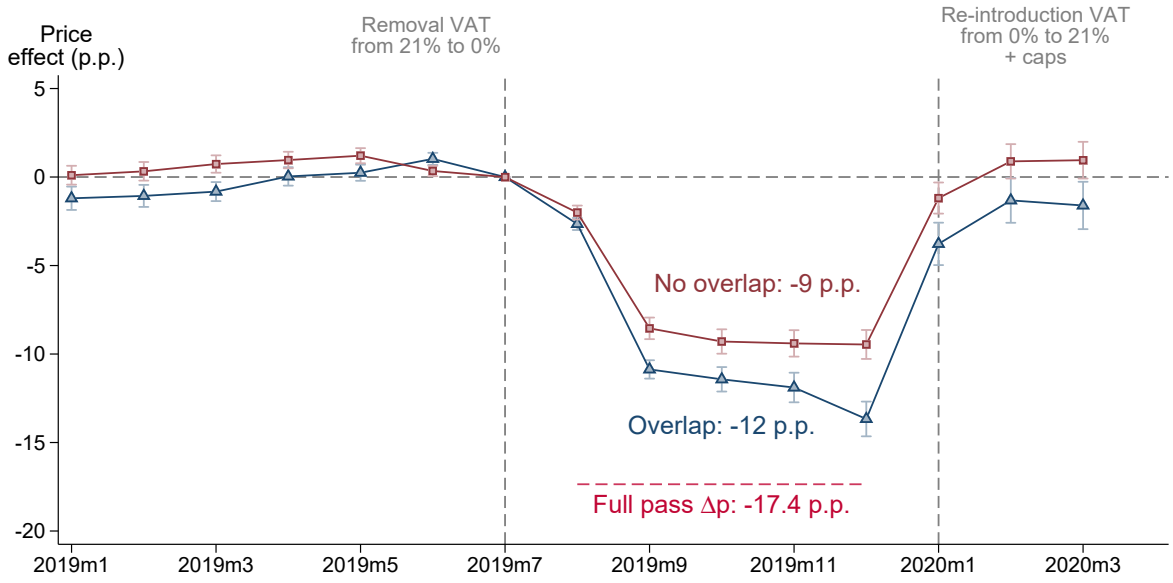


(b) **Treated goods**



Notes: This figure plots the unconditional mean of the average price level for control and treated food products separately before and after the VAT cut and its subsequent repeal. In each case, we normalize every barcode series to 100 in the month before the VAT cut was implemented. Panel (a) corresponds to control goods while panel (b) treated goods in large chains and small independent stores with retail scanner data collected at the monthly level.

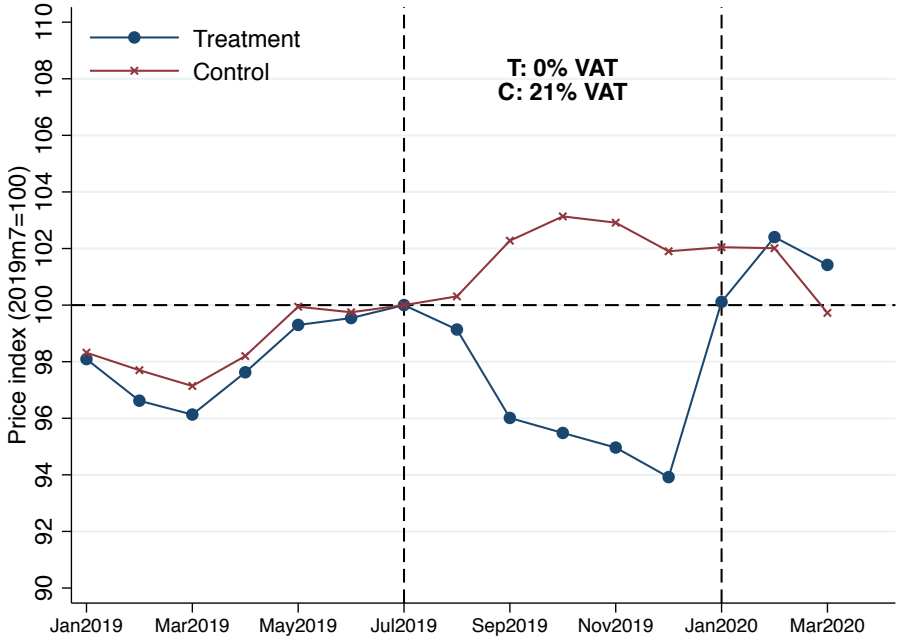
Figure A.18: Price levels for barcodes sold in both small and large stores (overlap) versus barcodes sold in either small or large stores (no overlap)



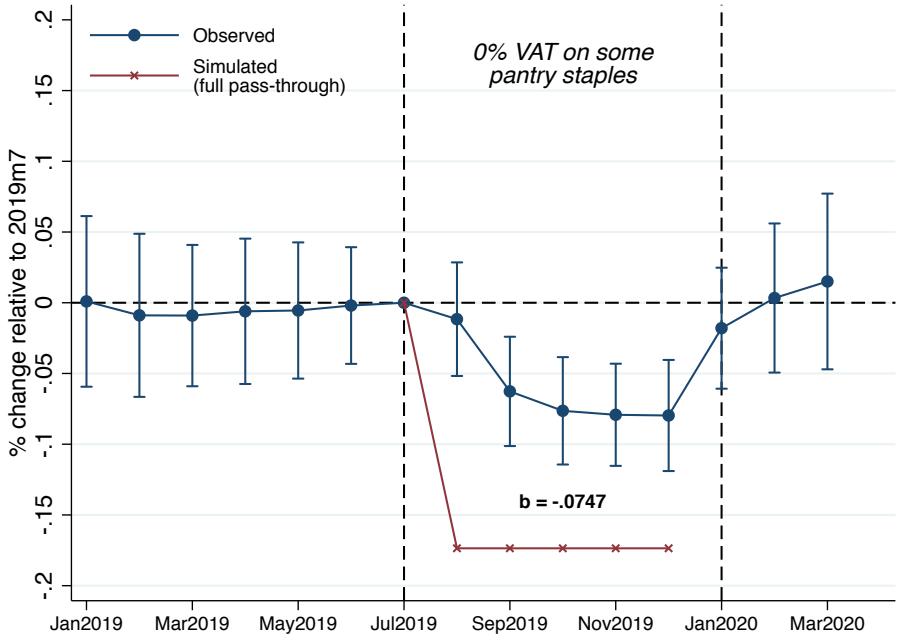
Notes: This figure pools chain and independent supermarkets and breaks down pass-through rate estimates for goods at the barcode level that are sold in both types of supermarkets versus goods that are sold in either one of them but not both. Presumably, goods that are sold in both supermarket and independent chains will be more competitive, probably leading to higher pass-through rates of the VAT cut.

Figure A.19: Partial pass-through to consumer prices (macro series)

(a) **Levels**



(b) **Difference-in-differences**



Notes: This figure replicates our main result using aggregate price series from the National Institute of Statistics and Census (INDEC). Panel (a) shows the evolution of the average CPI for categories in treatment (temporary 0% VAT) and control (standard 21% rate) groups. We normalize each time series to 100 in July 2019. Panel (b) shows the evolution of the coefficient β_t from the dynamic difference-in-differences specification $P_{it} = \alpha_i + \gamma_t + \sum_{t \neq 2019m7}^{2020m5} \beta_t D_{it} + \epsilon_{it}$, where D_{it} is an indicator that denotes whether a product is treated in month t. All coefficients test the effect relative to July 2019. Note that INDEC gathers these data from large and small grocery stores to construct the CPI used to measure inflation. Hence, the pass-through effect captures a weighted average comparable to that of Figure 2b.

Table A1: Point estimates (large chains, weekly data)

	VAT removed	VAT reinstated
(a) Baseline sample		
Average price change	-14.7***	-2.7***
(w.r.t. 2019 week 32)	(0.4)	(0.6)
Observations	2,541,535	2,541,535
Barcodes in T	2,032	2,032
Barcodes in C	2,613	2,613
Pass-through rate	84%	81.3%
(b) Excluding substitutes in the control group		
Average price change	-15.2***	-3.4***
(w.r.t. 2019 week 32)	(0.45)	(0.63)

Notes: This table presents the point estimates of the pass through using weekly data for large chains. In particular, the specification pools the individual coefficients identified by the original equation (1) in the following way: $P_{it} = \alpha_i + \gamma_t + \delta W_{it} + \beta W_{it} \cdot Post_{it} \cdot Treat_{it} + \epsilon_{it}$, where W_{it} refers to the *window* of interest. In the first column, *window* goes from the last week before the VAT cut (week 32 of 2019) to the last week of December 2019. In the second column, the *window* variable equals one for week 32 of 2019 or for the first ten weeks of 2020. The table presents the β coefficient which measures the change in prices relative to the pre-reform week. The bottom panel (b) shows the point estimates of the exercise that excludes close substitutes from the control group.

Table A2: Price changes in the region Periferia with alternative control groups (large chains)

	VAT removed	VAT reinstated
(a) Food products in the control group		
Average price change	-15.1***	-2.2***
(w.r.t. 2019 week 32)	(0.62)	(0.84)
Observations	297,712	297,712
Pass-through rate	87%	84.8%
(b) Non-food products in the control group		
Average price change	-15.7***	-4.1***
(w.r.t. 2019 week 32)	(0.60)	(0.88)
Observations	340,662	340,662
Pass-through rate	90%	85.9%

Notes: This table presents the point estimates of the pass through using weekly data for large chains in the region *Periferia*. Panel (a) repeats our main regression (1) using food products in treatment and control. Panel (b) uses the same treatment group but excludes food items from the control. By comparing food items subject to 0% VAT rate to non-food items taxed at 21%, we can assess how problematic substitution is in our main specification.

Table A3: Point estimates (various)

	Removal VAT	Re-introduction VAT
(a) Without imported goods		
Average price change	-14.6***	-2.9***
	(0.1)	(0.2)
Observations	2,513,245	2,513,245
(b) No cap		
Average price change	-12.6***	6.4***
	(0.3)	(0.4)
Observations	1,785,618	1,785,630
(c) Cap 7%		
Average price change	-15.3***	-3.2***
	(0.1)	(0.2)
Observations	2,549,751	2,549,767
(d) Macro series (INDEC)		
Average price change	-0.074***	0.014
	(0.017)	(0.019)
Observations	544	544

Notes: This table presents the point estimates of the pass through using weekly data for different type of goods. In particular, the proposed specification for this table, pools the individual coefficients identified by the original equation (1) in the following way: $P_{it} = \alpha_i + \gamma_t + \delta W_{it} + \beta W_{it} \cdot Post_{it} \cdot Treat_{it} + \epsilon_{it}$, where W_{it} refers to the *window* of interest. The table presents the β coefficient which measures the change in prices relative to the pre-reform week. We focus on four different samples: (a) Removing imported goods, (b) goods not subject to the cap in the re-introduction of the VAT, (c) goods subject to the 7% cap and (d) using the official macro price indices instead of the scanner micro-data.