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Heterogeneous effects of SSB taxes: Evidence from Spain *

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Abstract

We study the effects of taxation on sugar-sweetened and edulcorated beverages by using a natural experiment in Spain: in 2021 an increase in the Value Added Tax (VAT) was introduced in all regions except for three. These regions serve as a control, offering a unique opportunity in the literature for two reasons, the guarantee of avoiding cross-border consumer movements due to their geographical location, and the availability of a household database with a rich set of characteristics. We find a pass-through of the tax slightly above 100% and a fall in consumption of 14% among the poorest tertile of households, more pronounced among those with children. We also find suggestive evidence of a significant reduction in spending on unhealthy complementary goods among the first tercile households. However, the remaining households did not react to the tax by reducing either their consumption of soft drinks or their spending on complementary goods.

Keywords: sugar-sweetened beverages, tax, consumption, complementary

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1 Introduction

Taxation to correct negative externalities in consumption has a long tradition in economic history. However, it is only in the last decades that such taxes have started to be levied on sugar-sweetened beverages, mostly in high-income countries. Although the empirical literature analysing this type of taxes is recent, a good number of studies have already begun to accumulate around three key issues of this policy: the pass-through of the tax to prices, its effect on consumption, and its distributive effect. The results so far have been very heterogeneous so far. For example, in the literature review carried out by Cawley et al. (2019b), the range of pass-through of these taxes to final prices varies between 43% and 100%, depending on the case. For demand elasticities, Andreyeva et al. (2010) estimates, based on fourteen studies, an average aggregate elasticity of -0.74 and a range of variation from -0.13 to -3.18. In another meta-analysis, Powell et al. (2013), obtains higher elasticities of the order of -1.21. Partly because of the heterogeneity of results in the literature, the design of this type of taxes to correct the negative externalities of sugar-sweetened beverages is still an open debate. Por example, authors such as Sharma et al. (2014) favour volumetric taxes, both for efficiency and equity reasons, although these are not without problems, including potential demand-side substitution effects, as will be discussed in more detail in the literature review.

In January 2021, an increase in Value Added Tax (VAT) on sugar-sweetened and edulcorated beverages from the reduced rate of 10% to the general rate of 21% came into effect in Spain. This measure has two particular features. Firstly, it does not only apply to sugar-sweetened beverages; *zero* products were also affected by the policy as edulcorated beverages were also included. Secondly, sugar-sweetened or edulcorated beverages consumed in bars or restaurants were excluded from the increase. This situation allows us to study the effect of taxation on the negative externalities of sugar-sweetened beverage consumption, addressing a growing concern in the literature: the substitution effect between sugar-sweetened and edulcorated beverages. For example, in the case of Catalonia, a spanish region, Castelló and Casasnovas (2020) and Puig-Codina et al. (2021) identify a significant substitution effect between sugar-sweetened and edulcorated beverages, which experienced different price increases as a

consequence of the tax design. By applying the VAT increase over the entire range of sugar-sweetened or edulcorated beverages, this policy provides a novel case study on the consequences of expanding the list of goods on which the tax is levied.

Our empirical strategy uses the fact that three regions, the Canary Islands and the autonomous cities of Ceuta and Melilla have their own indirect taxes: the Canary Island General Indirect Tax (IGIC) and the Tax on Production, Services, and Imports (IPSI) respectively, so that households in these territories did not experience any increase in the tax burden on sugar-sweetened and edulcorated beverages. Using these three regions as a control group, and thanks to the short notice of the announcement of the measure (October, 2020), we establish the causal effects of the tax on prices, consumption and household spending. The geographic location of these three regions, isolated from the rest of the spanish territort by the sea, prevents any movement of consumers across the border, something that has been a major concern in previous studies such as (Cawley et al., 2019a), (Cawley and Frisvold, 2015) and (Capacci et al., 2019).

To conduct the analysis, we use microdata from the Household Budget Survey (HBS) for the years 2017 to 2021, a rich annual household survey that provides detailed information from a representative sample of around 20,000 Spanish households, including their spending on a large number of groups of goods and services, which allows us to identify very clearly the effect of the tax on different categories of affected products. Firstly, we find that the degree of pass-through to prices of the VAT increase amounts to 112%, corresponding to an increase in the price per liter of soft drink of 13 cents, an increase of 11.25%. Using data corresponding to the Consumer Price Index (CPI), we reach an almost identical conclusion, with a pass-through close to 100%, concentrated in the month of January. In other words, the pass-through of the tax to prices was almost complete and occurred very quickly. We made additional estimates for other smaller groups of sugar-sweetened and edulcorated beverages, finding a degree of pass-through of over 100%, consistent with the findings of Bonnet and Réquillart (2013) for France.

On the other hand, we find that the effect of the tax on the amount of soft drinks consumed is very heterogeneous according to the household's economic capacity. For

households in the first tercile of equivalent expenditure, we find a negative and very significant effect amounting to 13 liters per household, which is equivalent to a drop in consumption of 14.2%. For the second tercile the result is negative, but not statistically significant and, for the third tercile, the coefficient is positive, but again, not significant. It should be noted that the results for the third tercile should be taken with caution since our control regions are relatively poor, which, added to their limited sample size, means that the representativeness of control households in the upper part of the distribution could be compromised.

In addition, we contribute to the literature by studying the heterogeneous effect of the tax by household composition, focusing on the differential effect of the tax on households with children of age to consume soft drinks. Our results indicate that among households with lower economic capacity (first tercile), the effect of the consumption tax was several times higher for households with children than for households without them. Specifically, we document a drop in consumption among poor households with children of 24 litres of soft drinks per household per year, compared to an average drop of 13 litres in the first tercile.

Finally, our paper studies an issue so far underrepresented in the literature: the possible spillover effects of these taxes on the consumption of complementary goods. To do so, we replicate our empirical strategy with the expenditure on soft drinks of the poorest households who, as we have documented above, are the only ones to reduce their soft drink consumption as a consequence of the tax. We find suggestive evidence that these households reduced their spending on snacks by almost the same proportion as they reduced their consumption of soft drinks, showing a fall of 9.7%. That highlights the importance of taking into account complementary goods in the impact assessment of taxes on sugary products.

The rest of the paper is structured as follows: section two contains a review of the literature, followed by an explanation of the institutional environment in which the policy is developed in section three, a detailed description of the methodology and the databases to be used in section four, a presentation and discussion of the results in section five, and a sixth section devoted to the main conclusions.

2 Literature review

The academic literature has studied in depth how taxes modify household consumption habits. In the case of indirect taxes, Arce (2022) finds a reduction in the consumption of Spanish households in response to an increase in the reduced VAT rate in 2012, especially in soft drinks, restaurants and hotels.

In recent years, different governments around the world have established levies on the price of sugar-sweetened beverages, under the hypothesis that the optimal tax burden is conditioned by the level of externalities produced by such goods as shown in Allcott et al. (2019). However, a broad review of the empirical evidence is essential to understand the results that have been found by multiple evaluations on taxes for sugar-sweetened beverages. In particular, the evaluations that study the effect of these taxes on prices and consumption, tend to find, a large increase in the average price per litre and a decrease in the consumption of these beverages.

In 2012, France was one of the first countries to introduce a tax on sugar-sweetened beverages, taxing these goods at 0.0716 euro per litre of soft drink (VAT excluded) or 0.0755 euro/L (VAT included). This policy affects soft drinks, diet soft drinks and juices with added sugar, excluding pure juices and mineral water. Seven years after the implementation of the tax, Capacci et al. (2019) study the effect of the policy on the price and consumption of the taxed goods. For that, they used the DiD estimator with France as the treatment group and two Italian regions as the control group. They use monthly data from the CPI of both countries, data from the italian HBS, and Kantar household consumption panel data for four neighboring regions, two French (2,928 households) and two Italian (400 households). However, given the authors' concern about possible cross-border movements, they estimate an alternative model using only French households. The authors find a pass-through to prices, of 66% and a consequent reduction in consumption of about half a litre per person per year.

Catalonia is a Spanish region that, in 2017, started to levy a tax on soft drinks with 5 or more grams of sugar per 100 millilitres. A tax of 0.08 €/L was established for those drinks that had between 5 and 8 gr/100ml and 0.12 €/L for drinks that exceeded

8gr/100ml, forcing the stablishments by law to pass on 100% of the tax to the final prices. Recently, (Castelló and Casasnovas, 2020) using sales data of supermarkets, find a reduction in the consumption of taxed beverages of 7.7%. (Royo-Bordonada et al., 2019), using a DiD approach with Madrid as a control group for Catalonia, estimate a 38% reduction in soft drink consumption and (Puig-Codina et al., 2021), with aggregate monthly data from the Ministry of Agriculture, and through the creation of a synthetic control, find a reduction in sugar-sweetened soft drinks of 12.1% and a 17% increase in diet soft drinks, which were not taxed. A similar tax to that of Catalonia was implemented in Portugal in 2017, where a tax of 0.08 euro/L was levied on sugar-sweetened and edulcorated beverages with less than 80 grams of sugar per litre and 0.16 euro/L for those soft drinks with more than 80 grams per litre. (Gonçalves and Pereira dos Santos, 2020) study this tax, that resulted in a 100% price pass-through and an 18% reduction in the consumption of sugar-sweetened beverages with less than 80 grams per litre.

Within Latin America, Mexico passed a 1 peso/litre tax on sugar-added beverages in 2014 with the goal of reducing overweight among its population. To study the effect of the tax on the price of soft drinks (Grogger, 2017) through the Consumer Price Index, findS a price increase of 1.32 pesos per liter throughout 2014, which is equivalent to a degree of tax pass-through of over 100%. In addition, (Aguilar et al., 2021) studies its effect on consumption and, although they find a reduction in consumption of sugar-sweetened beverages of 2.7%, part of that drop was offset by increased purchases of other unhealthy products not subject to the tax.

Several regions in the United States have introduced taxes on sugar-sweetened beverages over the past few years. The city of Berkeley, California, in January 2015, was the first to introduce a 1 cent per ounce tax on soda. Using sales data from all Berkeley supermarkets and a sample of San Francisco supermarkets (Cawley and Frisvold, 2015) found that prices rose 43.1% on average. It is worth mentioning that, for every extra mile of distance from San Francisco, the price increased by 25.8% to 33.3% depending on the size of the package. This again shows the importance of cross-border movements on the effectiveness of this type of taxation. Subsequently, in 2017 the city of Philadelphia taxed soft drinks at 1.5 cents per ounce. Cawley et al. (2019a) find a negative

effect on consumption of 8.9 ounces per purchase, while increasing out-of-town resident purchases. They also find a 97% pass-through of the tax to final prices and a 22% drop in child consumption of the taxed beverages.

Consumption of sugar-sweetened beverages increases the likelihood of being overweight and experiencing cardiovascular disease, diabetes, etc. Malik et al. (2013). The effect of taxes on these beverages on the body mass index of young people in Mauritius has been studied, with no effect found, but a negative effect on the probability of children consuming these types of beverages. In the same vein, they find no solid evidence that existing taxes reduce adult body weight and open the possibility that higher levels of taxation are needed to achieve this goal.

The review of the international literature presented in this section highlights two fundamental problems that the different authors are not able to completly solve. Derived from the use of supermarket sales data or aggregated purchasing panels, the previous works cannot verify that consumers are not moving to other jurisdictions to make their purchases and, in addition, it is not usual to have socio-demographic information on consumer households. The case of Spain is unique in that the control group we use are regions separated from the spanish peninsula by the Mediterranean Sea and the Atlantic Ocean, thus solving the problem of border movements. Finally, the data used has household socio-demographic information for both the treatment and control group, this will allow us, by conducting a heterogeneity analysis, to better understand which households react to the tax and why.

Table 1: Sumary of existing literature

Article	Region	Tax	Incluye diet drinks ?	Design	Prices	Consumption
Castelló and Casasnovas, 2020	Catalonia 2017	5-<8 gr/100ml : 0.08 euros >8 gr/100ml : 0.12 euros	No	DiD	100%	-7.7%
Royo-Bordonada et al., 2019				DiD	100%	-38%
Puig-Codina et al., 2021				DiD	100%	-12.1%
Capacci et al., 2019	France, 2012	0.0716 euros por Litro	Yes	DiD	66%	0.5L per capita.
Gonçalves & Dos Santos, 2020	Portugal, 2017	<80 gr/L : 0.08 euros >80 gr/L : 0.16 euros	Yes	DiD	100%	-18%
Grogger, 2017	Mexico, 2014	1 peso por litro	No	DiD	132%	-
Cawley & Frisvold, 2015	Berkeley, 2015	1 centavo por onza	No	DiD	43.1%	-
Cawley et al, 2019	Philadelphia, 2017	1.5 centavos por onza	Yes	DiD	-	-8.9 onzas por compra
Seiler et al., 2021				DiD	97%	-22%

Note: Authors' own elaboration

3 Data and Institutional setting

3.1 Database

To perform the analysis, we have microdata from the Household Budget Survey (HBS), an annual survey published by Spain's National Statistics Institute (INE), which collects very detailed spending information from a representative sample of Spanish households. The region of Catalonia implemented its own excise tax on sugar-sweetened beverages in 2017, which was subsequently increased in 2019. For this reason and to avoid a downward bias in our estimates we exclude households from this region from the sample, although their inclusion does not alter our main results. The HBS also provides information on the composition of the household, its characteristics, members, type of housing and tenure regime. In addition, it includes a number of characteristics of the main breadwinner, such as employment, country of birth, nationality and age, among others.

With respect to the different expenditure groups, we will focus on the analysis of the group corresponding to code 01222 "Carbonated and non-carbonated soft drinks", which is the largest group of goods, related to sugar-sweetened and edulcorated beverages, in terms of expenditure, and which contains the highest share of goods affected by the VAT increase. Even so, in the annex we study the effect of broadening the definition of sugar-sweetened and edulcorated beverages by including other minor expenditure codes such as energy and isotonic drinks, which do not alter the main conclusions of the paper.

Using the HBS for the analysis offers several advantages over other databases. First, its breadth in terms of sample and household information allows us to perform different heterogeneity analyses. In addition, the HBS offers us the possibility of obtaining the three key variables for the analysis, expenditure on soft drinks, consumption in liters and price, all at the household level. Although the ultimate purpose of the survey is to measure total household expenditure, in many expenditure categories the amount consumed is collected, although in some cases this variable has problems of missing values. Fortunately for us, the percentage of households that report some expenditure

on soft drinks, but have missing values in their consumption in liters, barely represents 3% of the total number of households in the entire period analyzed. The average expenditure on soft drinks of this 3% of households is barely 2 euro, and is distributed homogeneously by terciles of equivalent expenditure, so in no case does it threaten the robustness of our results. However, the HBS does not have income data from administrative records, since the income variables in the survey are self-reported by the household. Therefore, throughout the analysis we will use household equivalent expenditure as a proxy for household economic status. We define equivalent household expenditure as total household expenditure divided by the number of consumption units (using the modified OECD scale) that compose it, thus following the definition used by the INE.

Table 2: Number of households by period and equivalent expenditure tercile

	Tercile 1		Tercile 2		Tercile 3	
	Treatment	Control	Treatment	Control	Treatment	Control
2017	5.935	637	6.428	336	6.394	269
2018	5.818	605	6.153	369	6.275	262
2019	5.702	551	6.001	345	6.099	253
2020	5.053	513	5.568	330	5.770	253
2021	5.151	512	6.692	315	5.673	288
Total	27.659	2.818	29.842	1.695	30.211	1.325

*S*ource: Authors' elaboration based on HBS microdata (2017-2021).

We have information available for 93,500 households over a five-year period, of which approximately 60% have a positive consumption of soft drinks. Of the total households available, about 5% of them belong to the control group, with the majority located in the Canary Islands region. Since the households belonging to our control group are in the lower part of the equivalent expenditure distribution, as shown in the table 2, we will present the results disaggregated by terciles of equivalent expenditure. The reason for employing terciles of equivalent expenditure, rather than alternative measures such as quartiles or quintiles, is precisely to ensure the representativeness of our control group at the top of the distribution. The portion of this subgroup of control households in the top 33% of equivalent expenditure that has positive expenditure on the main group of sugar-sweetened and edulcorated beverages matches that of the sample as a whole: about 60%.

In addition to the Household Budget Survey (HBS),we have agregated monthly data from the spanish Consumer Price Index (CPI) to complement the price analysis. These data are published monthly by the INE and allows us to check, firstly, if there has been any type of anticipation effect on prices and, secondly, in which part of the year 2021 the reaction of prices, on the part of companies, to the growth of the tax was concentrated.

3.2 Institutional Context

Value Added Tax (VAT) is the indirect tax with the highest revenue in Spain. As in many European countries, it has different tax brackets for different goods and services. In the case of Spain there are four rates, the general rate of 21%, the reduced rate of 10%, the super reduced rate of 4% and certain goods and services which, being exempt, are taxed at 0%. Spain is one of the European countries with the hightest percentage of the VAT tax base being taxed at reduced tax rates (Airef, 2020), which is where sugar-sweetened and edulcorated beverages were until 2021: they were taxed at the reduced rate of 10%.

On October 27, 2020, the Spanish government made public its draft General State Budget (GSB) for the next year, which included the proposal to move these beverages from the reduced rate to the general rate, which meant an increase of 11 percentage points in the tax rate. The measure excluded sugar-sweetened and edulcorated beverages consumed in bars and restaurants, in order not to hinder the recovery of the sector after the Covid-19 pandemic. Although the government initially quantified the expected collection at 340 million euros, the Independent Authority for Fiscal Responsibility (AIReF) (Airef, 2020) lowered this forecast to 208 million euros, and later to 189 million euros, after excluding liquid yogurts from the policy. It is worth noting that, for its estimates, AIReF used the same Household Budget Survey used in this paper, although no household consumption elasticity was incorporated in their estimations.

Following the favorable vote in Congress on December 3, the tax increase included in the PGE came into effect on January 1, 2021, thus leaving two months for companies and consumers to react to the policy in advance. In the following sections we will

provide evidence that discourages this anticipatory effect on prices, based on CPI data.

4 Empirical Strategy

As mentioned above, our control group are households located in the Canary Islands, Ceuta and Melilla, while the treated households are those located in the Peninsula or in the Balearic Islands. Our empirical strategy consists of a difference-in-differences model, using the cross-sectional data from the HBS. Our main specification is the one described in the equation 1, which we will apply to three different independent variables, prices, consumption in liters and expenditure in euros on soft drinks in each household.

$$Y_{itc} = \alpha + \beta_1 Treat_i * Post_t + \lambda_t + \delta_c + \theta_i + \epsilon_{it} \tag{1}$$

Where β_1 is the coefficient of interest associated with the policy effect, Y_{itc} is the variable of interest, whether it be price, quantity consumed, or expenditure on soft drinks of household i in period t and region c. In turn, λ_t represents the time-fixed effects and δ_c represents the region-fixed effects, and finally θ_i is a set of controls for observable household characteristics such as the age of the main breadwinner, educational attainment, employment status and gender, as well as other associated household controls such as the size of the municipality of residence, the number of members and the total equivalent expenditure of the household, to take into account the heterogeneity of economic capacity within each tercile.

In addition, it is of interest to know whether the effect of the policy has been different among households with children, so we estimate an additional regression derived from the main regression to elucidate this. To do so, we introduce an interaction term, as can be seen in the equation 2 in which we interact the effect of the policy with a binary variable that takes zero if there are children between 5 and 16 years old in the household and one otherwise, associated with β_3. Thus the coefficient β_1 now gives us the effect of the policy on households with children in that age group, since they are the group that has been left as a reference in the regression.

$$Y_{itc} = \alpha + \beta_1 Treat_i * Post_t + \beta_2 Treat_i * Post_t * Child_i + \beta_3 Child_i + \lambda_t + \delta_c + \theta_i + \epsilon_{it} \tag{2}$$

Our empirical strategy requires two essential assumptions. First, that people from the treated regions do not travel to the control territories to make their purchases. This does not seem likely, since our control regions are located outside the peninsula and, therefore, travel costs would be too high. Secondly, the fundamental assumption, as in any difference-in-differences analysis can be expressed as $E[\epsilon_{it}|Treat_j * Post_t = 0$, i.e., that the assumption of parallel prior trends is met. In addition to assessing that these trends are met, through parallel prior trend hypothesis testing, we estimate additional lead and lag regressions to confirm this assumption, where 2020, the year prior to policy implementation, will serve as the base year.

$$Y_{itc} = \alpha + \beta_t Treat_i * \lambda_t + \lambda_t + \delta_c + \theta_i + \epsilon_{it} \tag{3}$$

For the reasons discussed in section 3, the above regressions will be run separately for each of the three terciles of equivalised expenditure.. These terciles are defined annually, using the entire available sample of households. The equivalent expenditure formula uses the total monetary expenditure of the household divided by the number of consumption units (modified OECD scale) that compose it.

5 Results

5.1 Effects on prices

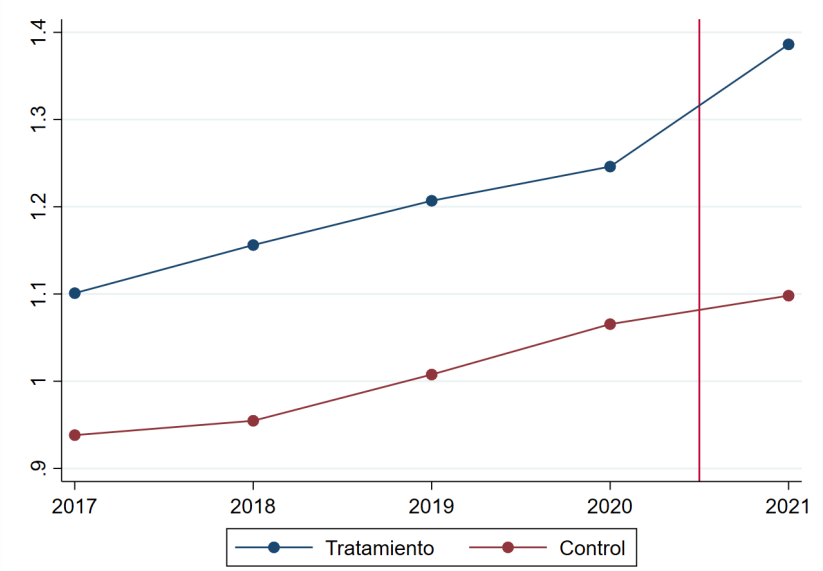
First, we begin by assessing the extent to which the tax was passed on to soft drink prices. To do so, we calculate the price per litre of soft drinks from the HBS microdata, using consumption data in liters and expenditure data, which already includes taxes. In total, we have price information from around 60% of households, which report consumption and expenditure information, a percentage that hardly varies between the different terciles of equivalent expenditure, as shown in table 16 in the annex.

Below, we show the average price per liter of soft drink, differentiating between households in the treatment group (Peninsula and Balearic Islands), and those that are part of the control group (Canary Islands, Ceuta and Melilla) between 2017 and

2021. As can be seen, the difference in the average price between the two groups remains constant until 2021, when the average price in the treatment group increases by 11.2%. It is worth pointing out that, if households in the treatment group had redirected their consumption towards soft drinks with a lower price in €/per litre, we would be underestimating the final price effect of the tax, and vice versa, but unfortunately we do not have sufficient data to study whether this has happened or not.

There is a significant difference in average price between treatment and control group households, which can be partially explained by the difference in tax rates between VAT and IGIC. While soft drinks were taxed at 10% VAT until 2021, the tax rate associated with IGIC was only 3% between 2017 and 2021. Despite this difference in price levels, the evolution of prices throughout the period prior to the policy change is very similar, as can be seen in the figure 1.

Figure 1: Price per liter of soft drink in € (2017-2021)

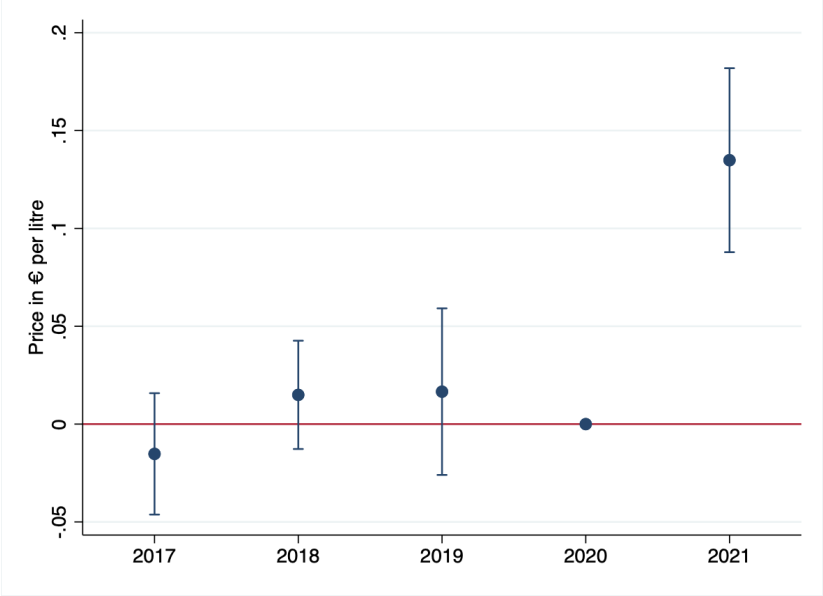


To validate our identification strategy, we estimate a leads and lags model on the price per liter of soft drinks, including autonomous community (AC) and year fixed effects, a series of basic household controls and with clustered errors at the AC level. The figure 2 shows the coefficients associated with the interaction terms, defined as the binary year variables multiplied by the treatment, leaving the coefficient corresponding to the year 2020 as the base. The coefficients associated with the years 2017, 2018, and 2019 are all statistically insignificant and very close to zero. However, the coefficient associated with the interaction between treatment and 2021 is positive, highly

significant, and economically relevant, at 12 cents per liter.

In table 3, we show the results of the equation 1 applied, separately, to the price per liter of soft drinks, energy drinks, and isotonic drinks. In our preferred specification, which includes household and primary breadwinner controls, we find a final policy effect of 13 cents per liter on the price of soft drinks. The inclusion of these controls slightly increases the coefficient associated with the policy effect by one cent, suggesting a very little change in the treatment group relative to the control in terms of its observable characteristics following the policy. This effect is equivalent to a 11.25% increase in prices as a result of the policy relative to prices in the 2017-2020 period. Since the theoretical price increase that should occur if the tax were fully passed through is 10%, we can conclude that 112% of the tax burden was passed through to final prices or, in other words, that there was a slight over pass-through to final prices. It is worth remembering that, unlike the tax on sugar-sweetened beverages in Catalonia, this tax increase had no legal requirement to pass the tax on to prices, so these results are entirely attributable to the behavior of market agents.

Figure 2: Effect of the VAT increase on the price of soft drinks



Also in table 3, we can see the estimates of the same model for two other groups of goods, isotonic beverages and energy drinks. These groups, as can be seen from the number of observations, have significantly fewer consuming households. The results, in our preferred specification, yield a price increase of 0.48€/per litre for isotonic drinks and 0.87€/per litre for energy drinks. This represents a percentage increase, compared

to their price in the years before the policy, of 22,4% and 28,9%, respectively. Therefore, the degree of pass-through to prices is much higher than 100%. While this may at first glance seem counterintuitive, it is consistent with greater vertical integration of firms in the sector, and more inelastic demand in these particular products, as shown in the Bonnet and Réquillart (2013) for the case of France and Bergman and Hansen (2019) for Denmark. In the table 14 of the annex, we provide evidence that the assumption of parallel prior trends was also fulfilled in the case of these two products.

Table 3: Pricing Model Results

	(1)	(2)	(3)
Soft drinks	0.116***	0.129***	0.130***
	(0.019)	(0.019)	(0.020)
P-value Wildbootstrap	(0.214)	(0.146)	(0.122)
Observations	56,649	56,649	56,649
Energy drinks	0.929*	0.845*	0.868**
	(0.443)	(0.440)	(0.391)
P-value Wildbootstrap	(0.322)	(0.342)	(0.284)
Observations	6,618	6,618	6,618
Isotonic beverages	0.515***	0.541***	0.483***
	(0.168)	(0.147)	(0.136)
P-value Wildbootstrap	(0.308)	(0.366)	(0.380)
Observations	11,485	11,485	11,485

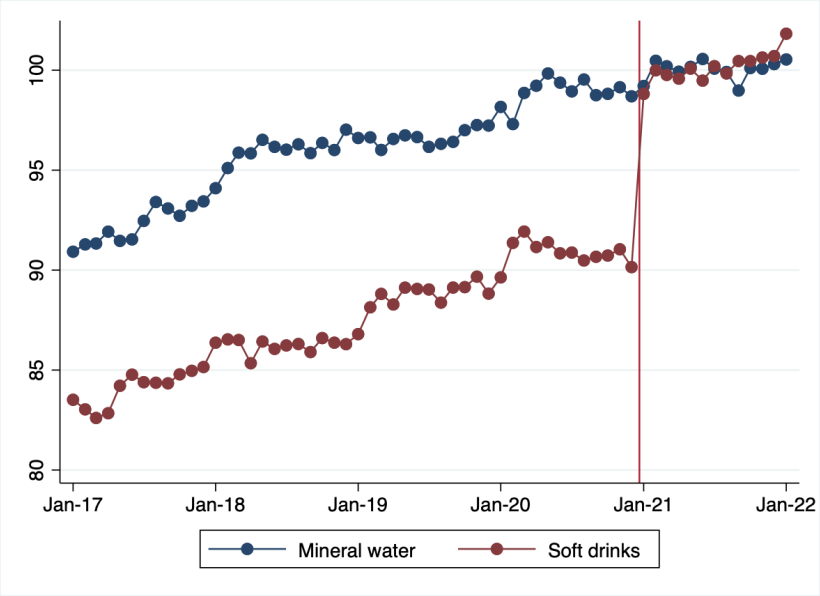
Results of the equation 1 for the prices of each good, expressed in euros per liter. Model (1) has no controls, model (2) has controls for the main breadwinner, and model (3) is presented with controls for the main breadwinner and the household.Clustered standard errors at the CCAA level.*** p<0.01, ** p<0.05, * p<0.1

In light of these results, knowing how long it took companies to react and incorporate the tax increase into prices is a relevant question. On the one hand, there could be anticipatory behavior in the two months between the announcement of the measure and its entry into force, or the pass-through to prices could be fully implemented in 2021 but take several months to be completed, both of which could affect our subsequent estimates of consumption and spending. We therefore consulted the corresponding CPI data for soft drinks and for bottled water, from January 2018 to December 2021, shown in the figure. We employ bottled water as a control group, following (Capacci et al., 2019), it can be clearly seen that the price growth of both goods was, in fact, parallel before the policy came into effect. The figure 3 answers the above questions: firstly, no price increase in soft drinks can be seen in the two months prior to the entry into

force, in which the anticipation effect could occur. In addition, it can be seen that the incorporation of the tax into final prices occurs essentially in the month of January and, to a lesser extent, February. Considering the increase in prices in both months, the degree of pass-through to prices is around 98%.

The evidence presented allows us to conclude that, despite there being no legal requirement to pass on the tax to prices, the companies in the sector passed on more than 95% of it to final consumer prices. For the next section, it is worth remembering that, according to the World Health Organization[1], price increases of at least 20% are necessary as a result of these taxes to produce significant effects on calorie consumption, weight and various diseases.

Figure 3: CPI evolution between 2017 and 2022 (2021=100)



[1]https://www.who.int/en/news-room/detail/11-10-2016-who-urges-global-action-to-curtail-consumption-and-health-impacts-of-sugary-drinks

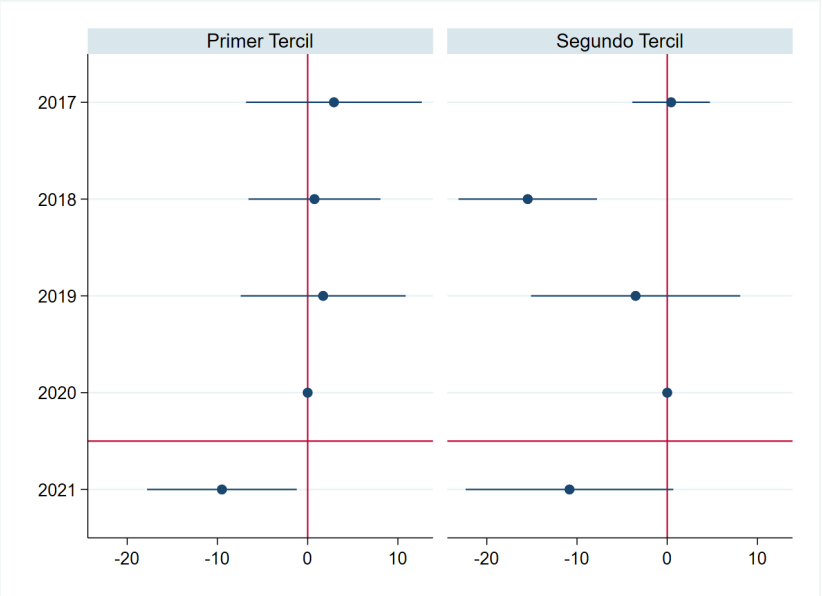
5.2 Effect on household consumption and spending

After verifying in the previous section that the effect of the price tax was large and statistically significant, it is necessary to evaluate what effect this price increase had on household soft drink consumption. The specification of the difference-in-differences model is the same as that described in the equation 1, except that in this case we will provide the results by terciles of equivalent household expenditure, a variable that we use as a proxy for household economic capacity. The reason for this is twofold: on the one hand, it helps us to study the heterogeneous effects of the policy, depending on the household's economic capacity. Moreover, as there are problems of representativeness of the top tercile among the control group, we believe it is convenient to take the results of this group with caution as they fulfil less rigorously the assumption of parallel prior trends as shwon in table 15 in the annex.

In the figure 4 we can see the leads and lags regressions for the first two expenditure terciles. In the case of the first tercile of equivalent expenditure, all the coefficients for the period prior to the policy change are positive, but statistically insignificant, while the coefficient for 2021 is negative, significant and equivalent to 12.7 liters. For the second tercile, the coefficient associated with 2018 is very close to being statistically significant at 5% significance. Although the coefficient for one of the years prior to the policy change is close to being significant, we perform a parallel prior trend test in the table 15 in the appendix where the hypothesis of non-parallel prior trends is rejected with a p-value of 0.2339.

In the third tercile of equivalent expenditure, the same parallel prior trend contrast is rejected at 5% significance, something that is probably explained by the very small sample size among the control group, which drastically increases the variability from one year to the next. As shown in the table 2, only 20% of the households in the control group are part of this tercile, which amounts to less than 300 households per year, of which just over 100 would consume soft drinks. Next, we show the results of the equation 1 by terciles, using household consumption in liters as the independent variable, including those with zero consumption.

Figure 4: Effect of the VAT increase on soft drink consumption in liters



Within the set of controls that we add in the regressions, we include the total equivalent household expenditure, to control for heterogeneity of economic status within each tercile. Additionally, we include the characteristics of the main breadwinner of the household such as gender, country of birth, educational level and age. Finally, we include the number of household members, the size of the municipality of residence, the tenure status of the household, a binary indicating whether they reside in a provincial capital and the number of lunches and dinners during the period of household collaboration in the survey as well as fixed effects by year and region.

In the case of the poorest 33% of households, the VAT increase generated a negative and very significant drop in soft drink consumption of 13 liters per household per year, which is a very significant effect on their previous consumption, which amounted to 92.6 liters per household per years before the implementation of the policy. This implies a drop in consumption of 14% in response to a price increase of 11.25%, which implies a price elasticity of demand for households in the first tercile of -1.25. The second and third terciles show negative and positive policy effects on consumption respectively, but in neither of them is statistically significant at conventional levels.

It should be noted that the above results refer to all households, so that the drop in consumption observed in the first tercile can be explained either by a reduction in consumption among those households with positive consumption (intensive margin), or

Table 4: Effects of the VAT increase on soft drink consumption per household (Liters)

All households			
	(1)	(2)	(3)
Tercile 1	-13,201***	-13.824***	-12.958***
	(3.357)	(3.320)	(2.510)
P-value Wildbootstrap	(0.072)	(0.108)	(0.042)
Tercile 2	-0.458	-3.759	-1.226
	(6.275)	(5.862)	(6.295)
P-value Wildbootstrap	(0.970)	(0.490)	(0.850)
Tercile 3	12.062*	6.049	2.630
	(6.261)	(6.593)	(6.499)
P-value Wildbootstrap	(0.706)	(0.768)	(0.756)
Observations	31,536	31,536	31,536
Only for households with soft drink consumption			
Tercile 1	-17.639***	-17.218***	-16.799***
	(3.333)	(3.527)	(3.374)
P-value Wildbootstrap	(0.048)	(0.052)	(0.058)
Observations	30,477	30,477	30,477
Tercile 2	7.950	6.814	8.136
	(7.158)	(6.860)	(7.404)
P-value Wildbootstrap	(0.558)	(0.596)	(0.628)
Observations	31,537	31,537	31,537
Tercile 3	18.015**	14.776*	12.935*
	(7.073)	(7.230)	(7.276)
P-value Wildbootstrap	(0.572)	(0.684)	(0.590)
Observations	31,536	31,536	31,536

Results of equation 1 for soft drink consumption, expressed in liters per household. Model (1) has no controls, model (2) has main breadwinner controls, and model (3) is presented with main breadwinner and household controls.Clustered standard errors at the CCAA level.*** p<0.01, ** p<0.05, * p<0.1

by an increase in the number of households that do not consume soft drinks (extensive margin). To decompose the fall in consumption among households in the first tercile between the two components, the same model is estimated only for households with positive soft drink consumption, the results of which are shown in the second part of the table. The drop in consumption among households in the first tercile now becomes 16.8 liters per household, considering that about 58.4% of households have positive

consumption of soft drinks that leaves us with a weighted drop attributable to the intensive margin of 9.8 liters. In other words, 75% of the negative effect associated with the policy would be caused by lower consumption by households with soft drink consumption, while the remaining 25% could be attributed to a slight drop in the percentage of households with positive consumption of soft drinks.

These results are reasonably aligned with previous literature on the effect of this type of tax on consumption. For example, (Castelló and Casasnovas, 2020) found a drop in sales in Catalonia of 7.7% concentrated in goods with a higher amount of sugar and therefore with a higher tax rate, while for products with a lower sugar content, which experience a rise similar to the one studied in this article, the drop in sales is not significant. On the other hand, in (Capacci et al., 2019) for France, they do not find an aggregate effect on household consumption but, as in our case, they do find an effect on certain groups of households, being in their case households with higher consumption those that show a clear fall in consumption as a consequence of the tax increase.

The effect that the policy has had on soft drink consumption in less affluent households has consequently led to a negative effect on the initially expected revenue from the tax increase. To test the magnitude of the drop in spending, we estimate the equation 1 this time with household spending on soft drinks, including taxes, and applying the same controls as in the previous regressions. The results are in the expected direction; for the last two terciles we see an increase in spending, consistent with the increase in prices, although this increase is not statistically significant. In the case of households belonging to the first tercile, the effect of the policy is negative and significant, reducing spending per household by 8.7€, a drop of about 11.6% from previous levels.

Finally, one of the main objectives of the policy is to reduce childhood obesity rates, although we do not have medical data on household members, we can study whether the policy had a greater effect on consumption in households with children. To do so, we introduce a new variable in our main specification that interacts the effect of the policy with a binary variable that takes a value of zero if there are children between 5 and 16 years of age in the household and one otherwise, thus excluding children

Table 5: Effects of the VAT increase on soft drink spending per household (Euros)

Tercile	(1)	(2)	(3)
Tercile 1	-8.644***	-8.970***	-8.742***
	(2.641)	(1.884)	(1.940)
P-value Wildbootstrap	0.186	0.174	0.162
Tercile 2	8.567	9.206*	8.800
	(5.304)	(5.217)	(5.380)
P-value Wildbootstrap	0.534	0.622	0.628
Tercile 3	15.867***	8.902*	8.020
	(4.684)	(4.602)	(4.703)
P-value Wildbootstrap	0.638	0.682	0.694

Results of equation 1 for expenditure on soft drinks, expressed in euros per household. Model (1) has no controls, model (2) has controls for the main breadwinner, and model (3) is presented with controls for the main breadwinner and the household.Clustered standard errors at AC level.*** p<0.01, ** p<0.05, * p<0.1

under five years of age because we consider that most of them are still too young to consume this type of beverage. The results indicate that, while in the last two terciles the interaction term is not statistically significant, it is significant in the case of the first tercile, indicating a greater effect of the policy on households with children in the age range we have defined.

Specifically, the effect of the VAT increase on soft drink consumption among households without children between 5 and 16 years of age in the first tercile is reduced from the 13 liters previously estimated to five liters while the interaction term rises to twenty liters. This indicates a drop in consumption among households with children in the first tercile to 24 liters per household. It should be noted that poor households with children had, before the policy change, a higher level of soft drink consumption than households in the same tercile without children. While the former reached 142 liters per household in the 2017-2020 period, the latter barely exceeded 78 liters. Among households with children the drop would be about 16.9% while for poor households without children it would be about 7%. The following table shows the results of the equation 2 considering different levels of controls.

Although the size of the fall in spending as a result of the policy among poor households is not economically very relevant, since it confronts the price increase with

Table 6: Effect of the VAT increase on households with children between 5 and 16 years of age.

	(1)	(2)	(3)
Tercile 1	-26.773***	-19.998***	-24.052***
	(6.920)	(6.789)	(4.731)
P-value Wildbootstrap	(0.144)	(0.132)	(0.044)
Tercile 2	6.402	11.165	11.506
	(11.219)	(12.182)	(12.641)
P-value Wildbootstrap	(0.636)	(0.468)	(0.496)
Tercile 3	28.583	30.238	22.347
	(14.304)	(15.415)	(15.279)
P-value Wildbootstrap	(0.426)	(0.456)	(0.458)

Results of equation 2 for soft drink consumption, expressed in liters per household. Model (1) has no controls, model (2) has controls for the main breadwinner and model (3) is presented with controls for the main breadwinner and the household.Clustered standard errors at the AC level.*** p<0.01, ** p<0.05, * p<0.1

the fall in quantities consumed, it is worth putting the size of the fall in consumption into perspective. A drop in consumption of 10 liters represents a drop in consumption of 30 cans of soft drinks per household per year, which would amount to 44 in the case of households with positive consumption and up to 75 for poor households with minors.

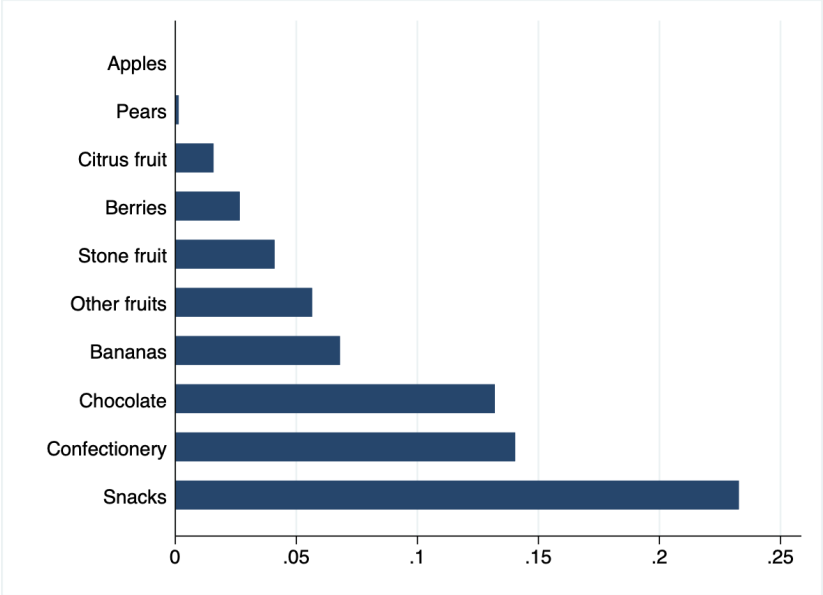
5.3 Effects on complementary goods

As discussed in more detail in the 2 section, the literature studying this type of tax has focused on the analysis of the consumption of substitute goods, mostly soft drinks not subject to the tax due to their low sugar content. At this point, we have documented that the policy had a significant and negative impact on a portion of households with lower economic capacity. This opens the door to another relevant question, whether the drop in consumption of sugar-sweetened and edulcorated beverages also implies a drop in the consumption of complementary goods. This is a question that plays a key role in the final effect of the policy on health and which, so far, has not received sufficient attention in the literature. The main papers that have, studied how these types of taxes

affect the consumption of substitute and complementary goods are (Schroeter et al., 2008) and (Finkelstein et al., 2013), theoretically and empirically respectively. The latter find that the fall in the consumption of complementary goods, as a consequence of a tax on sugar-sweetened beverages, contributes significantly to reduce the purchase of calories.

Assuming that complementary goods are also unhealthy products, a tax-induced reduction in their consumption would amplify the final effect of the policy on public health, without the need to establish new tax figures. Thanks to the design of the Household Budget Survey (HBS), we have household expenditure on a broad set of foods, although we will focus our analysis on expenditure on *snacks* products, following (Edwards, 2011). We can find a technical justification for this decision in the following graph, which shows the correlation of spending per household on various goods with spending on soft drinks. As can be seen, the correlation of expenditure on soft drinks is particularly high for unhealthy products such as snacks (a group mostly composed of potato chips), and, to a lesser extent confectionery and chocolate. However, the correlation is much weaker, or even zero, for healthy products such as a wide range of fruits. Ideally, we would estimate the equation 1 for the quantity consumed of *snacks*,

Figure 5: Correlation of each expenditure with per household expenditure on soft drinks for the first tercile of equivalent expenditure (2017-2020)

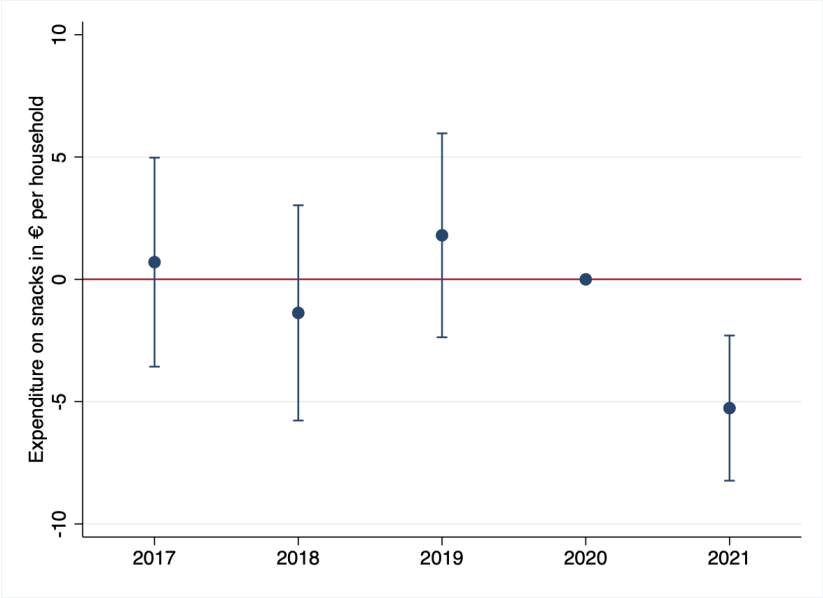


but, as mentioned in section 3.1, there are certain expenditure codes for which either the quantity consumed does not exist or has a particularly high level of missing values,

the latter being the case for *snacks*. This is why we estimate the equation 1 using the expenditure per household on *snacks*, we consider that, as there are no abrupt price changes between the pre and post periods, the expenditure is a suitable proxy for the quantity consumed which, unfortunately, we cannot observe with the available data.

Before moving on to the equation 1 we estimate, for spending on *snacks*, the equation 3 to test the key assumption of parallel prior trends. The coefficients associated with the interaction between treatment and pre-policy years are statistically insignificant at 5%, while the coefficient associated with the policy year is statistically significant and economically relevant, with a 5 euro drop in spending per household. With respect to average spending on snacks by poor households in the year prior to policy implementation, this represents a 10.5% drop in spending, an amount remarkably similar to the drop in soft drink consumption documented among the same group of households in the previous section. In the following table we present the results, for

Figure 6: Effect of the VAT increase on spending on *snacks* among households in the first tercile of equivalent expenditure



different levels of specification, of the equation 1 for the expenditure per household on snacks. Again, as was already the case with the regressions for soft drink consumption, the variation in the coefficients between the different specifications is minimal, with our preferred specification yielding a drop in expenditure of 5.5 euro per household. The policy relevance of these results can hardly be ignored, since they imply an elasticity of the consumption of complementary products with respect to soft drink consumption

close to unity.

This implies that, solely due to a contagion effect, households have reconfigured their consumption baskets even in goods that were outside the scope of the tax. This finding highlights the importance of taking into account, when evaluating taxes on sugar products, the set of complementary products that surround them and that, until now, the literature had not studied in depth. In the appendix we find evidence that the fall in expenditure that we estimate as a consequence of the tax is essentially explained by a fall in expenditure within the treatment group, and not only by an increase in consumption by households in the control group. This, coupled with the very similar level of spending on pre-tax snacks between the two groups, gives us confidence in the robustness of our results.

Table 7: Effects of the VAT increase on spending in *snacks*

	(1)	(2)	(3)
snacks	-5.682***	-5.929***	-5.508***
	(1.629)	(1.681)	(1.503)
P-value Wildbootstrap	(0.414)	(0.534)	(0.470)
Observations	30,477	30,477	30,477

Results of equation 1 for expenditure on snacks, expressed in euros per household. Model (1) has no controls, model (2) has controls for the main breadwinner and model (3) is presented with controls for the main breadwinner and the household.Clustered standard errors at the CCAA level.*** p<0.01, ** p<0.05, * p<0.1

6 Conclusiones

Within the empirical and health debate on obesity, especially childhood obesity, sugar consumption policies have been gaining weight and have come to occupy a prominent place. This is especially true for taxes, considered within the economic discipline as one of the instruments with the greatest potential to incentivize or discourage certain behaviors that generate externalities. However, the methodological challenges presented by the evaluation of taxes on sugar-sweetened and edulcorated beverages are numerous. First, many of these taxes lack a clear control group that can be used to assess their impact, as they are most commonly applied across the board to all households

in a jurisdiction. In addition, the lack of adequate data on household consumption means that, in many cases, we have to resort to data on sales in retail distribution establishments, which ultimately prevents us from disaggregating the effect of the tax among different types of households. Finally, the previous works that exploits natural borders usually faces the problem of the movement of consumers across borders, which can lead to overestimating the effect of these taxes.

In this paper, we present quasi-experimental evidence on the effect of a VAT increase from 10% to 21% on sugar-sweetened and edulcorated beverages in Spain. This policy has three peculiarities with respect to other taxes on sugar-sweetened beverages: first, it is an ad valorem tax that does not vary according to the amount of sugar; second, sweetened beverages are also affected; and finally, beverages consumed in on-trade establishments were excluded from the tax increase. Although the VAT increase does not only apply to soft drinks, as it also includes juices or energy drinks, we focus on this group because of its larger size in terms of the number of households with positive consumption and the fact that all the products that make up this group, were affected by the tax.

Our empirical strategy consists of using as a control group households in three Spanish regions not affected by the tax, the Canary Islands, Ceuta and Melilla, which have their own indirect taxes. These regions, being located outside mainland Spain, do not present any risk of consumer mobility between regions. Our findings can be summarized in four: first, we find clear evidence of a pass-through of the tax to prices of more than 100%, concentrated in the first two months of the tax's entry into force. Second, we find that only 33% of households with a lower level of equivalent expenditure show a negative and statistically significant drop in consumption of 14%, essentially via the intensive margin. Moreover, within the first tercile of equivalent expenditure, households with children aged 5 to 16 have reacted more strongly to the policy, with a drop in their soft drink consumption, equivalent to 17% of his pre treatment consumption levels. Finally, we estimate the effect of the tax on complementary goods. Specifically, we follow (Finkelstein et al., 2013) by studying the impact it had on spending on snacks, which has the highest correlation with spending on soft drinks at the household level. We find suggestive evidence that, among poor households, spending on snacks declined

by 11%, a drop slightly less than the decline in soft drink consumption previously documented, although this result is not robust to estimation with wildbootstrapping.

These results are consistent with previous evidence, which shows a high degree of pass-through of these types of taxes to prices, as well as a limited effect on consumption for price increases of less than 20%. In addition to adding further evidence to this growing literature on the effects of such taxes, our key contribution is the disaggregation of the effect across different types of households according to their economic status and household composition. As noted in (Sassi et al., 2018), identifying these types of households, and individuals ultimately, is key to being able to subsequently assess the health consequences of the tax. The positive effects on health, coupled with a lower weight of spending on these types of goods in the budget of poor households could significantly reduce the negative distributional effect that these types of taxes tend to have. A more complete and richer evaluation of these effects is, in any case, the next step, logical and necessary in our opinion, of the present work.

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A Anexo

The following annex presents different tables with data and results that have been referred to throughout the main text but, for reasons of space, could not be included in the rest of the sections of the document. Firstly, in table five we can see the data from which the first figureof the section 5 is constructed, which shows the evolution of the average price of a litre of soft drinks, differentiating between the households that form part of the control group (Canary Islands, Ceuta and Melilla) and the treated households (mainland Spain and the Balearic Islands).

Table seven shows the results of the equation 1 considering a different expenditure group, in this case that of energy drinks. This group of drinks was not included in the main analysis because of the small size of its consumption in aggregate terms, mainly due to the small percentage of households with a positive consumption of this good.

Table 8: Average price per litre of soft drinks according to their exposure to the VAT increase

	(1)	(2)
Year	Treatment group	Control group
2017	1.100	.938
2018	1.156	.954
2019	1.206	1.007
2020	1.246	1.065
2021	1.386	1.098

Source: Prepared by author based on HBS microdata (2017-2021).

Table 9: Effect of the VAT increase on the consumption of energy drinks by terciles

	Without controls	SP controls	SP and household controls
Tercile 1	-1.135***	-1.097***	-1.103***
	(0.319)	(0.314)	(0.302)
Tercile 2	-1.861***	-1.979***	-1.977***
	(0.377)	(0.374)	(0.360)
Tercile 3	1.470**	1.249*	1.203*
	(0.618)	(0.626)	(0.631)

Fuente: Elaboración propia a partir de los resultados de la ecuación 1

Table 10: Effect of the VAT increase on the consumption of isotonic beverages by terciles

	Without controls	SP controls	SP and household controls
Tercile 1	-1.657***	-1.532***	-1.553***
	(0.366)	(0.384)	(0.395)
Tercile 2	1.223*	1.273**	1.354**
	(0.598)	(0.539)	(0.551)
Tercile 3	-0.152	-0.324	-0.314
	(0.518)	(0.449)	(0.414)

Source: Own elaboration based on the results of the equation. 1

The results indicate that the effect on consumption is equally negative in the first and second tercile. However, the results in the third tercile have a positive sign, although they are only significant at 10%. As in the main analysis, the results in the third tercile should be taken with caution because of the small sample size among the control group. Table 8 shows the results for isotonic drinks with markedly similar results with respect to the first tercile. In this case a positive effect is found within the second tercile although not as significant as the effect found in the first tercile (significant at 5% but not at 1%). All this indicates that, if these products were included in the overall analysis, the conclusions drawn would not be affected.

Moreover, the decision taken in the main paper to present the results separately for soft drinks, energy drinks and isotonic drinks in the price analysis section responds to potential differences in both the structure of demand and its elasticity with respect to price and, in this case, taxation. Similarly, it was felt that the results on consumption were worth presenting in this paper.

Table 11: Average soft drink consumption per household in litres (2017-2021)

	Tercile 1		Tercile 2		Tercile 3	
	Treatment	Control	Treatment	Control	Treatment	Control
2017	101.17	99.11	113.11	98.81	117.55	97.16
2018	90.83	89.03	125.12	94.56	99.19	91.01
2019	82.80	83.42	106.93	90.80	140.16	84.90
2020	82.81	84.21	112.04	96.58	87.78	90.63
2021	74.52	85.43	118.81	96.21	101.96	92.71

Source: Own elaboration based on HBS micro data (2017-2021)

Table 12: Average energy drinks consumption per household in litres (2017-2021)

	Tercile 1		Tercile 2		Tercile 3	
	Treatment	Control	Treatment	Control	Treatment	Control
2017	2.59	2.81	1.71	4.12	2.55	2.13
2018	1.86	2.95	1.90	3.10	1.19	3.42
2019	2.05	2.43	1.73	2.99	1.23	1.35
2020	1.99	4.19	1.70	2.04	1.70	0.92
2021	1.98	4.97	2.20	5.34	2.05	0.82

Source: Own elaboration based on HBS micro data (2017-2021)

Finally, the following tables show the average consumption per household, i.e. also considering households with zero consumption, of soft drinks, energy drinks and isotonic drinks.

Table 13: Average consumption of isotonic beverages per household in litres (2017-2021)

	Tercile 1		Tercile 2		Tercile 3	
	Treatment	Control	Treatment	Control	Treatment	Control
2017	3.58	5.34	8.3	5.96	6.18	6.14
2018	2.75	5.12	7.8	5.24	4.2	5.54
2019	3.34	3.61	5.19	5.09	3.41	5.67
2020	5.23	2.94	3.58	4.31	3.34	4.83
2021	4.21	3.09	3.79	3.89	4.46	5.57

Source: Own elaboration based on HBS micro data (2017-2021)

Table 14: Effect of the VAT increase on the price of other products

Year	SP and household controls	
	Energy drinks	Isotonic beverages
2017	0.162	-0.357*
	(0.143)	(0.189)
2018	0.355	0.163
	(0.224)	(0.255)
2019	0.201	-0.329
	(0.192)	(0.202)
2020	0	0
	0	0
2021	0.894*	0.379**
	(0.420)	(0.139)

Source: Own elaboration based on the results of the equation. 1

Table 15: Hypothesis testing of parallel prior trends (Regressions of household litre consumption)

Tercil	Without controls	SP controls	SP and household controls
Tercile 1	0.5227	0.4523	0.8274
Tercile 2	0.2802	0.8465	0.2339
Tercile 3	0.0003	0.0012	0.0014

Source: Own elaboration based on the results of the test for the existence of parallel prior trends for the regressions of consumption per household in litres.

Figure 7: Average household expenditure on *snacks* among households in the first tercile of equivalent expenditure in € (2017-2020)

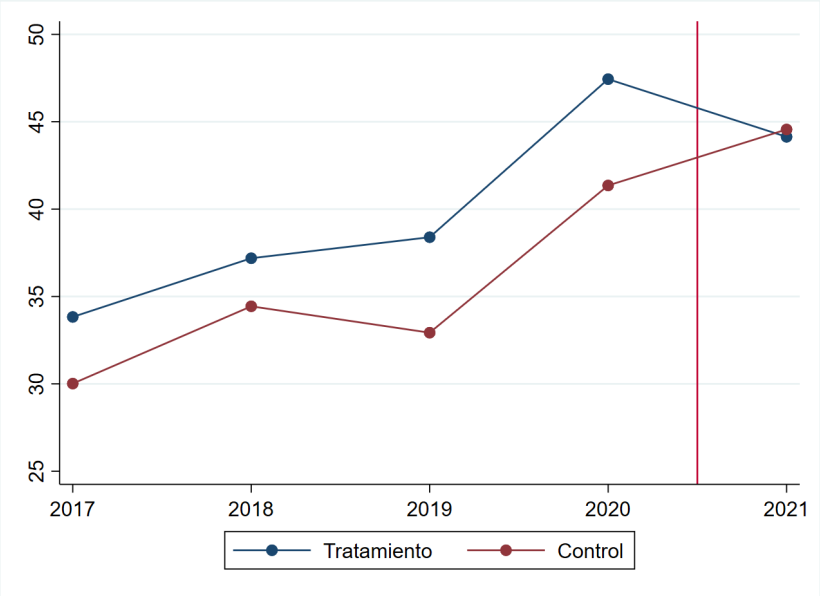

Table 16: Average soft drink consumption per household in litres (2017-2021)

	Treated		**Control**	
Variables	2017-2020	2021	2017-2020	2021
Price of soft drinks in € per litre	1.1564	1.3784	0.9934	1.0980
Price of energy drinks in € per litre	3.0133	3.4444	3.0251	2.5577
Price of isotonic beverages in € per litre	2.1421	2.4666	2.1673	1.9112
Consumption in litres per household				
Tercile 1	92.56	76.11	88.62	85.43
Tercile 2	96.66	99.28	113.56	116.92
Tercile 3	92.88	97.99	111.08	103.81
% of soft drink consuming households				
Tercile 1	58.43	51.55	65.38	60.27
Tercile 2	60.86	53.61	73.02	66.35
Tercile 3	59.73	54.33	69.16	63.88
Spending on soft drinks in € per household				
Tercile 1	75.61	70.80	71.70	75.43
Tercile 2	90.61	102.44	101.16	104.72
Tercile 3	96.82	114.13	105.39	106.43
Spending on snacks in € per household				
Tercile 1	38.10	43.60	33.93	44.83
Tercile 2	50.36	59.55	49.23	50.86
Tercile 3	54.61	69.61	59.53	62.28

Source: Own elaboration based on HBS micro data (2017-2021)