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ABSTRACT: This paper empirically tests whether property owners react to the salience of taxes in terms of their consumption of public services. Exploiting a policy change that reduced fares on public transport in various municipalities of the metropolitan area of Barcelona, we find that salience of the tax to finance the fare reduction increases the consumption of public transportation. Our empirical findings support the hypothesis that the salience of taxes may affect the consumption behavior of taxpayers and our main results contribute to previous empirical evidence relating tax salience and consumption behavior regarding public services.

JEL Codes: D12, H24, R41, R48

Keywords: Tax salience, Public transportation, Fare policy

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1 Introduction

Public authorities worldwide have recently implemented a range of different types of policy aimed at reducing the use of private transportation and/or increasing the number of public transport users. The municipal authorities in the *Àrea Metropolitana de Barcelona* (the Barcelona Metropolitan Area, henceforth, AMB) are, in this respect, no exception, given that as of 1 January 2019 a number of municipalities previously lying in what was public transport "zone 2" with respect to the city of Barcelona were reclassified as "zone 1",[1] which introduced a change in fare policy in the metropolitan area that saw fares between the affected municipalities and the city of Barcelona halved.

This reduction in fares, however, was not a free gift for residents in these municipalities, as their respective city councils introduced a new tax (*Tribut Metropolità*) levying all property owners in the municipality. The tax is based on the cadastral value of the property independently of whether or not owners use public transport. However, and primarily for electoral reasons (in this instance, the municipal elections celebrated at the end of May 2019), local politicians spoke little about this new tax, in fact, they had not even got round to explicitly defining the tax (i.e., tax rates, tax base, etc.) to finance the fare reduction when it was approved (at the end of 2018). However, all property owners in the affected municipalities received a tax receipt from the AMB at the beginning of the last quarter of 2019 (almost five months after the municipal elections).[2] Most property owners knew nothing about this tax and even less about its links with the fare reduction in public transportation. Indeed, they only became aware of it when they received their receipt of payment. A simple Google search for "*Tribut Metropolità*" provides us with a good idea of the sudden interest generated by the metropolitan tax. Thus, we detect a spike in queries around 15 October 2019 coinciding with the date taxpayers received notification of payment (see Figure 1 in section 2).

The municipal elections explain in part the delay between the immediate effects of the policy (i.e. the fare reduction) and the belated awareness of the tax among property owners (almost one year later). As such, this delay provides us with an interesting setting in which to examine the impact of "tax salience" on the consumption of public services (public transportation),[3] the underlying intuition being that the more salient the taxes to finance specific public services, the greater the increase in their consumption.

The main objective of this paper is to analyze whether the salience of a new tax introduced to finance a public transport fare reduction altered homeowners' behavior in terms of their consumption of public trans-

[1] The municipalities affected are *Badia del Vallès, Barberà del Vallès, Begues, Castellbisbal, Cerdanyola del Vallès, Cervelló, Corbera de Llobregat, Molins de Rei, Pallejà, la Palma de Cervelló, el Papiol, Ripollet, Sant Andreu de la Barca, Sant Climent de Llobregat, Sant Cugat del Vallès, Sant Vicent dels Horts, Santa Coloma de Cervelló, Torrelles de Llobregat*

[2] The AMB is the urban core of a large urban area and accounts for 40% of the population of Catalonia and 52% of its GDP. The AMB is home to 3.2 million inhabitants and 36 municipalities, most of which are immediately contiguous and some cities are physically adjacent to Barcelona and connected by subway. Formed by a council of 90 members (delegates from the municipalities), the AMB is funded by transfers (mainly from the municipalities) and by different taxes (on waste and sewage). The responsibilities of the AMB include territory and urbanism; transport and mobility; housing; environment; economic development and social cohesion. However, these powers are not exclusive but rather shared with both local and regional governments. Moreover, the AMB coexists alongside other sectoral agencies, associations and consortiums, including the Metropolitan Transport Authority (MTA). Created in 1997, the MTA is responsible for the coordination and planning of transport on an even larger scale (253 municipalities).

[3] We use "tax salience" to refer to the visibility or awareness of the tax on the part of potential public transport users. For example, in our case study, if the tax had been given the same publicity as the fare reduction we would consider this a salient tax.

portation. Additionally, we explore how this fare reduction affected the use of public transportation. To conduct these two exercises we take advantage of a policy change that, as of 1 January of 2019, reduced fares on public transport in 18 of the 36 municipalities making up the AMB. Then, using a confidential and unique data-set of hourly ticket validations on public transport in the municipalities around Barcelona, and exploiting the timing of the salience of the new tax, and the policy change itself, we analyze both effects by implementing a difference-in-differences research design. Specifically, we compare the use of public transportation (ticket validations) in treated and non-treated municipalities, before and after owners received their tax receipts, interacted with the policy change implemented at the beginning of 2019.

Our main results show an important effect of the reduction in fares. Specifically, when we compare treated and non-treated municipalities, we find that, following the fare reduction, the use of public transportation in the treated municipalities was around 33% higher than in the two previous years. Second, we also find that once individuals became fully aware that the transport fare reduction was to be financed via a new tax (after 15 October), public transportation use in the affected municipalities rose by a further 9 percentage points. Our results are robust to different specifications and to several robustness checks, including, for instance, the removal from the control group of municipalities that originally implemented "zone 1" fares during the first decade of the new millennium and the exclusion of neighboring municipalities from the analysis. Additionally, we find no differential effects either after the elections were held or before property owners received their tax receipts, indicating that the differential effect in the last quarter of 2019 is a consequence of the salience of the new tax.

This paper contributes to two different strands of the literature. First, it extends previous empirical evidence regarding tax salience, a strand that analyzes how the salience of taxes can affect the consumer behavior of taxpayers (e.g. Chetty, Looney, and Kroft (2009), Goldin and Homonoff (2013), Taubinsky and Rees-Jones (2018) and Bradley and Feldman (2020)). Exploiting natural and/or field experiments, these papers document that, on average, consumers of private goods under-react when sales taxes are not fully salient. In a similar vein, Finkelstein (2009) shows that tax salience could affect tax rates, in particular, by examining the adoption of an electronic toll collection system in the US, she finds that after its implementation, toll rates are higher than they would have been under a manual toll collection system. Specifically, our study extends this growing body of literature, by providing empirical evidence that relates the salience of taxes with the consumption of public services (services provided by the public sector). In particular, we display evidence that property owners in the affected municipalities change their consumption of public transportation after they visualize the tax burden (i.e., when they received the tax receipt) as a consequence of the reduction in transport fares.

Second, our paper also contributes to that strand of the literature that estimates the effects of changes in transport fares on demand for public transportation, (e.g., Kholodov et al. (2021) and Sharaby and Shiftan (2012)). These papers evaluate different changes in fare policies, showing that fare reductions or fare integrations (which also reduce fares for many passengers) generate an increase in the use of public transportation, explained mainly by those travelers that reduce their use of private transportation. In the same vein, we also estimate an increase in the demand for public transportation as a consequence of the fare reduction.

The rest of the paper is organized as follows. Section 2 describes the policy change and the chronology of the events. In section 3, we present the data, a description of the main variables, and our sample selection. The methodology is explained in section 4. The results appear in section 5 and, finally, in section 6, we present the main conclusions.

2 Background and Policy Reform

To provide a better understanding of the policy analyzed in this article, this section explains the institutional background to the coordination of public transport in the AMB and how its travel zones and corresponding fares were changed as of 1 January 2019.

Within Spain, Barcelona's metropolitan area presents the greatest degree of institutionalization. In July 2010, the Catalan Parliament passed the AMB Act, with the aim of ending the institutional fragmentation that had previously characterized the governance of the metropolitan area of the Catalan capital. As provided for under the Act, the new entity (the AMB) was to begin functioning after the municipal elections of May 2011, and was to replace the three metropolitan authorities that had existed since the 1980s.[4]

When the AMB was created, the 18 municipalities that had belonged to the Metropolitan Transport Entity came to constitute zone 1 of the public transport network. Since 2001, property owners in these 18 municipalities have been paying a tax for the use of public transport (*Tribut Metropolità*). The other 18 municipalities making up the AMB were designated as belonging to zone 2. This meant that public transport fares have been cheaper for zone 1 inhabitants than for zone 2 inhabitants wishing to travel into zone 1, although all the municipalities belonged to the same metropolitan government. In order to homogenize fares throughout the AMB, on 16 October 2018, a reform was provisionally approved by the Metropolitan Council, stating that, as of 1 January 2019, the 18 municipalities in zone 2 municipalities would be switched to zone 1 and, as a result, all fares would be halved.[5] To offset this loss of revenue, all individuals owning a (residential or commercial) property in these 18 affected municipalities would be charged a new tax, the metropolitan tax. This new tax was to be levied during the last quarter of 2019 (from October to December) and it was to be linked to the existing property tax using a specific formula related to the cadastral value of the property. However, the exact amount of the tax was not fixed at this time (i.e. October 2018) by the Metropolitan Council, primarily it seems because local elections were to be held on 26 May 2019. Indeed, the mayors and local councilors of the 36 municipalities are members of the Metropolitan Council. Incumbent local politicians were afraid of the public's reaction if they were to announce the new tax before the elections. Therefore, while the initiative was approved by a majority of the council, no explanation was provided that

[4] That is, the Metropolitan Transport Entity, the Metropolitan Entity of Water and Waste Treatment and the Association of Municipalities of the Metropolitan Area. These entities were created in 1987 when the Barcelona Metropolitan Corporation (a two-tier metropolitan government) was abolished by the regional government. As such, we can see that there were different phases of metropolitan governance, ranging from more institutionalized to less institutionalized models depending on the period in question (for a discussion of the history of Barcelona metropolitan governance, see Valbé, Magre, and Tomàs (2015)).

[5] For a daily commuter between the affected municipalities and the city of Barcelona, the fare reduction represented a saving of around 400 euros a year.

the reduction in fares would have an impact on the population by way of a new tax.[6]

On 1 January 2019 the new fares came into force: From that date, all 36 municipalities making up the AMB were included in zone 1 of the transport system and its users liable for the same fare. On 26 May 2019, the local elections were held. No public debates addressed the issue of the new tax. On the contrary, political representatives proudly announced that they had succeeded in reducing fares on public transport fares, but they made no mention of the new tax (see *Diari Ara*, accessed in July 2022). Indeed, a search through the AMB press releases from 2018 to 2021 for mentions of the metropolitan tax reveals not a single reference in 2019, although there were associated press releases in 2018 (1), 2020 (2) and 2021 (2).

As of 15 October 2019, all property owners (residential or commercial) in these 18 municipalities began to receive a receipt for this new tax.[7] The tax base is the cadastral value and the tax rate is 0.16%. Tax reductions and rebates may vary by municipality, among other reasons because of the cadastral value adjustment and the year of construction of the property. Such reductions can range from 65 to 80%. There are also rebates for large, low- income families (couples with three or more children and single parents with two or more children on an income lower than 30 thousand euros) and special properties. The tax receipt is issued by the AMB and starts at 3 euros a year, with an average of, approximately, 60 euros a year.

As of this date, we can begin to identify a reaction among the population to a tax that they had previously received very little news about. First, a simple Google search for the term "*Tribut Metropolità*" reveals a clear spike after 15 of October 2019, see Figure 1. We consider this to be indicative of the lack of awareness among the population of this tax prior to their receiving the first tax receipt. Second, the citizens resident in these 18 municipalities began to set up civic platforms opposing the metropolitan tax. Quickly, 15 platforms were created. They organized protests in front of the City Hall in each municipality, and coordinated their protests via the social media, unifying their demands under the name "*Plataforma Unificada NO al Tribut AMB*" (or the Unified Platform against the AMB Tax).

On 17 December 2019, the Metropolitan Council approved the decree providing for the metropolitan tax. The formula remained the same and the calendar stayed untouched (payment during the last quarter of each year). The Platform against the Metropolitan Tax continued its protests but without any success.

3 Data and Methodology

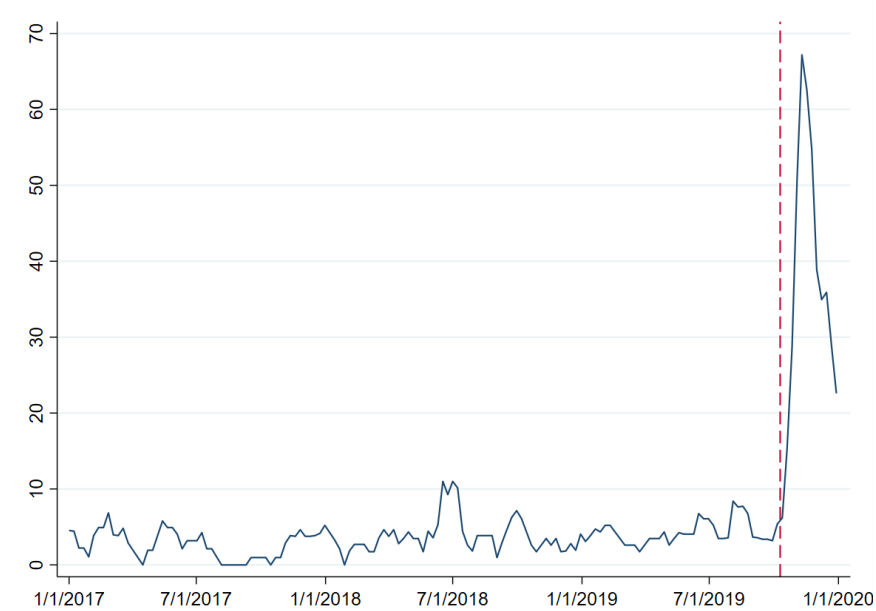
3.1 Data and sample selection

The empirical analysis conducted here exploits a unique data-set containing public transport ticket validations. Specifically, we have ticket validation data for every hour and every day at each train and metro station in the AMB for the period 2017-2019. This information is taken from the tickets that permanent

[6] More details on this particular strategy can be found in *Diari Ara*, accessed in July 2022.

[7] With the exception of the owners of main residences of low cadastral value. In other words, the tax did not affect owners of homes that constitute their first residence and which do not exceed the cadastral value of 46,210.11 euros. This amount was fixed at 72,033.78 euros in those municipalities that revised the cadastral value from 2012 onwards.

Figure 1: **Google Trends**



NOTE: Google Trends search on *"tribut metropolità"* & *"tributo metropolitano"* & *"impuesto metropolitano"* & *"impuesto transporte"* as a search topic. The search was restricted to the province of Barcelona. The vertical red line indicates the 15 of October. Source: Google Trends.

residents of the AMB typically use, as the day and time of travel are only included on tickets of this type.[8] By limiting our study to these tickets, we are able to clean our data (e.g., eliminate the use of public transport by the city's tourists) and ensure the analysis is primarily focused on the effects on the regular users of public transport. We further restrict our sample by including only validations made between the hours of 6 and 12 o'clock in the morning. Here, we seek to capture the use of public transport during those hours in which people tend to leave their municipality of residence. We collapse the information at the municipal level. In this way, we have the total number of ticket validations made by individuals that take the train or metro from their municipality of residence for each day and each municipality.

As explained in section 2, our analysis includes treated and non-treated (control) municipalities. The former correspond to the municipalities where the fare reduction was introduced on 1 January 2019, whereas the latter include some that have never experienced a fare reduction and others where the reduced fare was introduced around 2005. We exploit these different situations among the municipalities in the control group to conduct robustness checks.

Moreover, in our regression analysis we include several control variables that may be correlated with the treated municipalities and so confound our estimates. Among them, we include figures on income, population and unemployment rate at the municipal level (*Instituto Nacional de Estadística (INE)*).

[8] We considered validations of the following tickets: "T10", "Tmes", "Ttrimestre" and "Tfamilia".

3.2 Methodology

We implement a difference-in-differences strategy to identify the impact that the fare policy reduction might have had on the use of public transportation by residents in the affected municipalities. First, we estimate whether the difference in the use of public transportation between the affected and non-affected municipalities changed after the fare reduction. To do so, we estimate the following equation:

$$ln(\text{validations}_{jt}) = \beta_0 + \beta_1 Post_t + \beta_2 Treat_j + \beta_3 Post_t \times Treat_j + \rho^{'} X_{jt} + w_t + m_t + \epsilon_{jt} \quad (1)$$

where validations_{jt} is the number of ticket validations made in each municipality j at time t. Our data are daily and, therefore, t represents each day (morning) throughout the study period. $Post_t$ is a categorical variable that is equal to 1 in 2019 and 0 for other years. $Treatj$ is also a dummy variable that takes a value of 1 for municipalities that experienced the fare reduction on 1 January 2019 and 0 otherwise. Our parameter of interest is β_3 and given that our main dependent variable is in logs, it can be interpreted as the 100 $\times \beta_3\%$ variation in the dependent variable experienced when our interaction takes the value 1. X_{jt} are controls (unemployment rate, population, income, etc.) at the municipal level introduced to capture possible shocks that had a different impact on the municipalities (see explanation in section 3.1).[9] We also included days of the week, w_t (Mondays as the reference category) and month of the year fixed effects, m_t (January as the reference category). With these two fixed effects we intend to capture the seasonality in the use of public transportation. Finally, ϵ is the error term and in all our estimates we cluster standard errors at the municipal level.

In order to capture the effect after different moments of the year, we extend the previous specification to a triple difference-in-differences specification and estimate the following regression for different definitions of the variable $Post_t$:

$$\begin{aligned} ln(\text{validations}_{jt}) &= \beta_0 + \beta_1 Yr_t + \beta_2 Post_t + \beta_3 Treat_j \\ &+\gamma_1 Yr_t \times Post_t + \gamma_2 Yr_t \times Treat_j + \gamma_3 Post_t \times Treat_j \\ &+\delta_1 Yr_t \times Post_t \times Treat_j + \rho^{'} X_{jt} + w_t + m_t + +\epsilon_{jt} \end{aligned} \quad (2)$$

In equation 2 all the variables are same as in equation 1 with the addition of a categorical variable Yr_t representing each year included in our sample, where the reference category is 2017. Additionally, in this specification, $Post_{jt}$ is dummy that is equal to 1 if the observations are after 15 October 2019, when property owners in the affected municipalities realized they had to pay a new tax to finance the fare reduction. Likewise, we analyze other periods of time, including after 26 May 2019, to see if there was any effect after the municipal elections and, also, the period between 26 May and 15 October 2019. In this specification, therefore, we capture the main effect, for different post definitions, by interacting three variables and, therefore, our parameter of interest in these cases is δ_1. $Treatj$ is again a dummy variable that takes a value of 1 for municipalities that experienced the fare reduction on the 1 January 2019 and 0 otherwise. However, as outlined below, in our robustness check we test these estimates using different treated and control groups. Finally, we also include controls at municipal level and fixed effects for the day of the week and the month of the year.

[9] Controls are defined at a monthly or quarterly frequency depending on data availability.

4 Results

4.1 Main results

The difference-in-differences estimates obtained in the case of Equation 1 capture the effect of the reduction in public transport fares on the use of the public transportation (estimated parameter of the interaction of variables 'Post" -i.e. 1 January of 2019- and "Treat"). As can be seen in the first column of Table 1 treated municipalities experienced an increase in the number of ticket validations vs. the corresponding number in the control municipalities of 33%. This result is robust to the inclusion of the control variables (Panel B) increasing 1.3 p.p. up to 34.3%. This increase in the number of ticket validations (33%) can be considered a weighted average of the effect in two different periods: First, the response in public transport use due to the fare reduction in the first nine months of the year, when users were still unaware they would have to pay the new tax (column 2) and, second, the response of users after 15 October when they started to receive receipts for the new tax (column 3), that is, when most property owners in the treated municipalities realized they would have to pay for the reduction in fares.

Table 1: Estimates of the Effect of the Fare Reduction on Public Transportation

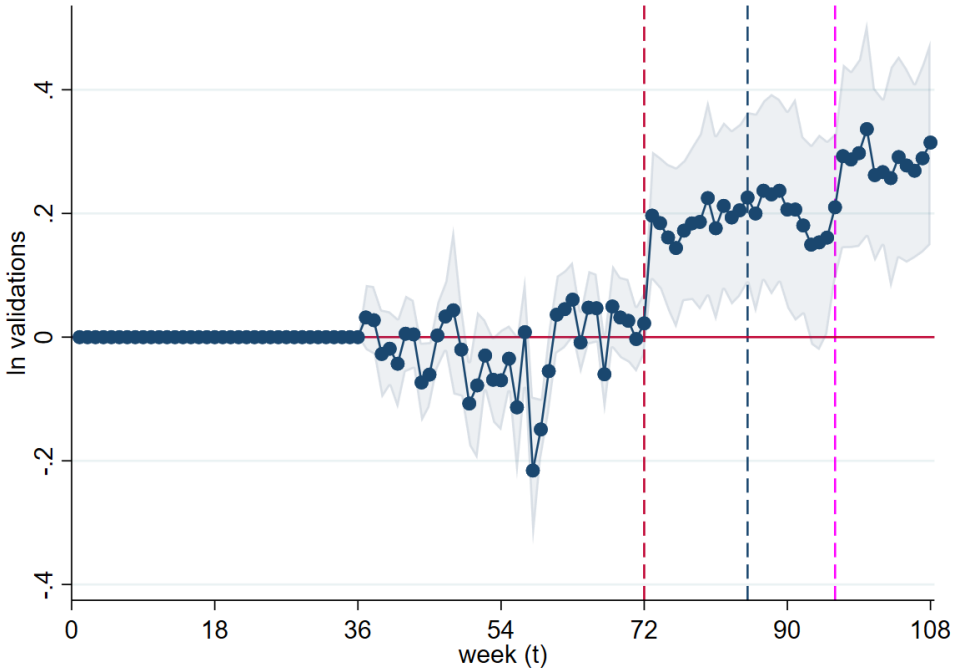
	(1) All 2019	(2) Before 15 October	(3) After 15 October
Panel A: without controls	0.330***	0.307***	0.411***
	(0.060)	(0.063)	(0.056)
R^2	0.086	0.087	0.084
Panel B: with controls	0.343***	0.321***	0.422***
	(0.061)	(0.063)	(0.056)
R^2	0.684	0.686	0.677
Observations	90,637	71,218	19,419

This table shows the estimates of the log of ticket validations on public transportation in the metropolitan area of Barcelona. Estimates are based on a difference-in-differences strategy. Estimations in Panels A and B include daily and monthly effects. Estimations in Panel B include unemployment, population and average income at the municipal level as control variables. Column 1 considers as the post-policy period the entire year of 2019, column 2 excludes observations after 15 October each year, and column 3 considers only the weeks after 15 October each year. Notes: Standard errors in parentheses. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively.

To examine in greater depth the magnitude of the effect over the year, we split our post period (year 2019) in three: from 1 January to 26 May ("pure fare effect"), from 26 May to 15 October ("municipal elections effect") and from 15 October to the end of the year ("tax salience effect"). To visualize any differences in response in the course of 2019, we first present our difference-in-differences estimates graphically. Figure

2 shows a clear increase in the use of public transportation in 2019 compared with the same weeks in the previous years. Moreover, a clear jump in the estimates is observed after 15 October indicating the additional consumption of public transport when property owners began to receive their tax receipts. We do not observe any significant change after the elections and before the 15 October 2019. Finally, and critical here for our identification, we do not observe any substantial differences between the treated and control municipalities in the pre-policy years (between 2017 and 2018).

Figure 2: **Main Estimates**



NOTE: Difference-in-differences estimates from equation 1 using weekly average data. The dependent variable is the log of validations. To avoid periods in which the use of public transportation cannot be considered representative, we exclude July and August, Easter weeks in the respective years and the first and last weeks of each year. Vertical lines indicate introduction of new fares on 1 January 2019 (red); the municipal elections held on 26 May (blue); and the distribution of tax receipts on 15 October (purple).

The estimates in columns 2 and 3 of Table 1 confirm the visual evidence presented in Figure 2. Specifically, Table 1 presents the effect before and after 15 October (columns 2 and 3 respectively). In both cases we estimate the same specification as in column one, but we eliminate observations that lie outside the period of interest. As can be seen, the effect after 15 October is about 8 p.p. higher than the estimated effect in the use of public transportation during the first nine and a half months of the year. We interpret this differential effect (before and after users received their tax receipt) to be attributable to the fact that users of public transport realize they are to pay a new tax as a consequence of the reduction in fares (i.e. it can be attributed to the salience of the tax). More specifically, public transportation users in the affected municipalities react to the tax salience by increasing their consumption of public transportation.

A second way to quantify the impact of the policy change and, in particular, to disentangle the effects of

the reduction in fares, the salience of the new tax and/or the municipal elections, is to reset the date used to define the pre- and post-periods. In column 1 in Table 2 we reproduce the estimates reported in the same column of Table 1; however, here, in column 2 we define our *Post* variable as a dummy that takes a value of 1 for observations after 15 October and 0 otherwise. When we interact this *Post* variable with the variables *Year* and *Treated* we capture the differential effect for the last two and a half months of the year, between the treated and control municipalities, in 2019 compared to the two previous years. As can be seen in column 2 of Table 2, the estimated effect on the use of public transportation as a consequence of receiving the tax receipts was 9.3%, a magnitude that is similar to the difference between the estimates in columns 2 and 3 of Table 1.

Table 2: Estimates of the Effect of "Tax Salience" and Elections on Public Transportation

	(1) All 2019	(2) After 15 October	(3) After 26 May	(4) Between 26 May & 15 October
Panel A: without controls	0.330^{***} (0.060)	0.093^{**} (0.042)	0.118^{***} (0.035)	-0.043 (0.043)
R^2	0.086	0.086	0.086	0.086
Panel B: with controls	0.343^{***} (0.061)	0.093^{***} (0.034)	0.111^{***} (0.030)	-0.053 (0.038)
R^2	0.684	0.684	0.684	0.684
Observations	90,637	90,637	90,637	90,637

This table shows the estimates of the log of ticket validations on public transportation in the metropolitan area of Barcelona. Estimates are based on a difference-in-differences strategy. Estimations in Panels A and B include daily and monthly effects. Estimations in Panel B include unemployment, population and average income at the municipal level as control variables. Column 1 considers as the post-policy period the entire year of 2019, column 2 excludes observations after 15 October each year, column 3 considers only the weeks after 15 October each year, and column 4 only those weeks between 26 May and 15 October. Notes: Standard errors in parentheses. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively.

As explained, on 26 May 2019 municipal elections were held in Spain. Thus, we define a further two *Post* variables to explore whether there is any differential effect in the use of public transportation attributable to discussions held during the campaign for the municipal elections. First, column 3 shows the effect from 26 May to the end of the year. As is evident, the effect is slightly greater than that observed after 15 October onward but the difference between these two estimated effects is not statistically significant.

Likewise, we define the third *Post* variable to explore if there is any differential effect in the use of public transportation in the period between 26 May and 15 October. We estimate a small negative coefficient that is not statistically significant from zero, indicating that, between the municipal elections and the moment property owners received the tax receipt, there was no effect in terms of the use of public transportation.

4.2 Robustness checks

In Table 3 we perform some additional exercises to highlight the reliability of our main results. In all the exercises, we estimate both equation 1 and equation 2 for different samples of municipalities. The first row reproduces our baseline results already presented in Panel B of Table 2. The robustness check 1 shows the results of our main specification after eliminating the municipalities that were already operating a reduced transport fare prior to our period of analysis. Our results remain practically unchanged. This exercise is also relevant because it means excluding the main cities in the AMB (that is, Barcelona, L'Hospitalet de Llobregat and Badalona).

Our second robustness check compares the treated and control municipalities included among the total municipalities of the metropolitan area. In other words, we eliminate from our control group those municipalities whose status was never changed to zone 1 and, as such, have never been in a reduced fare zone. Again, our results remain practically unchanged.

In order to rule out the possibility that our results concerning the increase in the consumption of public transportation are driven by changes in the behavior of residents in neighboring municipalities following the policy change, our third robustness exercise eliminates neighboring municipalities whose fare status was never changed. The aim of this exercise is to eliminate from our estimates any possible behavioral responses of the users of public transportation resident in neighboring municipalities, for instance, users that commute to the treated municipalities by private transport and take the train from there. If this were the case, our estimates would be overestimating the true effect. Again, the results of this exercise are very similar to those presented in the previous section.

In order that the distances between the respective municipalities and the city of Barcelona are more comparable, in robustness check 4, we consider only the 36 municipalities making up the AMB (18 treated and 18 control) plus the neighboring municipalities (i.e., we excluded municipalities lying further away from the AMB). Once again, the estimates point in the same direction as our baseline results.

Finally, another way to ensure that our estimates capture the policy change is to conduct a placebo test that redefines the treatment and control groups. Specifically, this exercise eliminates our treated municipalities. In other words, we compare the municipalities making up our original control group -i.e. municipalities that had operated a reduced fare since the mid-2000s (new treated) compared with municipalities that have never been in a reduced fare zone (new control). As can be seen in the last robustness test in Table 3 the results are very small and, as expected, statistically insignificant.

Table 3: Robustness Checks

	(1) All 2019	(2) After 15 October	(3) After 26 May	(4) Between 26 May and 15 October
Main Results	0.343^{***}	0.093^{***}	0.111^{***}	-0.053
Baseline	(0.061)	(0.034)	(0.030)	(0.038)
R^2	0.684	0.684	0.684	0.684
Observations	90,637	90,637	90,637	90,637
Robustness 1	0.350^{***}	0.107^{***}	0.111^{***}	-0.078^{*}
No municip. who had a reduced fare	(0.067)	(0.037)	(0.030)	(0.043)
R^2	0.61	0.61	0.61	0.61
Observations	74,306	74,306	74,306	74,306
Robustness 2	0.362^{***}	0.096^{**}	0.148^{***}	-0.048
No municip. who never change the fare	(0.074)	(0.043)	(0.046)	(0.066
R^2	0.79	0.79	0.79	0.79
Observations	28,290	28,290	28,290	28,290
Robustness 3	0.338^{***}	0.098^{***}	0.116^{***}	-0.051
Eliminate neighbor municip.	(0.061)	(0.034)	(0.031)	(0.039)
R^2	0.68	0.68	0.68	0.68
Observations	87,379	87,379	87,379	87,379
Robustness 4	0.368^{***}	0.061^{*}	0.122^{***}	-0.045
Eliminate control municip. further away	(0.064)	(0.035)	(0.035)	(0.045)
R^2	0.77	0.77	0.77	0.77
Observations	40,279	40,279	40,279	40,279
Robustness 5	-0.016	-0.025	-0.059	-0.002
Eliminate treated municip.	(0.043)	(0.041)	(0.041)	(0.051)
R^2	0.70	0.70	0.70	0.70
Observations	79,773	79,773	79,773	79,773

This table shows the estimates of the log of ticket validations on public transportation in the metropolitan area of Barcelona. Estimates are based on a difference-in-differences strategy. The estimates in the first row reproduce the results presented in Panel B of Table 2 and the columns are the same as those in Table 2. Robustness check 1: We eliminate those municipalities from the control group that introduced the reduced fare in the 2000s. Robustness check 2: We eliminate those municipalities that never operated a reduced fare. Robustness check 3: We eliminate neighboring municipalities who never reduced the public transportation fare. Robustness check 4: We eliminate distant lying controls. Robustness check 5: We eliminate the treated municipalities. All estimates include unemployment, population and average income at the municipal level as controls. Notes: Standard errors in parentheses. ***, **, * = indicate significance at the 1, 5 and 10% levels, respectivey.

5 Conclusion

We find that the reduction in fares on public transport and, in particular, the salience of the tax to finance the policy, had a significant impact on consumer demand for public transportation. We document an overall increase in ticket validations of around 33%. However, this effect is a weighted average between what happened before and after taxpayers visualized that they would have to pay a new tax to finance the measure. In that sense, we estimate that the "salience" of the new tax (after 15 October) generated an additional increase in the consumption of public transportation of around 9 p.p. Our results are robust to different specifications and checks performed.

Our paper provides additional empirical evidence that tax salience plays a prominent role in affecting consumption behaviors. The novelty of our outcome lies in the link found between salience of taxes and the consumption of public services (services provided by the public sector) which builds on and complements the previous literature that found that individuals tend to be more responsive to taxes that are more visible (Chetty, Looney, and Kroft, 2009).

Finally, we also document another well-established finding in the literature estimating a sizable increase in demand for public transportation as a consequence of the fare reduction.

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