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A Playground for Tax Compliance? Testing Fiscal Exchange in an RCT in Argentina

Huáscar Eguino[§] Simeon Schächtele[¶]

Abstract[*]

We present new evidence that a non-threatening behavioral intervention appealing to reciprocity significantly increases tax compliance in a setting (i.e., crisis-ridden Argentina) where one might least expect such an intervention to succeed. Prior research offers many examples of the efficacy of more threatening deterrence approaches. In contrast, field experimental evidence for non-deterrence nudges such as those appealing to taxpayers' feelings of reciprocity ("fiscal exchange") has been limited. This paper reports evidence from a randomized controlled trial with over 20,000 taxpayers in Argentina. A redesigned tax bill with fiscal exchange appeal increased payment rates of tax delinquents by about 20 percent, or almost 40 percent when the bills were delivered in person. With the fiscal exchange appeal, the new bill design elicited significantly more payments than without. The unfavorable economic crisis context in Argentina makes the impacts remarkable. We hypothesize that having children as beneficiaries, the visual form of the appeal, and the proximity between taxpayers and public services in the municipal setting have contributed to the positive compliance impacts.

JEL Classifications: C93, D32, D91, H26, H31, H71
Keywords: tax compliance, fiscal exchange, nudge, field experiment, randomized controlled trial, local public finance, Argentina

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1. Introduction

The provision of public goods and services depends on tax compliance. In many countries, noncompliance is substantial. For example, in the US, around 15 percent of tax liabilities are estimated to never be remitted (IRS, 2019).[1] Countries with lower institutional capacity find it more difficult to collect taxes. As Keen et al. (2015, p. 6) point out, "improving compliance has long been a core development objective, both to enhance revenue and as essential to building strong, trusted public institutions." At the same time, institutional quality, trust, and confidence in government facilitate compliance (Levi, 1988; OECD, 2019; Kirchler, Hoelzl, and Wahl, 2008; Prichard et al., 2019).

Behavioral interventions are one way in which tax administrations address noncompliance. While more threatening "deterrence" approaches have had some success, most field experiments have shown limited impact of non-deterrence nudges (Antinyan and Asatryan, 2019). Among the latter are appeals to taxpayers' feelings of reciprocity towards the state and society ("fiscal exchange"), which tap into the idea that the provision of valued public goods and services supports compliance (Timmons, 2005).

With the municipality of Mendoza, we tested a previously untested form of a "fiscal exchange nudge" in a cluster-randomized controlled trial (RCT) in Argentina. We thereby contribute to the literature on tax compliance (see Alm, 2019; Mascagni, 2018; Slemrod, 2019, for overviews), in particular regarding field experimental evidence for fiscal exchange. The fiscal exchange appeal on the tax bill significantly increased compliance. The economic crisis context makes the impacts remarkable. We hypothesize that the new combination of visual content and children as beneficiaries of the advertised public services and its visual format helped.

The next section reviews the literature on fiscal exchange. Section 3 lays out the institutional background of the randomized field experiment. Section 4 describes this experiment. Section 5 presents the results, which we discuss in the concluding Section 6.

2. Literature Review

Fiscal exchange (also "vertical reciprocity") is a motivational force for tax compliance covered under the umbrella term of "tax morale" (Luttmer and Singhal, 2014). It refers to the idea that taxpayers reciprocate the provision of valuable public goods with tax compliance.[2] From the viewpoint of a political theory of the state, fiscal exchange can be one factor in an optimal mix of fostering voluntary motivation and neither too little nor too much enforcement.[3]

The empirical evidence regarding fiscal exchange, however, is mixed. Early laboratory studies suggested a positive impact on tax compliance, as do survey experiments.[4] But neither involve actual tax compliance decisions. The crucial evidence from field experiments (or RCTs) is mixed.[5] In their survey of tax morale, Luttmer and Singhal (2014) assert "a predominance

[1] The data for the US are among the best available for the difficult task of estimating noncompliance.

[2] It may form part of a fiscal contract between the state and its citizens (Bates and Lien, 1985; Timmons, 2005).

[3] A high degree of coercion is not only undesirable per se, but can be inefficient (Stigler, 1970). Alternatively, a state may rely on and support voluntary motivations. Resulting "quasi-voluntary compliance" (Levi, 1988) still depends on enforcement: evidence from an unenforced church tax in Germany, for instance, points to 80 percent noncompliance (Dwenger et al., 2016). While tax morale might increase with enforcement (e.g. Filippin, Fiorio, and Viviano, 2013), excessive enforcement can backfire (Reid, 1979; Cabral and Hoxby, 2012).

[4] See Alm, McClelland, and Schulze (1992) and Alm, Jackson, and McKee (1993) for the first, and Ortega, Ronconi, and Sanguinetti (2016) and Doerrenberg and Peichl (2019) for the latter.

[5] We focus on constant resource allocation. In contrast, varying allocation also tests the effects of allocation (Carrillo, Castro, and Scartascini, 2018; Doerrenberg, 2015) while going beyond communicative changes.

of null findings." A meta analysis of over 40 RCTs concludes that fiscal exchange and other non-deterrence nudges "are on average ineffective" (Antinyan and Asatryan, 2019).[6]

Three exceptions to the tendency for null effects are worth noting.[7] Mentioning tax-financed public goods to British income tax delinquents slightly accelerated their tax payments compared to a "standard" letter (Hallsworth et al., 2017). A letter with similar information *decreased* compliance of Polish tax delinquents relative to a "behavioral letter" (Hernandez et al., 2017).[8] While these studies featured over 100,000 taxpayers, a third RCT targeted a smaller sample of Norwegian taxpayers. Here, a fiscal exchange sentence increased compliance at the intensive-margin (Bott et al., 2020).[9] The authors point out that their results could be due to favorable aspects of the Norwegian context, namely a high level of trust, a high general level of compliance and a general recognition that taxes finance important public goods. We next describe the current context.

3. Institutional Background

The cluster RCT took place in the Argentinian city of Mendoza, a city of over 100,000 inhabitants.[10] It concerned the local tax most important for the municipal budget.[11] Specifically, the municipality redesigned the bill for "municipal services related to properties," or the "municipal property tax" as we will write in reference to its base in the municipal assessment of property values.[12] According to the tax administration, compliance is almost perfectly observable (see also Castro and Scartascini, 2015). Even so, noncompliance in the form of late or non-payment is substantial (compare Section 4.4). Bills for the monthly dues are sent bimonthly (unless advance payment is chosen).

Two contextual factors deserve mentioning. First, if we think about the explanation by Bott et al. (2020) for the positive results in Norway, it is worth noting that Argentina ranks much lower than Norway on interpersonal trust and confidence in government.[13] This contrast with Bott et al. (2020) is not necessarily conducive to effective non-deterrence nudges. Second, the RCT took place during a recession and high inflation period (IMF, 2019; INDEC, 2020). This macroeconomic context made it more difficult than usual to pay taxes.[14] Because under the circumstances the municipality sought to avoid enhancing enforcement but needed to maintain revenues, it prioritized non-deterrence nudges.[15]

[6] Examples of null effects include Blumenthal, Christian, and Slemrod (2001), Castro and Scartascini (2015) and, Bérgolo et al. (2019).

[7] Table A.1 in the appendix provides more detail on the treatments used in key fiscal exchange nudging studies.

[8] It increased relative to an existing letter. New vs. old letter confounds novelty and attention with fiscal exchange effects. Moreover, unlike the old letter, the public goods treatment contained a threat and a moral appeal.

[9] Letters were sent to taxpayers at risk of under-declaring foreign income. The authors explain their results through the existence of "moral taxpayers" (which declare some foreign income even without enforcement).

[10] Mendoza is the capital of the homonymous province in western Argentina. Argentina is the world's eighth-largest country and the second-largest economy in South America (GDP p.c. $\sim$ \$20,000 PPP; IMF, 2019).

[11] It contributed one third of own revenues in 2018. The municipality also applied the public service ad to a business tax bill. Here, in a sample ten times smaller, there were insignificant effects (results omitted).

[12] The 'Tasas por Servicios Municipales a la Propiedad Raíz' are nominally fees, unlike the provincial property tax. Because fees are "delinked from the cost of service provision" (Muzzini et al., 2017, p.23), we use "taxes" broadly.

[13] Argentina (Norway) ranked 39 (1) out of 57 surveyed countries on interpersonal trust and 33 (16) of 56 on confidence in the government in the World Values Survey (Inglehart et al., 2014, last wave in which both countries participated).

[14] It also favoured deffering payments as inflation exceeded interest on municipal arrears.

[15] Besides, municipalities depend on transfers from the provincial and federal level (see Fretes Cibils and Ter-Minassian, 2015; Muzzini et al., 2017). In Mendoza, they account for half the municipal budget. Fostering (quasi-)voluntary compliance might reduce this dependency and increase fiscal space without alienating voters.

4. The Experiment

The cluster RCT tested the effects of three tax bill designs, especially a fiscal exchange appeal, on the payment of November/December 2019 municipal property taxes. We first describe the three treatments, then randomization, delivery, and the data. The tax bill designs are available in Appendix C.

4.1. Treatments

Control (T_0). As a benchmark, one group of taxpayers continued to receive the existing tax bill design (the control group). Like the new designs, it featured the municipality logo, followed by identifying information of the taxpayer. Two payment coupons, one for each month, occupied the bill's body, together with the amounts and dates due. The bill further listed banks and the municipality as places to effectuate payment. For taxpayers in arrears, an added sentence urged outstanding payments and avoiding judicial proceedings. The page bottom indicated where to get further information, a municipal service number and website, plus the address and telephone number of two municipal service centers (see Figure C.1).

Figure 1: Public Service Advertisement (key element of T_2)

New design (T_1). The new design treatment serves as a benchmark for the effects of design changes. It differs from the old bill: First, it was printed in color. Second, it contained less text, reducing cognitive load. Third, it made payment options more salient by printing bank logos. Fourth, it highlighted four municipal service centers for further information (along with the telephone number and website).For taxpayers in arrears, it featured the same sentence urging payments as in T_0, although more saliently. The right-hand side of the bill featured empty space where the following T_2 treatment placed the public service advertisement (see Figures C.2 and C.3).

New design and public service advertisement (T_2). This bill is the main treatment of interest. Except for the public service advertisement placed prominently on its right-hand side, it is similar to T_1. The advertisement used two color photographs of renovated public spaces (Figure 1; entire bill: Figures C.4 and C.5).[16] The top part read "Let's go outside!" in large letters. Below, the phrase "We renovated plazas and parks" subtitled a picture of a local park and the words "fitness and play elements for kids" accompanied a picture of children on a playground. Underneath, a symbol of a revolving coin and the text "Your fees return" (literally translated) visualized fiscal exchange.

[16] We had no systematic information on the extent taxpayers valued renovated parks and playgrounds. The municipal administrators chose this theme and planned on featuring different themes in later billing periods.

4.2. Sample and randomization

The municipal administration rolled out the bills to taxpayers in central sections of the city. At the municipality's request, we assigned the treatments to 1,593 small geographical zones, in equal proportion.[17] This zone-level assignment allows us to use different modes of inference for the treatment effects. As Section 5 explains, these produce consistent results.

The zones comprised 30,501 municipal property taxpayers, 17,811 without arrears and 12,690 with. Because a random two-thirds subsample of the debtors received a new tax dunning letter as part of a separate, concurrent intervention, we avoid confounding effects by excluding these observations. This leaves us with an analysis sample of 22,119 taxpayers.

4.3. Delivery and data collection

Municipal agents delivered the tax bills November 4–11, 2019. If possible, the agents delivered the bills in person, otherwise they slipped them under the door. They recorded the type of delivery.[18] The due date for the November (December) payment was November 21 (December 19). The data we analyze includes payments until January 9, 2020.

4.4. Data and balance

Table 1 provides an overview of the data and the extent to which the treatment groups are balanced. As the columns titled n show, the number of taxpayer observations in each group is in the order of 7,500, spread over 617–655 zones (clusters). The t-tests in the three right-most columns indicate that the covariates are balanced across the treatment groups, with one exception. We first describe the variables from top to bottom and then comment on potential implications for estimation.

Each treatment group had a mean municipal property tax bill between ARS$ 1220 and 1330 ($\sim$ US $20). In all groups, about 20 percent were in arrears.[19] The arrears amounts of these debtors averaged ARS$ 2720–2760 ($\sim$ US $45), as shown in the next row. Between 21 and 27 percent were located on the five streets with the most properties ("main street"). The share of in-person deliveries was significantly larger for T_1 than T_0 (47 percent vs. 36 percent, $p < .05$). Of all recipients, 3–4 percent of taxpayers received a different treatment than originally assigned. We explain why shortly.

The three next variables refer to zones. They allow us to control for potential effects of zone affluence, size, and compliance level. The mean municipal property tax bills in a zone are between ARS$ 1230 and 1320. By construction, these match the individual means (row 1) up to rounding error. The mean overall share of municipal property tax debtors in a zone is around 40 percent in each treatment. The (weighted) average overall number of taxpayers in a zone is 130–150. These two final variables refer to all taxpayers, regardless of inclusion in the analysis sample.[20]

[17] We randomized at a geographical level to simplify logistics and to reduce treatment contamination and potential confusion between neighbors receiving different-looking bills.

[18] Twenty tax bills were returned undelivered. Excluding these from the analysis leaves the results virtually unchanged.

[19] The arrears percentage refers to liabilities from 2018 and/or 2019.

[20] They therefore exceed their individual-level counterparts. Also keep in mind that, as for the other variables, the averages are taken over individuals. As a result, the treatment means of the number of taxpayers are implicitly weighted by the observations in a zone, and therefore do *not* constitute simple averages across zones. This is an additional reason that the displayed mean counts exceed observations divided by the number of clusters.

Table 1: Balance Table

	(1)		(2)		(3)		T-test		
	T_0 Control		T_1 New design		T_2 FEX		P-value		
Variable	n	Mean/SE	n	Mean/SE	n	Mean/SE	(1)-(2)	(1)-(3)	(2)-(3)
Tax bill amount	7539	1.25	7488	1.22	7303	1.33	0.73	0.52	0.39
[ARS$ 1,000]	[617]	(0.06)	[665]	(0.05)	[619]	(0.12)			
In arrears	7539	0.19	7488	0.20	7303	0.19	0.88	0.88	0.74
[0/1]	[617]	(0.03)	[665]	(0.02)	[619]	(0.02)			
Arrears	1457	2.76	1485	2.76	1375	2.72	0.99	0.93	0.94
[ARS$ 1,000]	[182]	(0.42)	[190]	(0.49)	[161]	(0.24)			
Main street	7539	0.27	7488	0.21	7303	0.25	0.50	0.84	0.63
[0/1]	[617]	(0.07)	[665]	(0.06)	[619]	(0.06)			
In-person delivery	7539	0.36	7488	0.47	7303	0.39	0.05**	0.64	0.13
[0/1]	[617]	(0.05)	[665]	(0.03)	[619]	(0.04)			
Treatment deviation	7539	0.03	7488	0.03	7303	0.04	0.97	0.17	0.18
[0/1]	[617]	(0.01)	[665]	(0.01)	[619]	(0.01)			
Tax bill zone mean	7539	1.26	7488	1.23	7303	1.32	0.73	0.60	0.47
[ARS$ 1,000]	[617]	(0.06)	[665]	(0.05)	[619]	(0.12)			
Share debtors in zone	7539	0.39	7488	0.39	7303	0.40	0.94	0.42	0.45
[0;1]	[617]	(0.01)	[665]	(0.01)	[619]	(0.01)			
# taxpayers in zone	7539	0.13	7488	0.13	7303	0.15	0.89	0.52	0.61
[1,000]	[617]	(0.02)	[665]	(0.02)	[619]	(0.02)			

Notes: Double columns (1), (2), and (3) show statistics of the variables on the left in the control and treatment groups (FEX stands for fiscal exchange). Columns titled n give the number of taxpayers and, in brackets below, of clusters. The columns right of n show the group mean of the respective variable and its standard error (in parentheses below). The three rightmost columns show the p-values of t-tests for differences in the group means. "Tax bill amount" refers to the municipal property tax bill November/December 2019 (in 1,000 ARS$). "In arrears" is an indicator equal to one if the taxpayer has outstanding municipal property tax liabilities from 2018–2019. "Arrears" is the outstanding amount (in 1,000 ARS$), conditional on positive. The displayed number of observations is thus smaller for this variable. "Main street" is an indicator for location on one of the five streets with the most taxpayers. "In-person delivery" is an indicator for personal delivery of the tax bill. "Treatment deviation" is an indicator equal to one if the taxpayer's treatment differed from original assignment. The three final variables refer to the zone level (constant within zone). "Tax bill zone mean" is the mean tax bill November/December 2019 amount in the zone (1,000 ARS$). "Share debtors in zone" measures the overall proportion of municipal property taxpayers in arrears in a zone. "# taxpayers in zone" is the overall number of taxpayers in the zone (in multiples of 1,000). Standard errors are clustered at the zone level. * $p < .10$; ** $p < .05$; *** $p < .01$

Two of the preceding statistics require commentary. First, a mismatch between assignment and treatment occurred for 736 taxpayers because the municipality updated their geographical information after randomization. Excluding these taxpayers leaves the results virtually unchanged (see Tables B.4 and B.10). Second, because in-person delivery can increase compliance (Ortega and Scartascini, 2020; Antinyan and Asatryan, 2019), the more frequent occurrence in T_1 could bias the results in its favor. Reassuringly, the estimates are robust to the inclusion of control variables such as in-person delivery. Likewise reassuringly, and in line with

compliance-enhancing effects, the treatment impacts are larger for personal deliveries.

5. Results

5.1. Empirical strategy

Our primary outcome is whether or not a taxpayer made a payment for the November/December 2019 tax bill.[21] In what follows, we present the main estimation approach. A host of alternative methods, notably Probit regressions, zone-level analysis and randomization inference, produce similar results (see Appendices B.1 and B.2).

For the main treatment effects, we estimate OLS regressions of the form:

$$Y_i = \alpha + \beta_1 T_{1i} + \beta_2 T_{2i} + X_i\gamma + W_z\delta + \epsilon_i, \tag{1}$$

where i indexes taxpayers, T_{1i} is an indicator for the newly designed bill, and T_{2i} for the new bill with public service advertisement. X_i and W_z are vectors of individual-level and zone-level covariates respectively. We report the results for various covariate sets (including none). Reassuringly, the covariates act primarily on the precision of the estimates.

β_1 and β_2 estimate the effects of the new bills relative to the old bill (the omitted reference category). To learn if the fiscal exchange component affected compliance beyond potential effects of the new design, we also test if $\beta_2 - \beta_1 = 0$ and append the result to the regression tables.[22] We further estimate (1) for different subsamples. We test for heterogeneous treatment effects by interacting (1) with subsample indicators.

To account for the clustered nature of the randomized treatment assignment, we cluster standard errors at the zone-level (Abadie et al., 2017; Cameron and Miller, 2015). Another valid approach to analyze cluster-randomized data is to do inference on cluster-level statistics (e.g., zone means). By relinquishing individual-level covariates, this approach forfeits statistical power. Reassuringly, however, it produces similar results to the individual-level regressions (see Table B.1). Randomization inference (Fisher, 1935; Young, 2019) on the permutation of treatments assignments to zones also accounts for clustered treatment assignment. This third method, too, produces results comparable to the main regressions (see Table B.2).

5.2. Results

We first examine the overall treatment effects. We then consider them in different subsamples. Finally, we take notice of spillovers of the tax bills on the payment of arrears.

Treatment effects on tax compliance. Table 2 shows the impacts estimated according to (1). Each column features a different set of covariates, starting from no covariates in column 1, individual-level covariates in columns 2 and 3, zone-level covariates in column 4, and ending with individual- plus zone-level covariates in column 5. Reassuringly, the treatment coefficients are robust to changing covariate sets. In line with foregone precision, specifications without individual-level covariates have larger standard errors. Hence, the effects of T_2 relative to T_0 and T_1 are significant at conventional levels in specifications with individual-level covariates (columns 2, 3, 5), but not without (columns 1, 4). Probit regressions (Table B.3) produce almost identical results.

[21] The data indicate that payments for November or December were either made in full or not at all.
[22] In practice, we re-estimated (1) with T_{1i} as omitted reference category.

Table 2: Treatment Effects

DV: paid bill	(1)	(2)	(3)	(4)	(5)
New design only (T_1)	0.50	0.50	0.61	0.50	0.59
	(2.28)	(1.34)	(1.37)	(2.17)	(1.37)
	[0.825]	[0.709]	[0.657]	[0.816]	[0.668]
Public service ad (T_2)	2.73	2.47**	2.76**	3.01	2.84**
	(2.12)	(1.23)	(1.30)	(2.13)	(1.35)
	[0.198]	[0.045]	[0.033]	[0.157]	[0.035]
Difference ($T_2 - T_1$)	2.23	1.97*	2.16**	2.51	2.25**
	(1.82)	(1.11)	(1.00)	(1.84)	(0.99)
	[0.221]	[0.075]	[0.030]	[0.172]	[0.023]
In-person delivery		2.02**	1.75*		1.82**
		(0.97)	(1.04)		(0.88)
Main street		0.17	-0.21		-0.31
		(1.22)	(1.21)		(1.07)
Tax bill amount		-0.20	-0.13		-0.092
		(0.14)	(0.10)		(0.071)
In arrears		-41.8***			
		(1.81)			
Arrears quartile 1			-18.9***		-18.6***
			(5.43)		(5.40)
Arrears quartile 2			-29.8***		-29.5***
			(2.06)		(2.10)
Arrears quartile 3			-50.3***		-50.0***
			(1.72)		(1.74)
Arrears quartile 4			-67.5***		-67.2***
			(1.45)		(1.48)
# taxpayers in zone				3.82	-0.16
				(11.7)	(6.05)
Tax bill zone mean				-0.56	-0.48
				(0.51)	(0.36)
Share debtors in zone				-30.7***	-4.02
				(4.29)	(3.07)
Control mean (T_0)	77.0	77.0	77.0	77.0	77.0
Observations	22119	22119	22119	22119	22119

Notes: Linear probability (OLS) regressions for the binary outcome "Paid the municipal property tax bill November/December 2019." All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 features no covariates. Column 2 adds individual-level control variables. Column 3 substitutes the binary indicator for having arrears with indicators for each quartile of arrears, no debt being the omitted reference category. Column 4 shows the results for zone-level covariates. Column 5 combines individual- and zone-level covariates. The note to Table 1 provides more detail on the covariates. Standard errors clustered at the zone level in parentheses, p-values for the treatment effects in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Across all specifications, the public service ad increased payments by 2.5–3 percentage points above the control group. Given the baseline compliance of 77 percent with the old letter, this represents a 3–4 percent increase. The impact of the public service advertisement is 2–2.5 percentage points larger than the new design alone. In fact, the new design by itself had no significant impact on payments. It thus appears that the public service advertisement is the crucial element of T_2.

Three remarks about the covariate coefficients are in order. First, the significant coefficients have the expected signs. In particular, in-person deliveries are associated with a higher payment probability and arrears vice versa. Second, arrears reduce the payment likelihood substantially. As arrears imply previous noncompliance and some determinants of compliance are stable, the large negative coefficient on being in arrears in column 2 is expected.[23] By partitioning the binary indicator in column 2 into indicators for each quartile of arrears, column 3 reveals that higher arrears are associated with a lower payment likelihood. Third, the zone-level covariates have no exploratory power beyond the individual-level covariates.[24] Given the importance of debt and, to a lesser extent, delivery, we now zoom in on these dimensions.

Table 3: Treatment Effects by Delivery Mode and Arrears Status

	all			in-person deliveries		
	(1)	(2)	(3)	(4)	(5)	(6)
DV: paid bill	all	in arrears	compliant	all	in arrears	compliant
New design only (T_1)	0.61	4.84	-0.57	1.47	6.85	-0.13
	(1.37)	(4.12)	(1.05)	(2.33)	(7.61)	(1.69)
	[0.657]	[0.240]	[0.586]	[0.530]	[0.368]	[0.940]
Public service ad (T_2)	2.76**	9.02**	1.20	5.73***	14.6**	3.22**
	(1.30)	(4.03)	(0.94)	(2.22)	(7.28)	(1.35)
	[0.033]	[0.025]	[0.204]	[0.010]	[0.044]	[0.017]
Difference ($T_2 - T_1$)	2.16**	4.18	1.77*	4.27***	7.79*	3.35**
	(1.00)	(2.61)	(0.99)	(1.46)	(4.05)	(1.48)
	[0.030]	[0.109]	[0.075]	[0.003]	[0.055]	[0.024]
Control mean (T_0)	77.0	40.6	85.8	76.1	37.4	87.3
Observations	22119	4308	17811	8963	1830	7133

Notes: Linear probability (OLS) regressions for the outcome "Paid the municipal property tax bill November/December 2019" by subsample. All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 includes all observations. Column 2 is restricted to taxpayers in arrears; column 3 to taxpayers not in arrears; column 4 to in-person deliveries; columns 5 and 6 split these into taxpayers with and without arrears respectively. All estimations include the individual-level covariates of Table 2, column 3 (unless voided by a subsample restriction): in-person delivery, main street, tax bill amount, arrears quartile 1–4. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

[23] In addition, higher debt is associated with a reduced ability to pay.

[24] The zone-level variables in column 5 are individually and jointly insignificant (F-test: $p = .34$). The zone-share of debtors cedes significance in the presence of individual-level covariates, including individual arrears (column 5).

Treatment effects by delivery mode and arrears status. Besides demonstrating the treatment effects, the preceding analysis pointed to delivery mode and arrears as important determinants of compliance. We now probe if the treatment effects are significant only among subgroups such as taxpayers in arrears. Thereafter, we test for treatment effect *differences* between the subsamples.

Table 3 shows the treatment effects separately for subsamples defined by delivery mode and arrears status. For reference, column 1 repeats the overall sample results.[25] Column 2 shows large treatment effects among taxpayers in arrears: T_2 increased compliance by nine percentage points compared to the old bill ($p = .025$). Given the low 41 percent baseline compliance in this group, this represents a 22 percent increase. The difference between T_1 and T_2 is marginally significant ($p = .109$).[26] Although half the effect of T_2 in this group could be related to the new design, the payment rate in T_1 is not significantly different from T_0.

In line with the literature,[27] column 3 suggests that the new tax bills have a smaller impact on taxpayers compliant at baseline. While T_2 caused almost a two percentage point rise in payment rates relative to T_1 ($p = .075$), the difference to the control group is not significant ($p = .204$). The coefficient on T_1 is negative, although not significantly different from zero ($p = .586$). A reason for these small effects is that most compliant taxpayers would have paid regardless of the intervention, in line with the high rate of 86 percent compliance in the control group. In other words, among previously compliant taxpayers, the fiscal exchange increased payments only slightly. However, the estimated treatment effects for bills delivered in person are larger.

Columns 4–6 of Table 3 repeat the subsample split estimations of columns 1–3 for cases of in-person delivery. As expected, the treatment impact estimates are larger. Among all in-person deliveries (column 4), the public service ad bill increased payments by 6 p.p. (8 percent) relative to the control group. For taxpayers in arrears (column 5), T_2 increased payment by almost 15 p.p. above the control group, representing a sizable 39 percent increase. Among those without arrears (column 6), the public service ad bill increased payments by 3 p.p. (4 percent). In all in-person delivery subsamples, the impact of the public service ad is significantly larger than the new design alone, which had no significant impact on compliance (see first row of Table 3). This result pattern suggests that the public service (fiscal exchange) component is chiefly responsible for the payment increases.

The treatment effects are not robustly significantly different between the subsamples (see Tables B.11 and B.12). To err on the side of caution, we therefore abstain from interpreting them in this way. However, the lack of significance does not imply homogeneous effects.

Treatment effects on arrears cancellation. So far, we established that the public service ad in the tax bill increased payments of that bill. It is possible that changes in the tax bill design also affect other tax payments such as arrears.[28] We investigate this hypothesis by re-estimating (1) with payment of municipal property tax *arrears* as the dependent variable. Indeed the new tax bill treatments increased arrears cancellation (see Tables B.13 and B.14).[29] Enhanced salience

[25] Specifically, for the efficient specification with individual-level covariates (column 3 of Table 2). Results with alternative covariate sets, in particular none and additional zone variables are available in Appendix B.2.

[26] With a more powerful Probit estimation (Table B.5), $p < .1$.

[27] See in particular the meta study in Antinyan and Asatryan (2019).

[28] Lopez-Luzuriaga and Scartascini (2019) and Ortega and Scartascini (2020) document positive spillovers across taxes.

[29] The effects between T_1 and T_2 are not significantly different.

of the debt cancellation appeal on the new treatment bills may have contributed to this.[30] As a result of this spillover, local tax revenues saw an additional increase.

6. Discussion and Conclusion

This paper showed that adding a fiscal exchange appeal to the tax bill significantly increased payments of a municipal property tax. Specifically, a redesigned tax bill advertising public services increased the share of tax delinquents paying their tax bill by over 20 percent relative to the regular bill. When the municipal agents delivered the tax bill in person, the effect was almost twice as large, approaching 40 percent. The point estimates are smaller for taxpayers not in arrears or not receiving the bill in person. Independent of delivery mode and arrears status, omitting the public service component elicited significantly less compliance and insignificantly more than the existing bill. The results are stable across covariate sets and estimation methods, including OLS, Probit, cluster-level analysis and randomization inference.

The sizable impact of the fiscal exchange appeal is encouraging for policy-makers hoping to increase tax compliance with amicable messages. It constitutes an exception to the tendency that non-deterrence nudges have low or no impact (Antinyan and Asatryan, 2019). Unlike in an RCT in Poland (Hernandez et al., 2017), the public service advertisement did not depress compliance, and increased it more in comparison to an existing letter. Its impact in the present context also exceeds the increase in timely payments for UK tax delinquents (Hallsworth et al., 2017). The intensive-margin effect found in Norway is at least as large as the present extensive-margin effect (Bott et al., 2020). The compliance effects of providing additional public goods could be even larger than communication effects. Practitioners should be aware that the effects typically diminish over time (Bérgolo et al., 2019) and consider communication as complementary to sound fundamentals of taxation.

Three aspects make the positive impacts of the fiscal exchange appeal remarkable. First, the economic crisis in Argentina constituted an unfavorable context, for at least two reasons: (i) it reduced the economic resources available for paying taxes and other expenses and (ii) high inflation reduces the real tax liability when tax payments are deferred. Second, Bott et al. (2020, p. 12) hypothesize that "the high level of trust in Norway might also have contributed to making the moral appeals [fiscal exchange] more effective." Compared to Norway's top position in the World Values Survey ranking of interpersonal trust, recorded trust in Argentina is lower (Inglehart et al., 2014). Hence an amicable message might also have gone without impact. Third, it was not possible to incorporate "best practices" (Behavioural Insights Team, 2012) like a personalized signature on the tax bills, nor to pre-test the designs, including if taxpayers appreciated the renovation of parks and playgrounds as a good use of municipal resources.

In contrast, three factors might explain the positive impact of the fiscal exchange appeal in this RCT. First, the main beneficiaries of the public services advertised were children. This could have provoked a more positive emotional reciprocal response than other goods. Second, unlike in most other studies, the public services advertisement featured colorful pictures (i.e., the information was visual rather than abstract). While it could also have diverted attention from the payment information, the results are more consistent with an overall increase in attention and effective transmission of the fiscal exchange appeal. Finally, as taxpayers may

[30] Recall that all bills sent to taxpayers in arrears featured a sentence calling for debt cancellation and avoiding penalties. It was arguably more salient in the new design treatments.

feel closer to local administrations and public services, the municipal setting may also have helped. Taxpayers may have seen and used exactly the goods and services advertised. Future research could investigate to what extent the effects extrapolate to other settings, different public services, and other formats of advertisement.

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Appendices

A. Fiscal Exchange Nudges in the Literature

Table A.1: Fiscal Exchange Nudges in the Literature

Study	Jurisdiction	Key treatment elements (fiscal exchange)	Graphical elements?	Children as prominent beneficiaries?
Bérgolo et al., 2019	Uruguay	If those who currently evade their tax obligations were to evade 10% less, the additional revenue collected would enable all of the following: to supply 42,000 portable computers to school children; to build 4 high schools, 9 elementary schools, and 2 technical schools; to acquire 80 patrol cars and to hire 500 police officers; to add 87,000 hours of medical attention by doctors at public hospitals; to hire 660 teachers; to build 1,000 public housing units ($50m^2$ per unit). There would be resources left over to reduce the fiscal burden. The tax behavior of each of us has direct effects on the lives of us all.	No	Yes
Blumenthal, Christian, and Slemrod (2001)	State of Minnesota, USA	So when taxpayers do not pay what they owe, the entire community suffers.	No	No
Bott et al. (2020)	Norway	Your tax payment contributes to the funding of publicly financed services in education, health and other important sectors of society.	In sub-treatment arms: visualizations of financed services in health, education, infrastructure, research.	Somewhat [via mentioning of education]
Castro and Scartascini (2015)	City of Junín, Argentina	In the first 6 months of this year, CVP's collection contributed to placing 28 new streetlights, water connections in 29 streets and sewerage networks in 21 blocks.	"Men at work" traffic signal	No
Hallsworth et al. (2017)	UK	[2 versions (gain/loss framing):] [Not] Paying tax means we all gain from [lose out on] vital public services like the NHS, roads, and schools.	No	Somewhat [via mentioning of schools]
Hernandez et al. (2017)	Poland	Are you aware that 37.79% of your personal income tax goes to your municipality? From this income, your municipality finances pre-schools, schools, roads, and safety, benefiting everyone in your municipality including yourself and your family. Don't be an irresponsible inhabitant of your municipality and pay your delinquent taxes!	No	Somewhat [via mentioning of pre-schools and schools]
The present study (2020)	City of Mendoza, Argentina	Let's go outside! We renovated plazas and parks. Fitness and play elements for kids. Your fees return. [Text elements located in different locations within a graphically designed public service advertisement]	Colored background and photos of a renovated local public park and playground with children.	Yes, visually highlighted beneficiaries

B. Robustness Analyses and Extensions

B.1. Main Effects: Zone-Level, Randomization Inference, Probit, Exclusions

Table B.1: Zone-Level Treatment Effect Analysis

DV: share paid bill (zone)	(1)	(2)	(3)	(4)	(5)	(6)
New design only (T_1)	0.79	1.20	1.21	0.75	1.20	1.10
	(2.27)	(1.69)	(1.76)	(2.29)	(1.71)	(1.78)
	[0.727]	[0.476]	[0.494]	[0.744]	[0.482]	[0.536]
Public service ad (T_2)	2.46	3.29*	3.09*	2.71	3.35*	3.13*
	(2.16)	(1.71)	(1.87)	(2.18)	(1.73)	(1.89)
	[0.255]	[0.054]	[0.099]	[0.214]	[0.053]	[0.097]
Difference ($T_2 - T_1$)	1.67	2.09*	1.89*	1.97	2.15*	2.02*
	(1.83)	(1.16)	(1.08)	(1.86)	(1.19)	(1.11)
	[0.363]	[0.072]	[0.082]	[0.291]	[0.069]	[0.068]
Tax bill amount zone mean		-0.17	-0.16		-0.17	-0.17
		(0.27)	(0.28)		(0.31)	(0.32)
Share debtors in zone		-18.0***	-19.5***		-18.9***	-20.4***
		(4.27)	(3.76)		(4.41)	(3.91)
Arrears amount zone mean		-7.51***	-7.45***		-7.18***	-7.13***
		(0.92)	(0.92)		(1.04)	(1.03)
# taxpayers in zone			9.81			9.76
			(7.83)			(7.87)
Share in-person deliveries in zone			-1.53			-0.95
			(1.84)			(1.85)
Share main street in zone			-1.93			-2.56*
			(1.40)			(1.50)
Control mean (T_0)	74.0	74.0	74.0	74.4	74.4	74.4
Observations (zones)	1593	1593	1593	1593	1593	1593

Notes: Treatment effect OLS regressions on zone-level aggregates. The dependent variable is the share of taxpayers who paid the November/December 2019 bill in each zone. All regressions are weighted by cluster size (the number of individual observations underlying the zone aggregates). All coefficients are expressed in percentage points. T_1 is an indicator for the new design treatment being the most common treatment in the zone. T_2 is an indicator for the public service ad treatment being the most common treatment in the zone. The omitted reference category are zones where the existing bill (T_0) is the most common treatment (the pen-ultimate row provides the mean outcome for this group). The coefficient "Difference" compares T_2 against T_1. Column 1 features no covariates. Column 2 controls for the mean tax bill amount in the zone, the share of taxpayers in arrears in the zone, and the mean arrears amount per zone. Column 3 additionally controls for the number of taxpayers in the zone, the share of in-person deliveries, and the share of main street observations per zone. Columns 4–6 mirror the specifications of columns 1–3 but exclude taxpayers with a different treatment than the zone mode. Robust standard errors in parentheses, p-values for the treatment effects in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Table B.2: Randomization Inference on Treatment Effects

DV: paid bill	(1)	(2)	(3)
New design only (T_1)	0.72	0.87	0.87
	(0.757)	(0.524)	(0.522)
	[0.752]	[0.541]	[0.531]
Public service ad (T_2)	2.79	3.01	3.14
	(0.206)**	(0.022)**	(0.022)**
	[0.224]**	[0.026]**	[0.022]**
Difference ($T_2 - T_1$)	2.07	2.14	2.27
	(0.272)	(0.031)**	(0.022)**
	[0.351]	[0.112]	[0.086]*
Covariates	none	individual-level	all
Control mean (T_0)	77.0	77.0	77.0
Observations	21385	21385	21385

Notes: This table shows the results of conducting randomization inference (Fisher, 1935; Young, 2019) on the treatment effects. All coefficients are expressed in percentage points. The underlying OLS regressions use no covariates (column 1), individual-level covariates (column 2) and all covariates (column 3), where "all" refers to the full set shown in Table 2. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Standard errors are clustered at the zone level. The values in parentheses are conventional p-values, the values in brackets the p-values from randomization inference. The estimations were implemented using code courtesy of Heß (2017).
* $p < .10$; ** $p < .05$; *** $p < .01$

Table B.3: Treatment Effects (Probit)

DV: paid bill	(1)	(2)	(3)	(4)	(5)
New design only (T_1)	0.49	0.40	0.50	0.55	0.49
	(2.23)	(1.27)	(1.28)	(2.10)	(1.27)
	[0.825]	[0.754]	[0.692]	[0.795]	[0.701]
Public service ad (T_2)	2.75	2.41**	2.72**	3.08	2.78**
	(2.13)	(1.20)	(1.23)	(2.10)	(1.28)
	[0.196]	[0.044]	[0.028]	[0.142]	[0.029]
Difference ($T_2 - T_1$)	2.26	2.01*	2.21**	2.54	2.29**
	(1.84)	(1.10)	(1.01)	(1.87)	(1.01)
	[0.220]	[0.068]	[0.028]	[0.175]	[0.023]
In-person delivery		2.23**	1.97**		2.01**
		(0.97)	(1.00)		(0.87)
Main street		0.19	-0.16		-0.32
		(1.16)	(1.13)		(1.07)
Tax bill amount		-0.14	-0.10		-0.064
		(0.085)	(0.063)		(0.041)
In arrears		-31.3***			
		(1.08)			
Arrears quartile 1			-15.7***		-15.5***
			(3.72)		(3.68)
Arrears quartile 2			-22.8***		-22.6***
			(1.34)		(1.38)
Arrears quartile 3			-35.6***		-35.3***
			(1.09)		(1.13)
Arrears quartile 4			-48.6***		-48.3***
			(1.21)		(1.26)
# taxpayers in zone				2.69	0.27
				(11.1)	(5.63)
Tax bill zone mean				-0.53	-0.44
				(0.43)	(0.29)
Share debtors in zone				-29.7***	-3.29
				(4.36)	(2.97)
Control mean (T_0)	77.0	77.0	77.0	77.0	77.0
Observations	22119	22119	22119	22119	22119

Notes: Probit estimations for the binary outcome "Paid the municipal property tax bill November/December 2019." All coefficients are average partial effects and expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 features no covariates. Column 2 adds individual-level control variables. Column 3 substitutes the binary indicator for having arrears with indicators for each quartile of arrears, no arrears being the omitted reference category. Column 4 shows the results for zone-level covariates. Column 5 combines individual- and zone-level covariates. The note to Table 1 provides more detail on the covariates. Standard errors clustered at the zone level in parentheses, p-values for the treatment effects in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Table B.4: Treatment Effects Excluding Zone Treatment Assignment Defiers

DV: paid bill	(1)	(2)	(3)	(4)	(5)
New design only (T_1)	0.72	0.73	0.87	0.74	0.87
	(2.34)	(1.34)	(1.37)	(2.20)	(1.36)
	[0.757]	[0.588]	[0.524]	[0.735]	[0.522]
Public service ad (T_2)	2.79	2.70**	3.01**	3.18	3.14**
	(2.21)	(1.26)	(1.32)	(2.21)	(1.37)
	[0.206]	[0.033]	[0.022]	[0.151]	[0.022]
Difference ($T_2 - T_1$)	2.07	1.97*	2.14**	2.43	2.27**
	(1.88)	(1.11)	(0.99)	(1.90)	(0.99)
	[0.272]	[0.075]	[0.031]	[0.201]	[0.022]
In-person delivery		1.83*	1.55		1.68*
		(0.99)	(1.05)		(0.90)
Main street		0.18	-0.15		-0.034
		(1.30)	(1.28)		(1.15)
Tax bill amount		-0.18	-0.13		-0.087
		(0.14)	(0.098)		(0.068)
In arrears		-42.1***			
		(1.84)			
Arrears quartile 1			-19.2***		-19.0***
			(5.54)		(5.50)
Arrears quartile 2			-29.6***		-29.3***
			(2.15)		(2.19)
Arrears quartile 3			-51.0***		-50.8***
			(1.74)		(1.75)
Arrears quartile 4			-68.0***		-67.7***
			(1.45)		(1.48)
# taxpayers in zone				2.75	-1.62
				(11.8)	(6.15)
Tax bill zone mean				-0.54	-0.46
				(0.52)	(0.36)
Share debtors in zone				-30.6***	-3.57
				(4.46)	(3.20)
Control mean (T_0)	77.1	77.1	77.1	77.1	77.1
Observations	21385	21385	21385	21385	21385

Notes: Linear probability (OLS) regressions for the binary outcome "Paid the municipal property tax bill November/December 2019," excluding the 736 taxpayers with a different treatment than assigned at randomization. All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 features no covariates. Column 2 adds individual-level control variables. Column 3 substitutes the binary indicator for having arrears with indicators for each quartile of arrears, no arrears being the omitted reference category. Column 4 shows the results for zone-level covariates. Column 5 combines individual- and zone-level covariates. The note to Table 1 provides more detail on the covariates. Standard errors clustered at the zone level in parentheses, p-values for the treatment effects in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

B.2. Heterogeneity Analyses: Probit, Covariate Sets, Exclusions

Table B.5: Treatment Effects by Delivery Mode and Arrears Status (Probit)

	all			in-person deliveries		
	(1)	(2)	(3)	(4)	(5)	(6)
DV: paid bill	all	in arrears	compliant	all	in arrears	compliant
New design only (T_1)	0.50	4.67	-0.57	1.15	6.33	-0.13
	(1.28)	(3.98)	(1.03)	(2.04)	(7.41)	(1.59)
	[0.692]	[0.241]	[0.577]	[0.570]	[0.393]	[0.936]
Public service ad (T_2)	2.72**	8.96**	1.25	5.57***	14.1**	3.36**
	(1.23)	(3.86)	(0.95)	(1.98)	(6.88)	(1.39)
	[0.028]	[0.020]	[0.189]	[0.005]	[0.041]	[0.016]
Difference ($T_2 - T_1$)	2.21**	4.29*	1.83*	4.42***	7.73*	3.48**
	(1.01)	(2.60)	(1.00)	(1.51)	(4.02)	(1.53)
	[0.028]	[0.098]	[0.068]	[0.004]	[0.055]	[0.023]
Control mean (T_0)	77.0	40.6	85.8	76.1	37.4	87.3
Observations	22119	4308	17811	8963	1830	7133

Notes: This table is the Probit estimation analogue of Table 3. Probit estimations for the binary outcome "Paid the municipal property tax bill November/December 2019" by subsample. All coefficients are average partial effects and expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 includes all observations. Column 2 is restricted to taxpayers in arrears. Column 3 is restricted to taxpayers not in arrears. Column 4 is restricted to taxpayers who received the bill in person. Columns 5 and 6 split these into taxpayers in arrears and not in arrears respectively. All estimations include the individual-level covariates of Table 2, column 3 (unless voided by a subsample restriction): in-person delivery, main street, tax bill amount, arrears quartile 1–4. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Table B.6: Treatment Effects by Delivery Mode and Arrears Status, No Covariates

	all			in-person deliveries		
	(1)	(2)	(3)	(4)	(5)	(6)
DV: paid bill	all	in arrears	compliant	all	in arrears	compliant
New design only (T_1)	0.50	4.35	-0.16	2.10	3.66	-0.17
	(2.28)	(4.68)	(1.10)	(4.79)	(8.54)	(1.72)
	[0.825]	[0.353]	[0.886]	[0.661]	[0.668]	[0.920]
Public service ad (T_2)	2.73	7.58*	1.30	6.19	12.5*	3.17**
	(2.12)	(4.12)	(0.98)	(4.45)	(7.44)	(1.36)
	[0.198]	[0.066]	[0.183]	[0.165]	[0.092]	[0.019]
Difference ($T_2 - T_1$)	2.23	3.22	1.46	4.09	8.87*	3.34**
	(1.82)	(3.55)	(1.05)	(2.82)	(5.39)	(1.48)
	[0.221]	[0.364]	[0.164]	[0.146]	[0.100]	[0.024]
Control mean (T_0)	77.0	40.6	85.8	76.1	37.4	87.3
Observations	22119	4308	17811	8963	1830	7133

Notes: Linear probability (OLS) regressions for the binary outcome "Paid the municipal property tax bill November/December 2019" by subsample—without covariates. All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 includes all observations. Column 2 is restricted to taxpayers in arrears. Column 3 is restricted to taxpayers not in arrears. Column 4 is restricted to taxpayers who received the bill in person. Columns 5 and 6 split these into taxpayers in arrears and not in arrears, respectively. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Table B.7: Treatment Effects by Delivery Mode and Arrears Status (Probit), No Covariates

	all			in-person deliveries		
	(1)	(2)	(3)	(4)	(5)	(6)
DV: paid bill	all	in arrears	compliant	all	in arrears	compliant
New design only (T_1)	0.49	4.37	-0.15	2.00	3.71	-0.16
	(2.23)	(4.70)	(1.07)	(4.53)	(8.65)	(1.62)
	[0.825]	[0.352]	[0.886]	[0.659]	[0.668]	[0.920]
Public service ad (T_2)	2.75	7.57*	1.32	6.25	12.4*	3.31**
	(2.13)	(4.11)	(0.99)	(4.39)	(7.37)	(1.40)
	[0.196]	[0.066]	[0.183]	[0.154]	[0.092]	[0.018]
Difference ($T_2 - T_1$)	2.26	3.20	1.48	4.25	8.72*	3.47**
	(1.84)	(3.52)	(1.06)	(2.92)	(5.28)	(1.53)
	[0.220]	[0.363]	[0.163]	[0.146]	[0.099]	[0.024]
Control mean (T_0)	77.0	40.6	85.8	76.1	37.4	87.3
Observations	22119	4308	17811	8963	1830	7133

Notes: Probit estimations for the binary outcome "Paid the municipal property tax bill November/December 2019." All coefficients are average partial effects and expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 includes all observations. Column 2 is restricted to taxpayers in arrears. Column 3 is restricted to taxpayers not in arrears. Column 4 is restricted to taxpayers who received the bill in person. Columns 5 and 6 split these into taxpayers in arrears and not in arrears, respectively. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Table B.8: Treatment Effects by Delivery Mode and Arrears Status, All Covariates

	all			in-person deliveries		
	(1)	(2)	(3)	(4)	(5)	(6)
DV: paid bill	all	in arrears	compliant	all	in arrears	compliant
New design only (T_1)	0.59	5.06*	-0.66	1.47	4.99	-0.13
	(1.37)	(2.77)	(1.05)	(2.19)	(4.49)	(1.72)
	[0.668]	[0.068]	[0.526]	[0.503]	[0.266]	[0.939]
Public service ad (T_2)	2.84**	8.93***	1.02	5.72***	12.7***	3.19**
	(1.35)	(2.74)	(0.95)	(2.04)	(3.82)	(1.39)
	[0.035]	[0.001]	[0.285]	[0.005]	[0.001]	[0.022]
Difference ($T_2 - T_1$)	2.25**	3.86	1.68*	4.25***	7.68**	3.32**
	(0.99)	(2.49)	(1.00)	(1.43)	(3.60)	(1.44)
	[0.023]	[0.121]	[0.093]	[0.003]	[0.033]	[0.022]
Control mean (T_0)	77.0	40.6	85.8	76.1	37.4	87.3
Observations	22119	4308	17811	8963	1830	7133

Notes: Linear probability (OLS) regressions for the binary outcome "Paid the municipal property tax bill November/December 2019" by subsample. All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 includes all observations. Column 2 is restricted to taxpayers in arrears. Column 3 is restricted to taxpayers not in arrears. Column 4 is restricted to taxpayers who received the bill in person. Columns 5 and 6 split these into taxpayers in arrears and not in arrears respectively. All estimations include the full set of covariates as displayed in column 5 of Table 2 (unless voided by a subsample restriction): in-person delivery, main street, tax bill amount, arrears quartile 1–4, number of taxpayers in the taxpayer's zone, mean tax bill November/December 2019 amount in the zone, share of taxpayers in arrears with the municipal property tax in zone. Standard errors clustered at the zone level in parentheses, p-values in brackets.
* $p < .10$; ** $p < .05$; *** $p < .01$

Table B.9: Treatment Effects by Delivery Mode and Arrears Status (Probit), All Covariates

	all			in-person deliveries		
	(1)	(2)	(3)	(4)	(5)	(6)
DV: paid bill	all	in arrears	compliant	all	in arrears	compliant
New design only (T_1)	0.49	4.72*	-0.67	1.14	4.28	-0.14
	(1.27)	(2.67)	(1.02)	(1.93)	(4.41)	(1.62)
	[0.701]	[0.077]	[0.515]	[0.555]	[0.331]	[0.930]
Public service ad (T_2)	2.78**	8.75***	1.06	5.56***	12.0***	3.33**
	(1.28)	(2.65)	(0.96)	(1.84)	(3.73)	(1.42)
	[0.029]	[0.001]	[0.269]	[0.003]	[0.001]	[0.019]
Difference ($T_2 - T_1$)	2.29**	4.03	1.73*	4.42***	7.77**	3.47**
	(1.01)	(2.46)	(1.01)	(1.49)	(3.53)	(1.50)
	[0.023]	[0.101]	[0.088]	[0.003]	[0.028]	[0.021]
Control mean (T_0)	77.0	40.6	85.8	76.1	37.4	87.3
Observations	22119	4308	17811	8963	1830	7133

Notes: Probit estimations for the binary outcome "Paid the municipal property tax bill November/December 2019." All coefficients are average partial effects and expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 includes all observations. Column 2 is restricted to taxpayers in arrears. Column 3 is restricted to taxpayers not in arrears. Column 4 is restricted to taxpayers who received the bill in person. Columns 5 and 6 split these into taxpayers in arrears and not in arrears, respectively. All estimations include the full set of covariates as displayed in column 5 of Table 2 (unless voided by a subsample restriction): in-person delivery, main street, tax bill amount, arrears quartile 1–4, number of taxpayers in the taxpayer's zone, mean tax bill November/December 2019 amount in the zone, share of taxpayers in arrears with the municipal property tax in zone. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Table B.10: Treatment Effects by Delivery Mode and Arrears Status Excluding Zone Treatment Assignment Defiers

	all			in-person deliveries		
	(1)	(2)	(3)	(4)	(5)	(6)
DV: paid bill	all	in arrears	compliant	all	in arrears	compliant
New design only (T_1)	0.87	5.03	-0.30	2.07	7.59	0.43
	(1.37)	(4.16)	(1.05)	(2.32)	(7.60)	(1.68)
	[0.524]	[0.226]	[0.773]	[0.372]	[0.318]	[0.797]
Public service ad (T_2)	3.01**	9.22**	1.44	6.02***	15.2**	3.42**
	(1.32)	(4.13)	(0.97)	(2.23)	(7.24)	(1.37)
	[0.022]	[0.026]	[0.138]	[0.007]	[0.036]	[0.013]
Difference ($T_2 - T_1$)	2.14**	4.19	1.74*	3.95***	7.60*	2.99**
	(0.99)	(2.62)	(0.99)	(1.46)	(4.17)	(1.49)
	[0.031]	[0.110]	[0.079]	[0.007]	[0.068]	[0.044]
Control mean (T_0)	77.1	40.4	85.9	75.8	37.0	87.1
Observations	21385	4175	17210	8798	1801	6997

Notes: This table is equivalent to Table 3, except that it excludes the 736 taxpayer observations with a different treatment than assigned at randomization ("defiers"). Linear probability (OLS) regressions for the binary outcome "Paid the municipal property tax bill November/December 2019" by subsample. All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 includes all observations. Column 2 is restricted to taxpayers in arrears. Column 3 is restricted to taxpayers not in arrears. Column 4 is restricted to taxpayers who received the bill in person. Columns 5 and 6 split these into taxpayers in arrears and not in arrears, respectively. All estimations include the individual-level covariates of Table 2, column 3 (unless voided by a subsample restriction): in-person delivery, main street, tax bill amount, arrears quartile 1–4. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

B.3. Heterogeneity Analyses: Interactions

Table B.11: Treatment Effect Interactions with Arrears Status

DV: paid bill	(1) all	(2) all	(3) in-person	(4) in-person	(5) door	(6) door
New design only (T_1)	-0.16	-0.57	-0.17	-0.13	-0.70	-0.70
	(1.10)	(1.05)	(1.72)	(1.69)	(1.27)	(1.26)
	[0.886]	[0.586]	[0.920]	[0.940]	[0.580]	[0.576]
Public service ad (T_2)	1.30	1.20	3.17**	3.22**	0.020	0.013
	(0.98)	(0.94)	(1.36)	(1.35)	(1.26)	(1.25)
	[0.183]	[0.204]	[0.019]	[0.017]	[0.987]	[0.992]
Difference ($T_2 - T_1$)	1.46	1.77*	3.34**	3.35**	0.72	0.72
	(1.05)	(0.99)	(1.48)	(1.48)	(1.28)	(1.27)
	[0.164]	[0.075]	[0.024]	[0.024]	[0.574]	[0.571]
T_1 x in arrears	4.51	5.41	3.84	6.98	6.07*	3.38
	(4.79)	(4.17)	(8.57)	(7.72)	(3.48)	(2.59)
	[0.346]	[0.195]	[0.654]	[0.366]	[0.081]	[0.192]
T_2 x in arrears	6.27	7.82*	9.37	11.4	4.12	4.46
	(4.13)	(4.02)	(7.32)	(7.27)	(3.33)	(2.77)
	[0.129]	[0.052]	[0.201]	[0.116]	[0.215]	[0.108]
($T_2 - T_1$) x in arrears	1.76	2.41	5.53	4.44	-1.95	1.08
	(3.62)	(2.68)	(5.47)	(4.25)	(3.62)	(3.19)
	[0.626]	[0.368]	[0.312]	[0.296]	[0.589]	[0.735]
Covariates	no	yes	no	yes	no	yes
Control mean (T_0)	77.0	77.0	76.1	76.1	77.5	77.5
Observations	22119	22119	8963	8963	13156	13156

Notes: The regressions reported in this table test if the treatment effects differ between taxpayers in arrears and taxpayers not in arrears. Liner probability (OLS) regressions for the binary outcome "Paid the municipal property tax bill November/December 2019." All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. After it, the interactions are displayed. Columns 1 and 2 include all observations. Columns 3 and 4 are restricted to in-person deliveries. Columns 5 and 6 show the cases where the tax bill was slipped under the door (not in person). Columns 1, 3, and 5 do not include covariates. Columns 2, 4, and 6 include the individual-level covariates of Table 2, column 3 (unless voided by a subsample restriction): in-person delivery, main street, tax bill amount, arrears quartile 1–4. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

Table B.12: Treatment Effect Interactions with Delivery Mode

DV: paid bill	(1) all	(2) all	(3) in arrears	(4) in arrears	(5) compliant	(6) compliant
New design only (T_1)	-0.62	-0.077	5.37	2.67	-0.70	-0.70
	(1.62)	(1.17)	(3.34)	(2.42)	(1.26)	(1.26)
	[0.702]	[0.948]	[0.107]	[0.269]	[0.580]	[0.576]
Public service ad (T_2)	0.62	0.75	4.14	4.47	0.020	0.013
	(1.85)	(1.22)	(3.33)	(2.72)	(1.26)	(1.25)
	[0.738]	[0.538]	[0.213]	[0.101]	[0.987]	[0.992]
Difference ($T_2 - T_1$)	1.24	0.83	-1.23	1.80	0.72	0.72
	(1.91)	(1.29)	(3.64)	(3.20)	(1.28)	(1.26)
	[0.517]	[0.521]	[0.734]	[0.574]	[0.574]	[0.571]
T_1 x in person	2.72	1.54	-1.71	4.18	0.53	0.58
	(4.73)	(2.58)	(8.72)	(7.97)	(2.06)	(2.06)
	[0.566]	[0.550]	[0.845]	[0.600]	[0.798]	[0.779]
T_2 x in person	5.57	4.98**	8.40	10.2	3.15*	3.21*
	(4.57)	(2.53)	(7.76)	(7.81)	(1.82)	(1.82)
	[0.223]	[0.049]	[0.279]	[0.193]	[0.083]	[0.078]
($T_2 - T_1$) x in person	2.85	3.44*	10.1*	5.99	2.62	2.63
	(3.05)	(1.93)	(5.93)	(5.06)	(1.91)	(1.91)
	[0.350]	[0.075]	[0.088]	[0.237]	[0.170]	[0.168]
Covariates	no	yes	no	yes	no	yes
Control mean (T_0)	77.0	77.0	40.6	40.6	85.8	85.8
Observations	22119	22119	4308	4308	17811	17811

Notes: The regressions reported in this table test if the treatment effects differ between taxpayers who received the tax bill in person and those who did not. Linear probability (OLS) regressions for the binary outcome "Paid the municipal property tax bill November/December 2019." All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. After it, the interactions are displayed. Columns 1 and 2 include all observations. Columns 3 and 4 are restricted to taxpayers in arrears with the municipal property tax. Columns 5 and 6 show the results for taxpayers not in arrears. Columns 1, 3, and 5 do not include covariates. Columns 2, 4, and 6 include the individual-level covariates of Table 2, column 3 (unless voided by a subsample restriction): in-person delivery, main street, tax bill amount, arrears quartile 1–4. Standard errors clustered at the zone level in parentheses, p-values in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

B.4. Treatment Effects on Arrears Cancellation

Table B.13: Treatment Effects on Arrears Cancellation

DV: paid debt	(1)	(2)	(3)	(4)	(5)
New design only (T_1)	6.28**	6.55**	6.90**	6.02**	7.09***
	(3.13)	(3.08)	(3.16)	(2.55)	(2.48)
	[0.044]	[0.033]	[0.029]	[0.018]	[0.004]
Public service ad (T_2)	4.35	4.41	5.30*	4.19*	5.27**
	(2.84)	(2.79)	(2.98)	(2.21)	(2.13)
	[0.125]	[0.114]	[0.076]	[0.058]	[0.013]
Difference ($T_2 - T_1$)	-1.93	-2.14	-1.60	-1.83	-1.82
	(2.43)	(2.38)	(1.96)	(2.34)	(1.94)
	[0.427]	[0.367]	[0.413]	[0.433]	[0.349]
In-person delivery		-1.17	-1.59		0.061
		(1.85)	(1.97)		(1.57)
Main street		1.31	0.27		5.49**
		(2.71)	(2.63)		(2.42)
Tax bill amount		0.69	0.23		0.19
		(0.45)	(0.17)		(0.16)
Arrears		-0.43***			
		(0.17)			
Arrears quartile 1			29.7***		30.0***
			(3.02)		(2.78)
Arrears quartile 2			19.9***		19.6***
			(1.54)		(1.61)
Arrears quartile 3			6.04***		6.04***
			(1.27)		(1.29)
# taxpayers in zone				-15.7**	-30.5***
				(7.53)	(11.5)
Tax bill zone mean				-0.85	0.42
				(0.61)	(0.68)
Share debtors in zone				-8.62*	-12.1**
				(5.05)	(5.05)
Control mean (T_0)	16.9	16.9	16.9	16.9	16.9
Observations	4317	4317	4317	4317	4317

Notes: Linear probability (OLS) regressions for the binary outcome "Paid 2018/2019 arrears with the municipal property tax" (debtors only). All coefficients are expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 features no covariates. Column 2 adds individual-level control variables. Column 3 adds indicators for the three highest quartiles of arrears (because the first quartile is the omitted reference category, the coefficients on the quartile indicators are positive). Column 4 shows the results for zone-level covariates. Column 5 combines individual- and zone-level covariates. The note to Table 1 provides more detail on the covariates. Standard errors clustered at the zone level in parentheses, p-values for the treatment effects in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

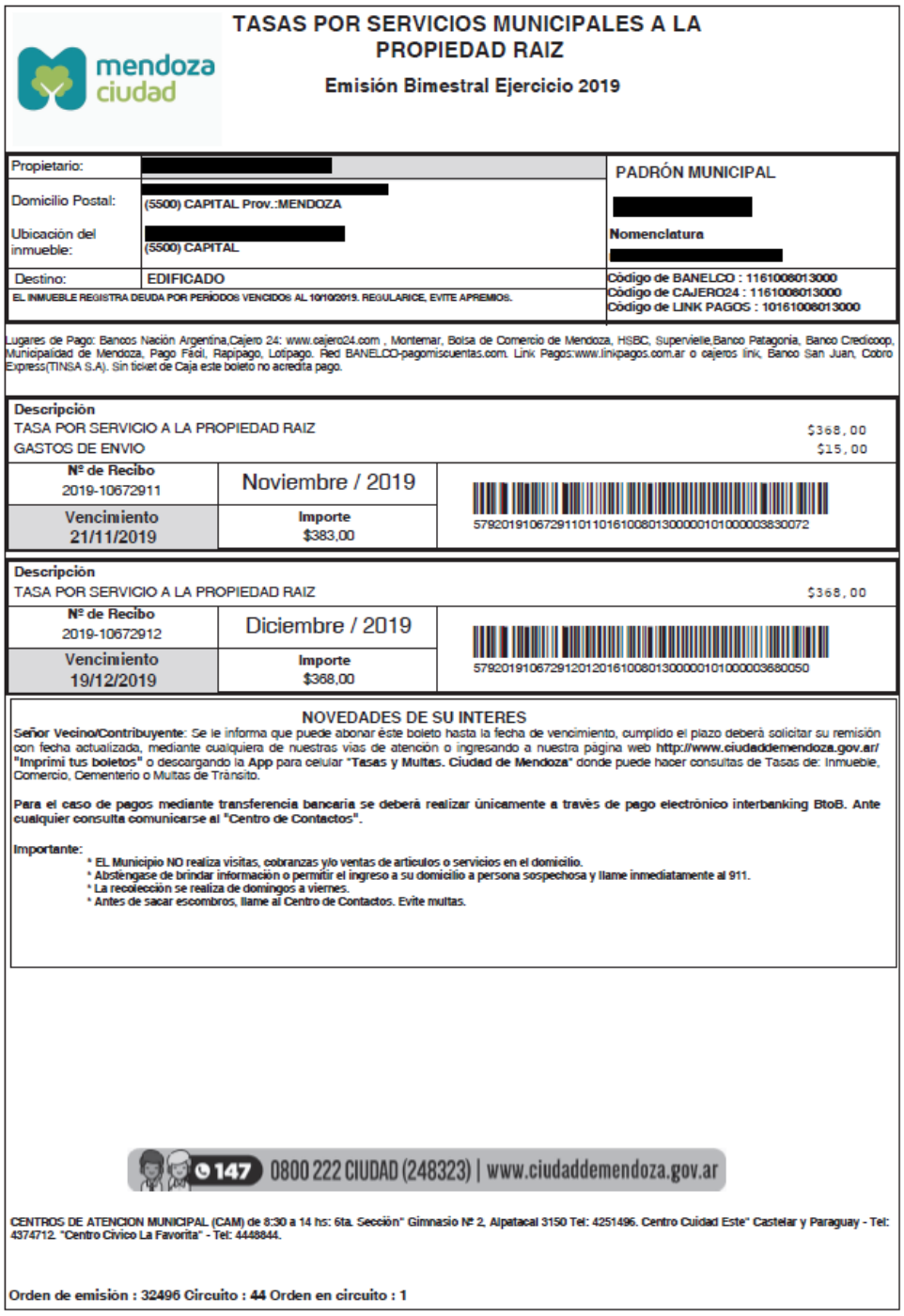
Table B.14: Treatment Effects on Arrears Cancellation (Probit)

DV: paid debt	(1)	(2)	(3)	(4)	(5)
New design only (T_1)	6.36**	6.53**	7.05**	6.26**	7.07***
	(3.20)	(3.19)	(3.08)	(2.67)	(2.45)
	[0.047]	[0.041]	[0.022]	[0.019]	[0.004]
Public service ad (T_2)	4.53	4.66	5.39*	4.52*	5.31**
	(2.99)	(2.97)	(3.03)	(2.44)	(2.28)
	[0.130]	[0.117]	[0.075]	[0.064]	[0.020]
Difference ($T_2 - T_1$)	-1.83	-1.87	-1.66	-1.74	-1.75
	(2.30)	(2.33)	(1.80)	(2.22)	(1.78)
	[0.426]	[0.423]	[0.357]	[0.433]	[0.323]
In-person delivery		-0.96	-1.47		0.23
		(1.86)	(1.87)		(1.48)
Main street		1.13	0.52		5.26**
		(2.77)	(2.54)		(2.07)
Tax bill amount		-0.61	0.30*		0.26
		(0.46)	(0.17)		(0.17)
Arrears quartile 1			30.1***		30.3***
			(2.67)		(2.35)
Arrears quartile 2			22.7***		22.4***
			(1.83)		(1.82)
Arrears quartile 3			9.39***		9.38***
			(1.98)		(1.96)
# taxpayers in zone				-17.7*	-30.6**
				(9.64)	(12.7)
Tax bill zone mean				-1.00	0.55
				(0.80)	(0.73)
Share debtors in zone				-9.34*	-12.2**
				(5.59)	(5.53)
Control mean (T_0)	16.9	16.9	16.9	16.9	16.9
Observations	4317	4317	4317	4317	4317

Notes: Probit estimations for the binary outcome "Paid 2018/2019 arrears with the municipal property tax" (debtors only). All coefficients are average partial effects and expressed in percentage points. T_1 and T_2 compare the respective treatment with the control T_0 (for which the pen-ultimate row provides the mean outcome). The coefficient "Difference" compares T_2 against T_1. Column 1 features no covariates. Column 2 adds individual-level control variables. Column 3 adds indicators for the three highest quartiles of arrears (because the first quartile is the omitted reference category, the coefficients on the quartile indicators are positive). Column 4 shows the results for zone-level covariates. Column 5 combines individual- and zone-level covariates. The note to Table 1 provides more detail on the covariates. Standard errors clustered at the zone level in parentheses, p-values for the treatment effects in brackets. * $p < .10$; ** $p < .05$; *** $p < .01$

C. Tax Bills (Treatments)

Figure C.1: Control Tax Bill (old design, T_0)



TASAS POR SERVICIOS MUNICIPALES A LA PROPIEDAD RAIZ

Emisión Bimestral Ejercicio 2019

Propietario:	[redacted]	PADRÓN MUNICIPAL
Domicilio Postal:	[redacted] (5500) CAPITAL Prov.:MENDOZA	[redacted]
Ubicación del inmueble:	[redacted] (5500) CAPITAL	Nomenclatura [redacted]
Destino:	EDIFICADO	Código de BANELCO : 1161008013000 Código de CAJERO24 : 1161008013000 Código de LINK PAGOS : 10161008013000

EL INMUEBLE REGISTRA DEUDA POR PERÍODOS VENCIDOS AL 10/10/2019. REGULARICE, EVITE APREMIOS.

Lugares de Pago: Bancos Nación Argentina,Cajero 24: www.cajero24.com , Montemar, Bolsa de Comercio de Mendoza, HSBC, Supervielle,Banco Patagonia, Banco Credicoop, Municipalidad de Mendoza, Pago Fácil, Rapipago, Lotipago. Red BANELCO-pagomiscuentas.com. Link Pagos:www.linkpagos.com.ar o cajeros link, Banco San Juan, Cobro Express(TINSA S.A). Sin ticket de Caja este boleto no acredita pago.

Descripción	
TASA POR SERVICIO A LA PROPIEDAD RAIZ	$368,00
GASTOS DE ENVIO	$15,00

Nº de Recibo		
2019-10672911	Noviembre / 2019	57920191067291101101610080130000010100000 3830072
Vencimiento 21/11/2019	Importe $383,00	

Descripción	
TASA POR SERVICIO A LA PROPIEDAD RAIZ	$368,00

Nº de Recibo		
2019-10672912	Diciembre / 2019	57920191067291201201610080130000010100000 3680050
Vencimiento 19/12/2019	Importe $368,00	

NOVEDADES DE SU INTERES

Señor Vecino/Contribuyente: Se le informa que puede abonar éste boleto hasta la fecha de vencimiento, cumplido el plazo deberá solicitar su remisión con fecha actualizada, mediante cualquiera de nuestras vías de atención o ingresando a nuestra página web **http://www.ciudaddemendoza.gov.ar/ "Imprimí tus boletos"** o descargando la **App** para celular **"Tasas y Multas. Ciudad de Mendoza"** donde puede hacer consultas de Tasas de: Inmueble, Comercio, Cementerio o Multas de Tránsito.

Para el caso de pagos mediante transferencia bancaria se deberá realizar únicamente a través de pago electrónico interbanking BtoB. Ante cualquier consulta comunicarse al "Centro de Contactos".

Importante:

* EL Municipio NO realiza visitas, cobranzas y/o ventas de artículos o servicios en el domicilio.
* Absténgase de brindar información o permitir el ingreso a su domicilio a persona sospechosa y llame inmediatamente al 911.
* La recolección se realiza de domingos a viernes.
* Antes de sacar escombros, llame al Centro de Contactos. Evite multas.

147 0800 222 CIUDAD (248323) | www.ciudaddemendoza.gov.ar

CENTROS DE ATENCION MUNICIPAL (CAM) de 8:30 a 14 hs: 6ta. Sección" Gimnasio Nº 2, Alpatacal 3150 Tel: 4251496. Centro Cuidad Este" Castelar y Paraguay - Tel: 4374712. "Centro Cívico La Favorita" - Tel: 4448844.

Orden de emisión : 32496 Circuito : 44 Orden en circuito : 1

Notes: The bill shown is for a taxpayer in arrears: A sentence below the cell "Destino" mentions the existence of arrears and asks for debt cancellation to avoid penalties. The same sentence features on the new bills sent to taxpayers in arrears (see Figures C.3 and C.5).

Figure C.2: New Design (T_1)

Figure C.3: New Design (T_1), Taxpayer in Arrears

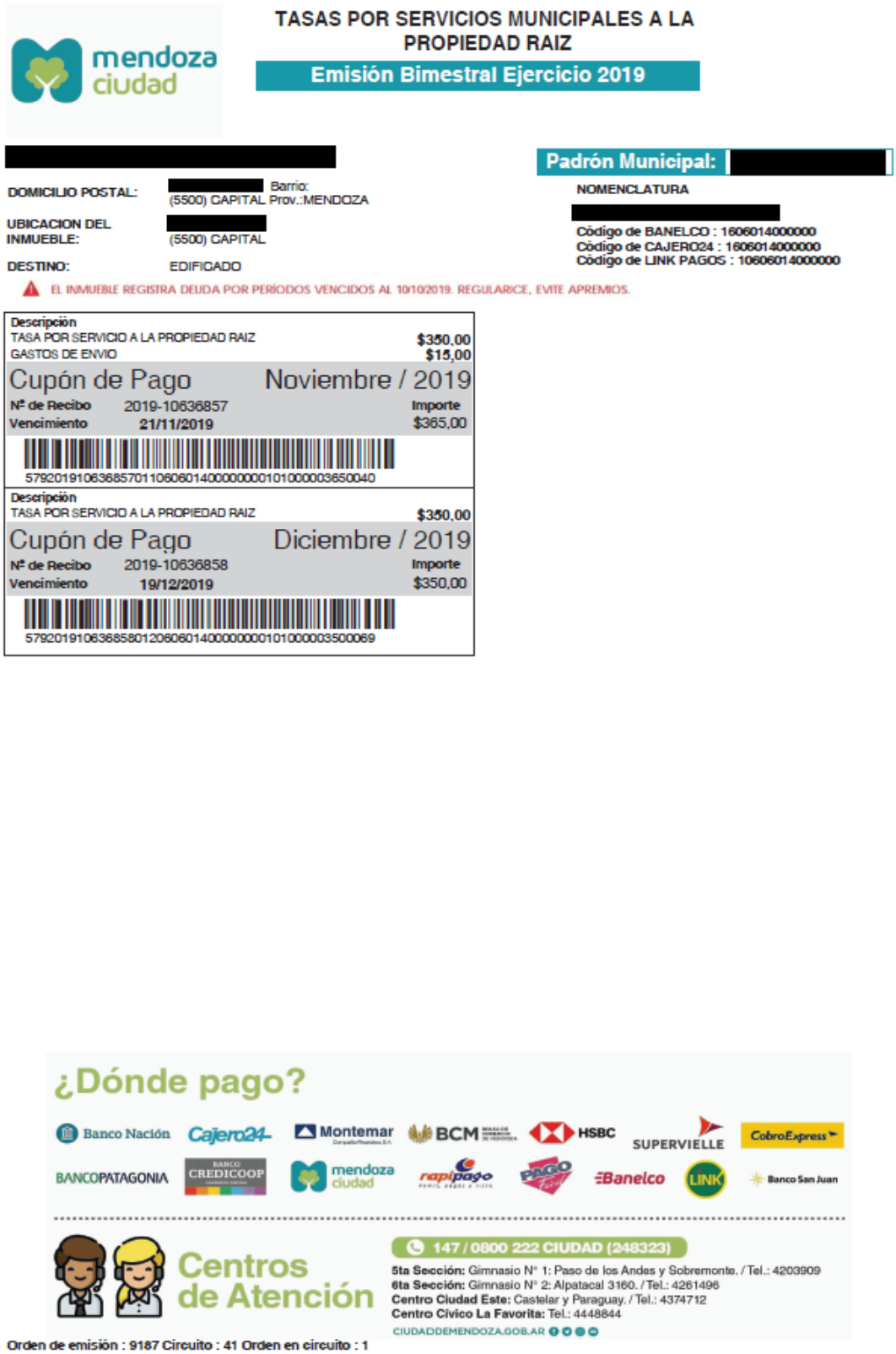


Figure C.4: New Design with Public Service Advertisement (T_2)

Figure C.5: New Design with Public Service Advertisement (T_2), Taxpayer in Arrears