

# Pre-Analysis Plan:

## Public Goods, Information, Trust and Tax Compliance

Bruno Cardinale Lagomarsino\*

Carlos Scartascini†

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### Abstract

Tax morale has been shown to affect individuals' willingness to pay taxes. There is evidence that people comply more when they see the government in action and public monies being used for the good of the community (reciprocity). There is also partial evidence that information about what the government does with the money matters too. This result has been more elusive. One possibility for the high variance in results could be that interventions have differed in the intensity of the treatments. Other possibility is that average results mask high heterogeneity across individuals based on their priors about the efficiency and efficacy of the government. These priors may be affected by their previous experience with the government. In this project we aim to disentangle among these hypotheses by evaluating the role of messages in the context of a large infrastructure campaign (i.e., high intensity treatment). We aim to evaluate the marginal effect of informing taxpayers about the use of public monies and check for heterogeneity according to the services each taxpayer receives (e.g., pave roads or dirt roads), and according to changes in their stock of public services. In terms of policy relevance, we can evaluate the marginal effect of information on top of the effect that public works would have by itself (people see the works and change their payment behavior). In this project, we also evaluate the effect of promises about future public works in the context of a local government with relatively low levels of trust but recently engaged in the expansion of public works. If people believe in promises, then governments could use them to finance future works in advance.

**JEL classifications:** C93, H42, H23, D62.

**Keywords:** field experiments, salience, information, messages, promises, tax compliance, public policy.

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\*Inter American Development Bank, brunoca@iadb.org

†Inter American Development Bank, carlossc@iadb.org [contact author].

# Contents

# 1 Introduction and Background

The ability of the government to collect taxes has a substantial impact on the development of a country. Even though taxation is not the only source of government revenue, it is usually the most important relevant. Individuals pay taxes because the government is able to enforce tax collection by imposing sanctions on those who don't pay, but they also pay taxes because non-pecuniary motivations for tax compliance as well as factors that fall outside the standard expected utility framework (?). People tend to comply more if they believe that others comply as well, and if they believe that the government makes good use of the money it collects (????). People's beliefs depend on the information they have about others and the government. The information can be self-acquired but it is usually affected by formal channels, such as news outlets and government provided information.

The main objective of this project is to shed light on the effect that government provided information has beliefs and hence, on the relationship between the government and the citizen, particularly regarding voluntary tax compliance. In particular, we will concentrate on the role of reciprocity as defined in the literature: "willingness to pay taxes in exchange for benefits that the state provides to them or to others" (?).

Most evidence supporting the role of reciprocity comes either from laboratory experiments (???) or the provision of public goods like pavement (?) or sidewalk construction (?). Field experiments that have relied on sending messages to the taxpayers regarding the use of money by the government have shown mixed results. For example, ? finds a positive effect of reminding people the relationship between taxes and public goods received but these results are not universal (?). Several papers do not find significant effects across all types of taxpayers (????).

One reason may be that the intensity of the treatment was not high enough so people did not change their priors much, hence their behavior. Another reason may be that average effects mask valuable heterogeneous responses and these responses vary according

to the distribution of priors in society (?). Evidence seems to indicate that priors are affected by the individuals' prior relationship with the government, particularly their experience with public goods provision (??). In this project we take advantage of these channels and provide information to taxpayers about public works in the context of a large infrastructure building campaign in a city with low stock of infrastructure.<sup>1</sup> As such, the information should have high relative intensity. Because there is high variance in the stock (e.g., some people have had pavement while others live in dirt roads) and change of infrastructure (e.g., some people have received new infrastructure recently) we can also evaluate the marginal effect of information on compliance within the context of a highly heterogeneous population. Finally, we can also check the effect of promises of new infrastructure, a novel feature in these types of interventions. At the time of the experiment, the overall infrastructure project is fully planned but the execution is incomplete. This gives us a unique opportunity to combine informative and promise treatments.

## 1.1 The Municipality of Pilar

We will carry out the field experiment in the municipality of Pilar to address these questions (Buenos Aires, Argentina).<sup>2</sup> The municipality of Pilar is one of 135 administrative divisions in Buenos Aires Province. Pilar is an important urban center located 35 miles from the City of Buenos Aires (Capital City of Argentina). The municipality shares borders with other divisions of Buenos Aires Province: Camapana, Escobar, Exaltación de la Cruz, General Rodríguez, Luján, Malvinas Argentinas, Moreno, and José C. Paz.

There are three rural districts (Fátima, Manzanares and Zelaya) and seven urban districts (Del Viso, La Lonja, Presidente Derqui, Villa Astolfi, Manuel Alberti, Villa Rosa and the head of the municipality, Pilar) within borders of the Municipality of

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<sup>1</sup> Since the change of administration in December 2015, the municipality has been executing an ambitious road recovery plan in order to tackle one of the strongest demands of local residents

<sup>2</sup> Figure ?? shows the location of Pilar in the country and in the province of Buenos Aires. Figure ?? shows the administrative division of the municipality within borders in 11 districts.

Pilar<sup>3</sup>. The population of the municipality is about 300,000 inhabitants, as per the 2010 census, but the number duplicates in weekends because there is a large number of vacation homes within the district. During the XX century the railroad and a brand new highway communicating Pilar and the City of Buenos Aires were the main growth engine of the municipality. In the 1990s, Pilar gained an increasingly upscale profile due to the development of numerous gated communities, country clubs, polo fields, and a sizable industrial area. Even though Pilar is considered one of the richest municipalities in the country there is great heterogeneity within borders, a first approach is to look at Table 2 and Figure ??.

## 1.2 Property Taxes in Pilar

The property-based tax is called “Tributo de Mantenimiento de la Vía Pública y Servicios Generales” (MVPSG henceforth). The MVPSG must be paid by taxpayers who own property in the municipality and is computed by taking into account the property linear frontage width (in meters), the property valuation, and the amount of indirect and direct services received by the property from the municipality.

Taxpayers are billed monthly. The bill is delivered to the owners’ address every two months (every bimester each taxpayer receives at the same time the bills necessary to pay the following 2 months). From the moment they receive the bills they have approximately 10 days to pay before the first due date. Late payments are charged a monthly interest rate of 3%. Even though the tax frequency payment is monthly, the municipality allows tax payers to pay on a “yearly” basis with various discounts according to the months paid in advance: 15% discount if the twelve months are paid, 10% if ten and, 5% if eight.

During 2014-2016, our pre-treatment period, 19.4% of tax bills were paid on time. Overall, only 36% of tax bills were paid in the entire period. Payment and non-payment tends to present high persistence as shown in Figure ??: the graph makes more clear that the payment rate is stagnant and relatively low even in different temporal horizons.

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<sup>3</sup> See Figure ?? for details.

Timely payment is particularly low if we compare it with different horizons of payment. Low compliance rate in both intensive and extensive margin is also evident in Figures ?? and ?. We graph 2014-2016 average block-level compliance rate for the intensive margin (timely payment) and extensive margin (anytime payment). Regarding timely payment, blue areas paid less than 50% of its liabilities on time for the entire pre-treatment period. Moreover, dark blue areas paid less than 25% of its liabilities on time, which means that they paid less than 9 out of 36 bills on time. Red areas paid more than 50% of its liabilities on time for the entire pre-treatment period, and dark red areas paid more than 75% of its liabilities on time for the entire period, which means that they paid more than 27 out of 36 bills on time. Regarding anytime payment, the graph has the same interpretation but with different payment horizon. Figure ?? is predominantly blue, which is in line with the extremely low timely payment around 20% for the entire period. Figure ?? is more encouraging with considerable red areas, but also there are clustered areas of low payment rate.

### 1.3 Infrastructure work in Pilar

The new administration, that took office in the Municipality of Pilar in December 2015, committed to tackle several issues within the 4 years of mandate. Commitments were made in four areas: security, relationship between government and the citizen, infrastructure, and education.<sup>4</sup>

The commitments made by the municipality are included in Figure ?. In this intervention, we concentrate on the role of information about infrastructure. The government promised to build and repair streets, sidewalks, sewers, buses transfer centers, buses waiting areas, parks and recreational spaces. Streets are one of the biggest concerns in the community: although the municipality is one of the richest in the country, there is a great proportion of non-paved streets. At the time of the intervention the administration claims that they have bounced and re-paved more than 5000 streets, they have extended

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<sup>4</sup> For more information, see the [official website](#).

and improved one of the most important entrance roads in the municipality (60,000 people use daily the six bus lines that travel this road), they have built 33 waterways to link-up neighborhoods and streams of water (to optimize water drainage in the city), they have built 45 blocks with sidewalks, and they have upgraded health-care centers in six districts.

## 2 Data collection and definitions

### 2.1 Overview

The Municipality has provided us with access to the historical data at the property level. We have collected data on tax compliance from January 2014 to December 2016 and time-invariant baseline characteristics. The Municipality has also agreed to send us updated information on the status of each street in the recovery plan and other characteristics for each property after the intervention takes place. See Table 1 for a description of variables.

### 2.2 Dependent variable: Tax compliance

Our intervention is designed to provide additional evidence on the role of information on tax compliance. We will use actual payment behavior as our outcome variable. Because we are working with a property tax, the taxpayer decision is only whether to pay or not to pay (and when to pay). As such, tax compliance can be perfectly measured. We have defined compliance in several alternative ways, but always dichotomously, to ensure we capture changes in behavior as precisely as possible.

Our outcome variables will take value 1 if the taxpayer has paid in full the total tax liabilities during a set period of time. Because payment could potentially be made late, the dependent variables take into account the timeliness of the payment:  $I(\text{Bill paid on time})$  takes the value of 1 if the payment took place before the second due date;  $I(\text{Bill paid within 2 months})$  takes the value of 1 if the payment took place before two months

of the second due date;  $I(\text{Bill paid within 3 months})$  takes the value of 1 if the payment took place before three months of the second due date;  $I(\text{Bill paid within 6 months})$  takes the value of 1 if the payment took place before six months of the second due date; and,  $I(\text{Bill paid anytime})$  takes the value of 1 if the bill was paid (regardless the timing).

Different definitions allow us to measure changes in two dimensions: extensive and intensive margins. For the extensive margin, we must look at long term definitions to evaluate the rate of total payment. For the intensive margin, we must look at short term definitions to evaluate the rate of timely payment.

## 2.3 Baseline characteristics

We have baseline information about properties in the municipality of Pilar. We use the information to define eligibility to treatment, to evaluate the heterogeneity of responses, and to improve efficiency. Regarding tax payment, for each taxpayer we have information on tax liabilities (amount)—*Tax Liability (ARG \$)*—, tax arrears (amount), date of payment, amount paid—*Amount paid (ARG \$)*—, and in-advance payment. Regarding the property itself, we have coordinates of the centroid of the property, we have information of the size (squared meters of surface)—*Lot area (m<sup>2</sup>)*—, valuation (comprises land and building)—*Value (ARG \$)*—, the category of public goods provided by the municipality—*Public good category*—, principal use of the property—*Use of land*—, and type of urbanization of the property. We also know if the bill is generated for the property, if the bill is actually received in the property, if the bill is automatically paid (debit card)—*Automatic payment*—, if the property owner has subscribed to a tax amnesty—*Tax Amnesty*—, and if the property belongs to the industrial area.

We use baseline characteristics for the period 2014-2016 and keep properties that...:

- ... are eligible to be billed (i.e., we eliminate for our sample properties owned by the government, churches, parks, squares, etc)
- ... receive the bill in the property billed (some properties do not receive the bill

physically)

- ... do not belong to the industrial park (because these firms may be quite different than other firms and citizens in the city)

## 3 Research design

### 3.1 Randomization

The overall remaining sample of eligible taxpayers consists of 120,807 properties. Because we are working with a sample with a high degree of heterogeneity, we divided the sample into strata to facilitate the balance between treatment and control groups. The strata are made upon the taxpayer’s average compliance for the period of interest (2014-2016) and access to public goods.

We divide the entire sample in three groups, which we characterize as (i) “never payers”; (ii) “intermittent payers”; and, (iii) “always payers”. We stratify according to these three groups because what we learned in previous field experiments.<sup>5</sup> The group characterized as “never payers” payed less than 10% of the MVPSPG’s liabilities they received between 2014 and 2016. This group is more likely to ignore the messages included in the tax bill, (they may not be receiving the bill altogether), and can in fact led to underestimate its impact due to the presence of a potential intended-to-treat downward bias. A second group of taxpayers—that we characterize as “always payers”— comprises properties of those taxpayers that have paid their taxes on time at least 90% of the time between 2014 and 2016. The remainder of the sample comprises the group of “intermittent payers”. This group encompasses properties of those taxpayers who payed between 10% and 90% of the MVPSPG’s liabilities they received between 2014 and 2016, being itself also an heterogeneous group.

We also divided the sample into strata according to the access to public goods of

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<sup>5</sup> Informational interventions are shown to work in the margin, but it is highly unlikely that an intervention like this will induce a radical change of state from never payer to always payer.

each property. We define five categories of public goods received by a property based on two dimensions: direct public services (e.g. garbage collection and street cleaning services) and indirect ones (e.g. maintenance of public spaces and recreational and leisure activities). Properties classified as category 1 receive all indirect and direct services; properties classified as category 2 receive all indirect services and only 3 (out of 4) direct services and; properties classified as category 3 receive all indirect services and only 2 (out of 4) direct services. Properties in gated communities in Pilar are considered as category 3 since they are private neighborhoods that do not receive some public services, but in this work we treat gated communities as an extra category. Also, we define an extra category for rural properties.

## 3.2 Intervention

Messages will be delivered with the tax bills corresponding to the July-August 2017 periods. Each group defined above was randomly split between three interventions: Control, Information, and Promise. The Control group will receive the tax bill as usual. The group assigned to Information will receive the bill with an additional flier that provides information about the work performed by the government (see Figures ?? and ??). The group assigned to Promise will receive the bill with a flier that provides information about the work done by the government (see Figure ??) and the promise of future work (see Figure ??). Finally, half of the properties assigned to the information treatment were assigned to receive an additional follow-up informational treatment alongside the September and October 2017 bills.

To separate treatment and control groups, we run 1,000 iterations to select a random draw that maximizes the balance between treatment arms and the control group. The set of pre-experimental characteristics are described in Tables 1 and 2. Description of treatment assignment and stratification in Tables 3, ?? and ?. Balancing conditions in Table ??.

We sent to the Municipality a code containing each property and taxpayer ID and the

treatment allocation. Even though the Municipality has proved to be efficient and responsive to our needs, we carried out a set of actions to minimize potential administrative errors and we have asked that they document with pictures the process.

### 3.3 Estimation

Forthrightly, our most important independent variables will be the treatment assignment, one dichotomous variable for each treatment. Formally, we will estimate the following linear probability model.

$$Y_{it}^v = D_i\Psi_1 + X_i\Delta_1 + Z_{it}\Gamma_1 + \lambda_t + \mu_{it}, \quad (1)$$

where  $Y_{it}^v$  is each of the outcome variables mentioned above,  $X_i$  is a vector of time-invariant characteristics of property  $i$ ,  $Z_{it}$  is a vector of time variant characteristics of the property, which is basically the tax liability of property  $i$  in month  $t$ ,  $D_i$  is a binary vector that takes the value of one if the property was assigned to treatment  $k$  and zero otherwise ( $k = \text{Information - I, Information - II, or Promise}$ ),  $\lambda_t$  are time fixed effects, and  $\mu_{it}$  is an unobserved random term. The vector  $\alpha_1$  measures the ‘intention-to-treat’ (ITT) effect of each treatment.

We will be able to evaluate potential heterogeneous effects on several dimensions. We have catastral data: we know the size of the properties, the valuation of the property, location, urbanization, and the amount and quality of public services each property receives. We also know the history of payment and debt accumulation for each taxpayer. We will be able to estimate several variations of equation (1) that interact the treatment vector,  $D_i$ , with relevant pre-treatment time-invariant characteristics. We will focus in specifications measuring heterogeneous effects in: wealth (using a proxy constructed with the size of the property and the valuation: value per squared meter), urbanization (using the categorical variable *Use of land*), and public goods (using the categorical variable *Public good category*). We are interested also in the feeling of closeness to public goods

provided, so we will perform exercises to assess whether is relevant or not. We will use geolocation of both properties and infrastructure work done to measure distances between them for estimations.

Additionally we will look for potential spillovers on the neighbors of treated taxpayers to understand separately the effect of receiving the letter personally and that of just being in a block where some properties were treated. We will exploit the fact that randomization was made at individual level and we will compute the proportion of treatment properties per unit of spillover (e.g., block level). This will allow us to look for the intensity effect of the spillover.

### **3.4 Power**

Since we have the proportion of treatments pre-defined by local authorities, we can assess the minimum detectable effect size for each treatment (MDES henceforth). Statistical power is set to 0.8 and significance to 0.05, standard values in economic literature. We conducted power calculations for each experiment separately. For each group of taxpayers we compute the MDES associated to the treatment received. Results in Table ???. We are able to identify any effect greater than 0.8 percentage points in Information and Promise treatments, and for the follow-up information treatment, we are able to identify any effect greater than 1.2 percentage points.

### **3.5 Timeline**

Data collection was done in May and treatments are being distributed at the beginning of July, but the whole process begun one month before the distribution. The second treatment is going to be distributed in September. Data collection for the intervention will take place between July and October 2017. Specifics are reported in Figure ??.

## 4 Relevance, Contribution, and Value of Research

In terms of academic relevance, the paper would provide additional evidence about the role of information about public works on increasing voluntary tax compliance.<sup>6</sup> We are going to exploit differences in public goods provision as a proxy for differences in perceptions about the efficiency and efficacy of the local government to check for heterogeneous effects. Additionally, by repeating the informational treatment on a sub-sample of taxpayers we could evaluate the persistence of the treatment and the effect of repeated treatment on behavior. Finally, this intervention is the first to evaluate the role of promises about public works on tax compliance.

In terms of policy relevance, results in the paper should be able to inform policymakers about the role that information and promises about public works play on citizens evaluation of government performance and subsequent tax compliance. In the presence of a positive effect, government could commit to public works that could be financed by ex-ante increases in revenues.

## 5 Risks and Ethical Considerations

There are several factors that may reduce the effectiveness of the intervention and/or make difficult to find significant results. First, the informational treatments may have limited impact if citizens have already fully updated their priors by either witnessing the work done by the Municipality directly or by watching the news and public reports about the public work. Second, the messages are delivered along with the tax bill. If taxpayers are not receiving the bill or they do not read the attached material, the treatment would not be effective. Third, there is some risk of contamination from the treatment to the control groups either because of direct communication between taxpayers or because the media catch up to the story and publicizes the information broadly. We are not able to measure any of the issues mentioned above, but in any case they would introduce a

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<sup>6</sup> Being reciprocity the main candidate as a driving mechanism.

downward bias and the size of the estimates would be reduced. The last concern is noise: the intervention is taking place at the beginning of the electoral season and taxpayers may have an overload of information.

We don't have ethical concerns. The project is being run by the local government under the advice of the municipality legal team, and complying with all local regulations. Providing information about municipal affairs alongside the tax bill has been already done in the past. The main change is the content and format of the informational instrument. Nobody is being made worse off than it had been absent our intervention.

# A Tables

Table 1: Description of variables

Variable	Unit of measurement	Description
<b>Pre-treatment characteristics</b>		
Tax Liability (ARG \$)	Argentinian pesos	Monthly average billing per property
Amount paid (ARG \$)	Argentinian pesos	Monthly average payment per property
Tax Amnesty	Binary	One if the property owner has received a tax amnesty
Lot area (m <sup>2</sup> )	Squared meters	Size of the surface
Value (ARG \$)	Thousands of Arg pesos	Land and building valuation
Automatic payment	Binary	One if the bill is automatically paid (debit card)
Use of land	Categorical	Type of urbanization where the property is located
Public good category	Categorical	Indirect and direct public good provision by the municipality where the property is located
<b>Treatment</b>	Categorical	Treatment assignment status
<b>Outcomes</b>		
I(Bill paid on time)	Binary	One if the payment took place before... ...the second due date
I(Bill paid within 2 months)	Binary	...two months of the second due date
I(Bill paid within 3 months)	Binary	...three months of the second due date
I(Bill paid within 6 months)	Binary	...six months of the second due date
I(Bill paid anytime)	Binary	...entering in a tax amnesty

Table 2: Summary statistics

Variable	Obs	Mean	Std. Dev.	P25	P50	P75
<b>Pre-treatment characteristics</b>						
Tax Liability (ARG \$)	120807	248.481	1947.008	49.762	65.316	174.631
Amount paid (ARG \$)	120807	150.018	1411.806	0	2.15	70.709
Tax Amnesty	120807	0.162	0.368	0	0	0
Lot area (m2)	120807	2432.34	27035.69	300	384	800
Value (ARG \$)	120807	332.770	2263.879	4.692	31.836	165.411
Automatic payment	120807	0.049	0.215	0	0	0
Use of land						
<i>Households</i>	120807	0.927	0.26	1	1	1
<i>Wasteland</i>	120807	0.018	0.133	0	0	0
<i>Business and related</i>	120807	0.055	0.228	0	0	0
Public good category						
<i>First</i>	120807	0.048	0.213	0	0	0
<i>Second</i>	120807	0.271	0.445	0	0	1
<i>Third</i>	120807	0.476	0.499	0	0	1
<i>Suburban</i>	120807	0.012	0.111	0	0	0
<i>Rural</i>	120807	0.015	0.121	0	0	0
<i>Gated community</i>	120807	0.177	0.382	0	0	0
<b>Treatments</b>						
Control	120807	0.333	0.471	0	0	1
Information - I	120807	0.167	0.373	0	0	0
Information - II	120807	0.167	0.373	0	0	0
Promise	120807	0.333	0.471	0	0	1
<b>Outcomes</b>						
I(Bill paid on time)	120807	0.194	0.308	0	0	0.306
I(Bill paid within 2 months)	120807	0.328	0.409	0	0.028	0.778
I(Bill paid within 3 months)	120807	0.334	0.412	0	0.028	0.806
I(Bill paid within 6 months)	120807	0.346	0.419	0	0.028	0.861
I(Bill paid anytime)	120807	0.36	0.428	0	0.028	0.917

*Notes:* Tax Liability (ARG \$) refers to the 2014-2016 monthly average amount of taxes billed for each property, Amount paid (ARG \$) refers to the 2014-2016 monthly average amount of taxes paid for each property, Tax Amnesty is a dummy variable that indicates if the property received a tax amnesty between 2014 and 2016, Lot area refers to the property's surface, Value (ARG \$) refers to the land and building valuation, Automatic payment is a dummy variable that indicates if the property uses an automatic payment method, Use of land is a categorical variable that indicates the principal use of the property, and Public good category is a categorical variable that measures the category of public goods provided by the municipality in each property. Treatments indicates the treatment status for each property. Outcomes measure tax compliance dichotomously for each property in different time horizons.

Table 3: Treatment assignment

Treatment	Number	Percent
Control	40,264	33
Information - I	20,138	17
Information - II	20,131	17
Promise	40,274	33
Total	120,807	100

*Notes:* Table shows the number and percentage of properties per treatment assignment group.

Table 4: Treatment assignment by strata - Taxpayer

	Control	Information - I	Information - II	Promise	Total
Never payers	21,841	10,923	10,920	21,845	65,529
Intermittent payers	9,841	4,922	4,920	9,844	29,527
Never payers	8,582	4,293	4,291	8,585	25,751
Total	40,264	20,138	20,131	40,274	120,807

*Notes:* Table shows the number of properties per treatment assignment group per category of taxpayer.

Table 5: Treatment assignment by strata - Public goods

	Control	Information - I	Information - II	Promise	Total
First	1,913	958	957	1,916	5,744
Second	10,928	5,465	5,464	10,931	32,788
Third	19,187	9,594	9,593	19,187	57,561
Suburban	500	250	250	502	1,502
Rural	599	301	299	600	1,799
Gated community	7,137	3,570	3,568	7,138	21,413
Total	40,264	20,138	20,131	40,274	120,807

*Notes:* Table shows the number of properties per treatment assignment group per public good category.

Table 6: Balancing conditions

Variable	All (1)	Control (2)	Information (3)	Promise (4)	p-value <sub>U</sub> (5)	p-value <sub>C</sub> (6)
<b>Pre-treatment characteristics</b>						
Tax Liability (ARG \$)	248.5 (5.602)	248.5 (9.259)	257.4 (12.677)	239.5 (5.999)	0.413	
Amount paid (ARG \$)	150.0 (4.062)	146.3 (5.044)	154.2 (9.652)	149.6 (5.467)	0.661	
Tax Amnesty	0.162 (0.001)	0.162 (0.002)	0.161 (0.002)	0.162 (0.002)	0.997	
Lot area (m2)	2432 (77.784)	2413 (123.856)	2486 (144.420)	2398 (135.115)	0.936	
Value (ARG \$)	333000 (6513.391)	332000 (9856.804)	336000 (14410.871)	330000 (8774.927)	0.879	
Automatic payment	0.0490 (0.001)	0.0480 (0.001)	0.0490 (0.001)	0.0490 (0.001)	0.736	
Use of land						
<i>Households</i>	0.927 (0.001)	0.927 (0.001)	0.928 (0.001)	0.926 (0.001)	0.743	
<i>Wasteland</i>	0.0180 (0.000)	0.0180 (0.001)	0.0180 (0.001)	0.0180 (0.001)	0.356	
<i>Business and related</i>	0.0550 (0.001)	0.0560 (0.001)	0.0530 (0.001)	0.0560 (0.001)	0.871	
Public good category						
<i>First</i>	0.0480 (0.001)	0.0480 (0.001)	0.0480 (0.001)	0.0480 (0.001)	0.967	
<i>Second</i>	0.271 (0.001)	0.271 (0.002)	0.271 (0.002)	0.271 (0.002)	0.998	
<i>Third</i>	0.476 (0.001)	0.477 (0.002)	0.476 (0.002)	0.476 (0.002)	0.973	
<i>Suburban</i>	0.0120 (0.000)	0.0120 (0.001)	0.0120 (0.001)	0.0120 (0.001)	0.952	
<i>Rural</i>	0.0150 (0.000)	0.0150 (0.001)	0.0150 (0.001)	0.0150 (0.001)	0.980	
<i>Gated community</i>	0.177 (0.001)	0.177 (0.002)	0.177 (0.002)	0.177 (0.002)	0.994	
<b>Outcomes</b>						
I(Bill paid on time)	0.194 (0.001)	0.195 (0.002)	0.193 (0.002)	0.193 (0.002)	0.634	
I(Bill paid within 2 months)	0.328 (0.001)	0.328 (0.002)	0.327 (0.002)	0.328 (0.002)	0.920	
I(Bill paid within 3 months)	0.334 (0.001)	0.335 (0.002)	0.334 (0.002)	0.334 (0.002)	0.905	
I(Bill paid within 6 months)	0.346 (0.001)	0.346 (0.002)	0.345 (0.002)	0.346 (0.002)	0.865	
I(Bill paid anytime)	0.360 (0.001)	0.360 (0.002)	0.360 (0.002)	0.361 (0.002)	0.919	
Observations	120,807	40264	40269	40274		

*Notes:* “Control” refers to those properties that were not assigned any message. “Information - I” refers to properties that were assigned to information messages in the bill corresponding to July-August 2017. “Information - II” refers to properties that were assigned to information messages in the bill corresponding to July-August and September-October 2017. “Promise” refers to properties that were assigned to promise messages in the bill corresponding to July-August 2017. The p-value in column (5) corresponds to an unconditional test of differences in means by treatment assignment status. The p-value in column (6) corresponds to a test of differences in means conditional on stratification.

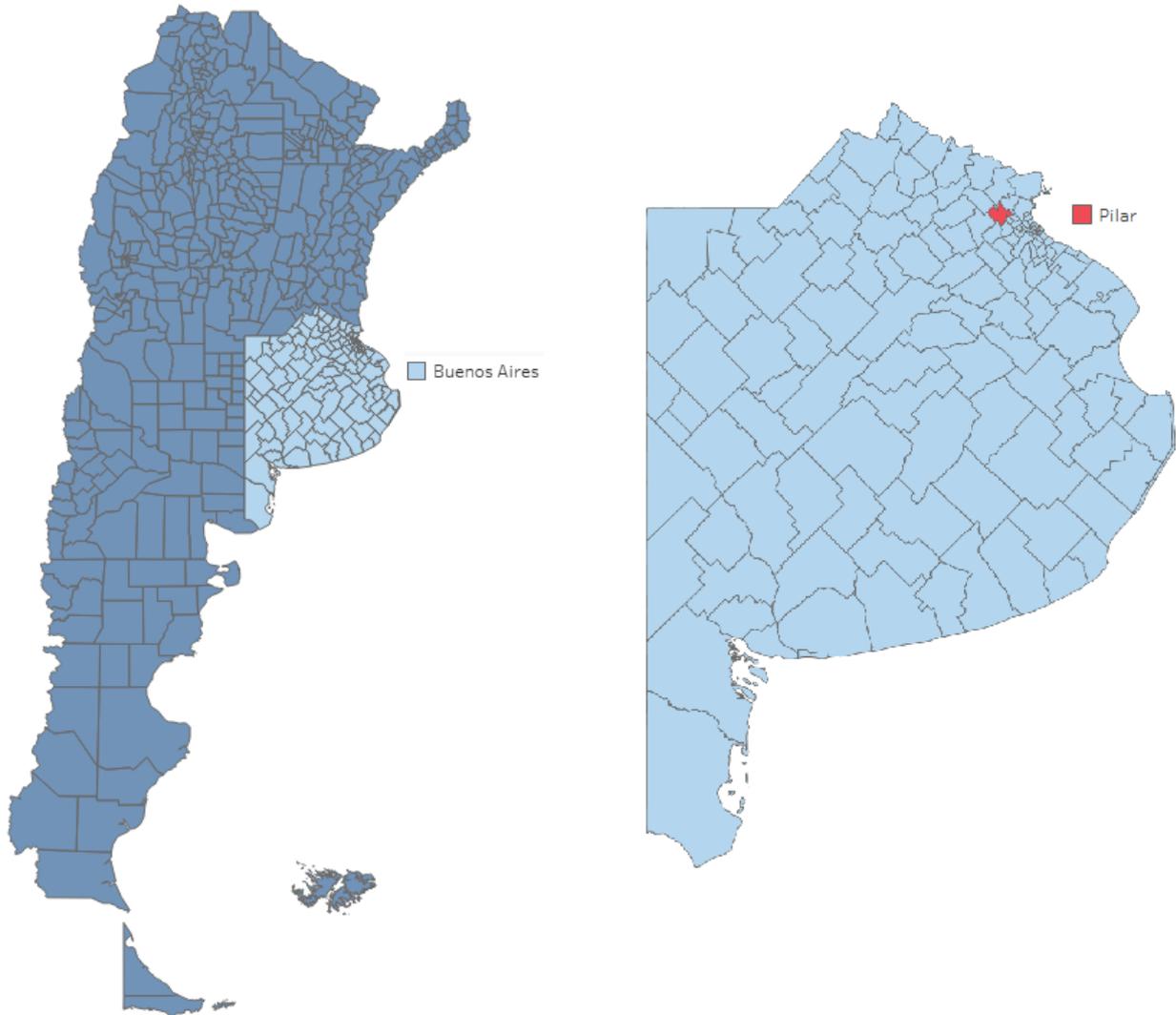
Table 7: Power calculation

	$\alpha$	Power	N	$N_C$	$N_T$	MDES	Mean <sub>C</sub>	Mean <sub>T</sub>	Std. Dev.
Information	0.0500	0.800	80533	40264	40269	0.008	0.335	0.343	0.412
Promise	0.0500	0.800	80538	40264	40274	0.008	0.335	0.343	0.412
Persistence	0.0500	0.800	40269	20138	20131	0.012	0.334	0.345	0.412

*Notes:* Table shows power calculations using the variable I(Bill paid within 3 months), which takes the value 1 if the payment took place before three months of the second due date.

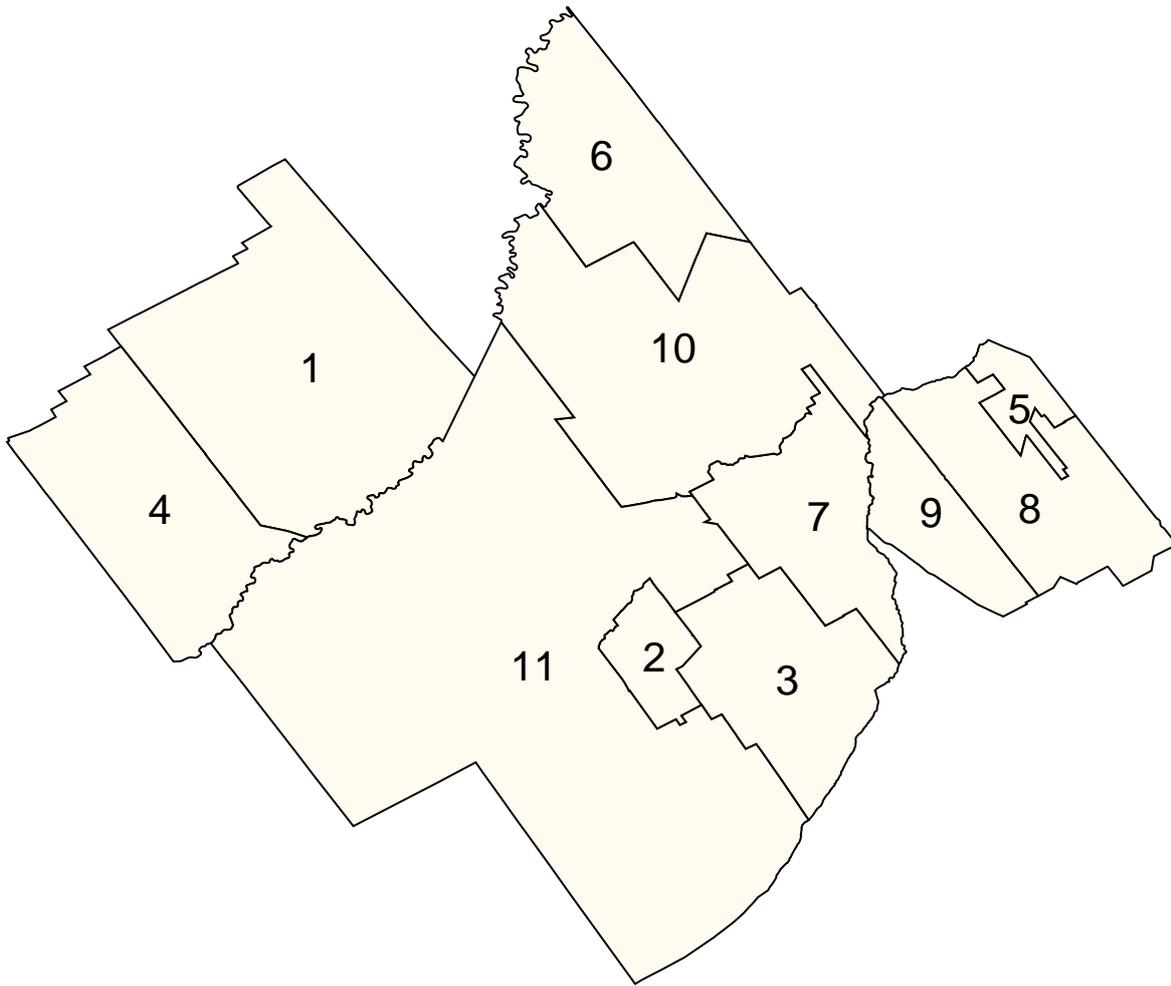
## B Figures

Figure 1: Location of Pilar in Argentina



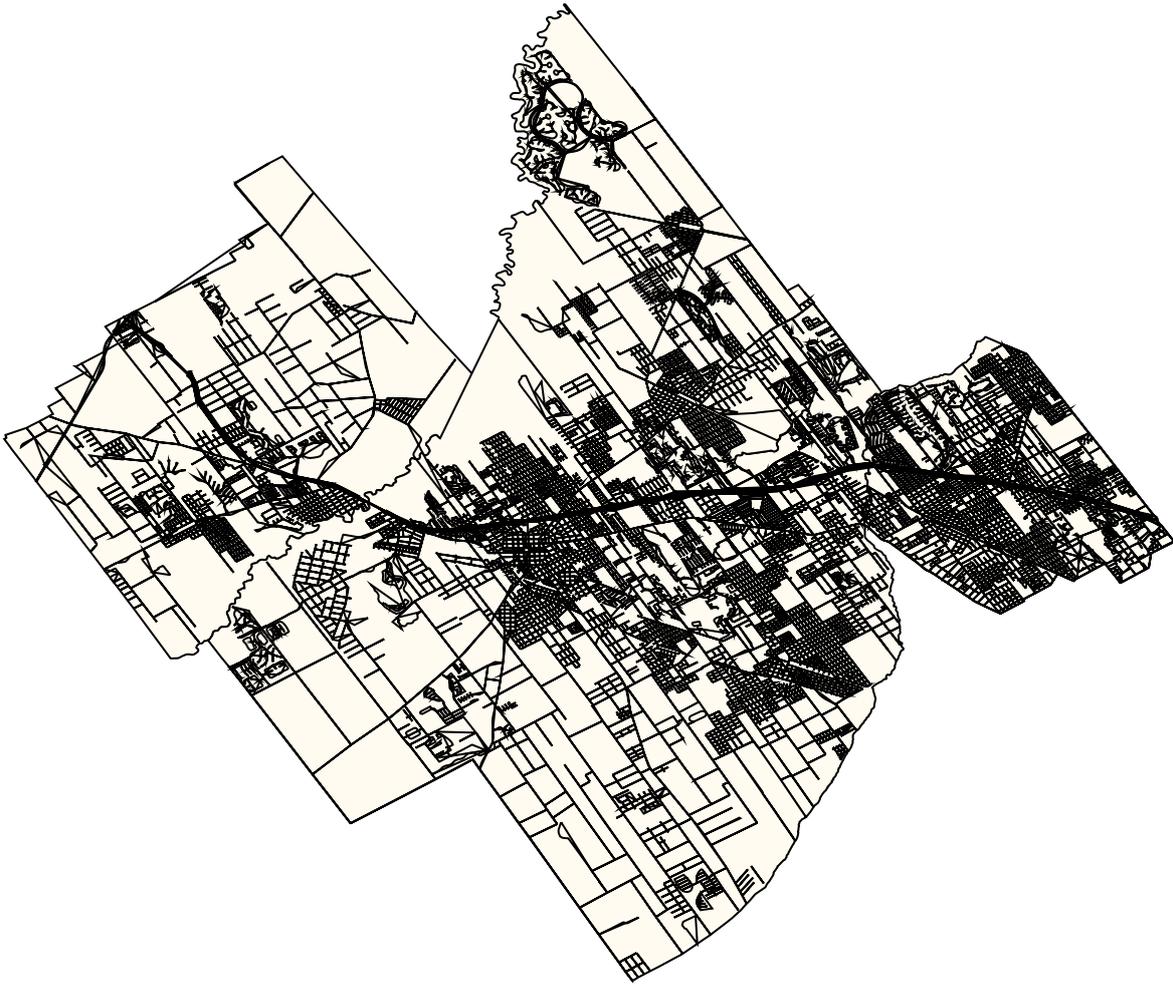
*Notes:* **Left:** Argentina and municipality borders. Municipalities in the province of Buenos Aires in light blue. **Right:** Province of Buenos Aires and municipality borders, Pilar in red.

Figure 2: Municipality of Pilar - Districts



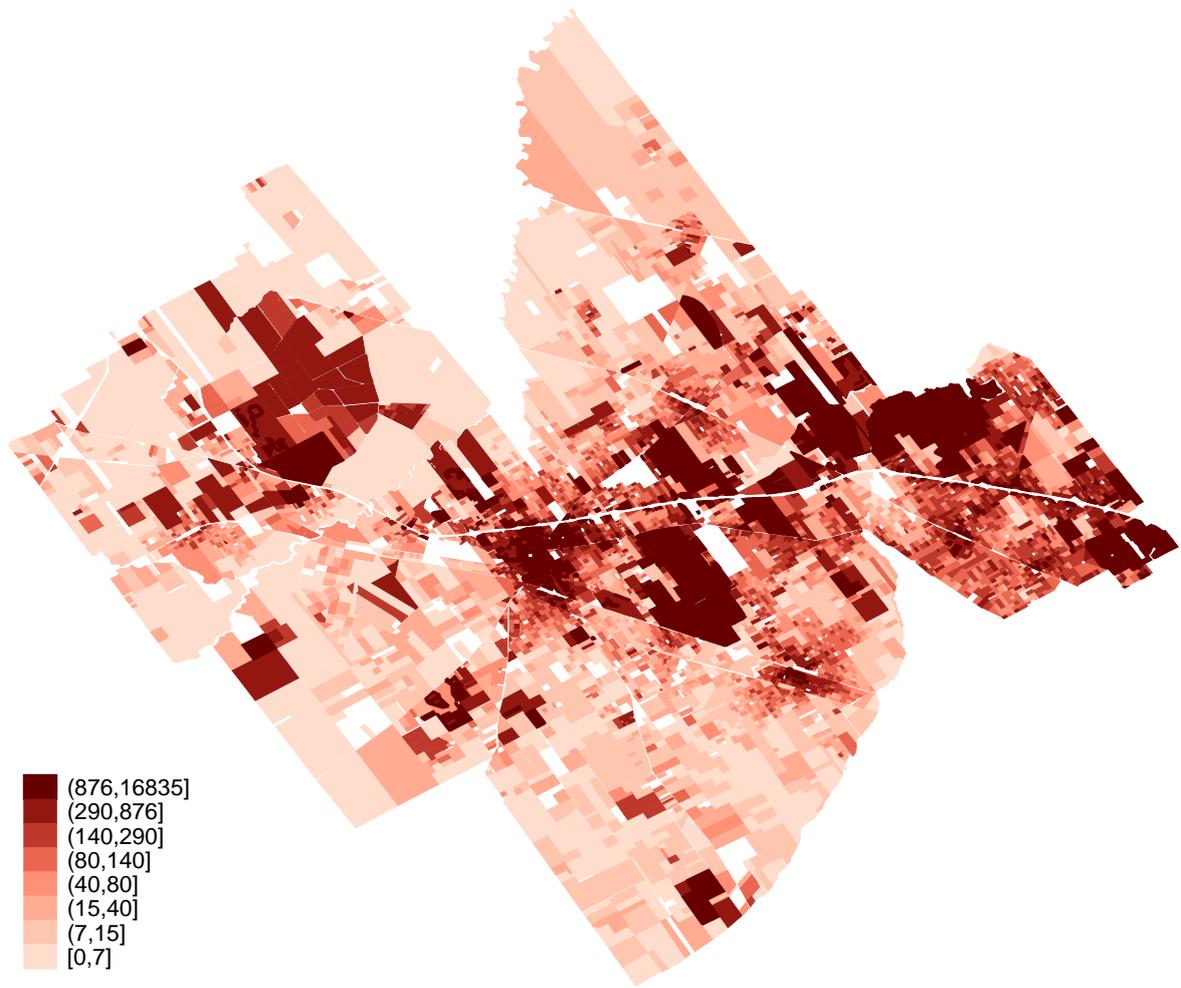
*Notes:* 1- Fátima 2- Villa Astolfi 3- Presidente Derqui 4- Manzanares 5- Luis Lagomarsino 6- Zelaya 7- La Lonja 8- Manuel Alberti 9- Del Viso 10- Villa Rosa 11- Pilar

Figure 3: Municipality of Pilar - streets and roads



*Notes:* The map shows the urban organization of Pilar: streets and roads delimiting blocks, Luján river, and gated communities are easy to identify.

Figure 4: Real estate wealth



*Notes:* The map shows the block-level average of the valuation per square meter of each property as a proxy of wealth.

Figure 5: Infrastructure - commitments



Notes: for more information about the commitments, see the [official website](#).

Figure 6: Payment rate

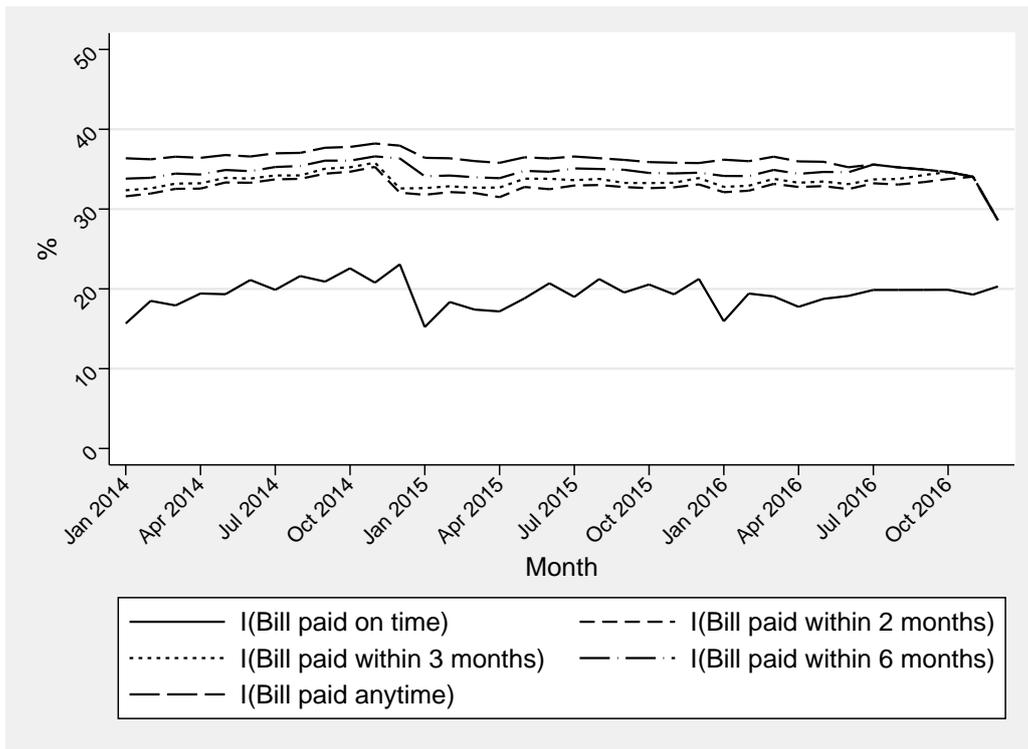
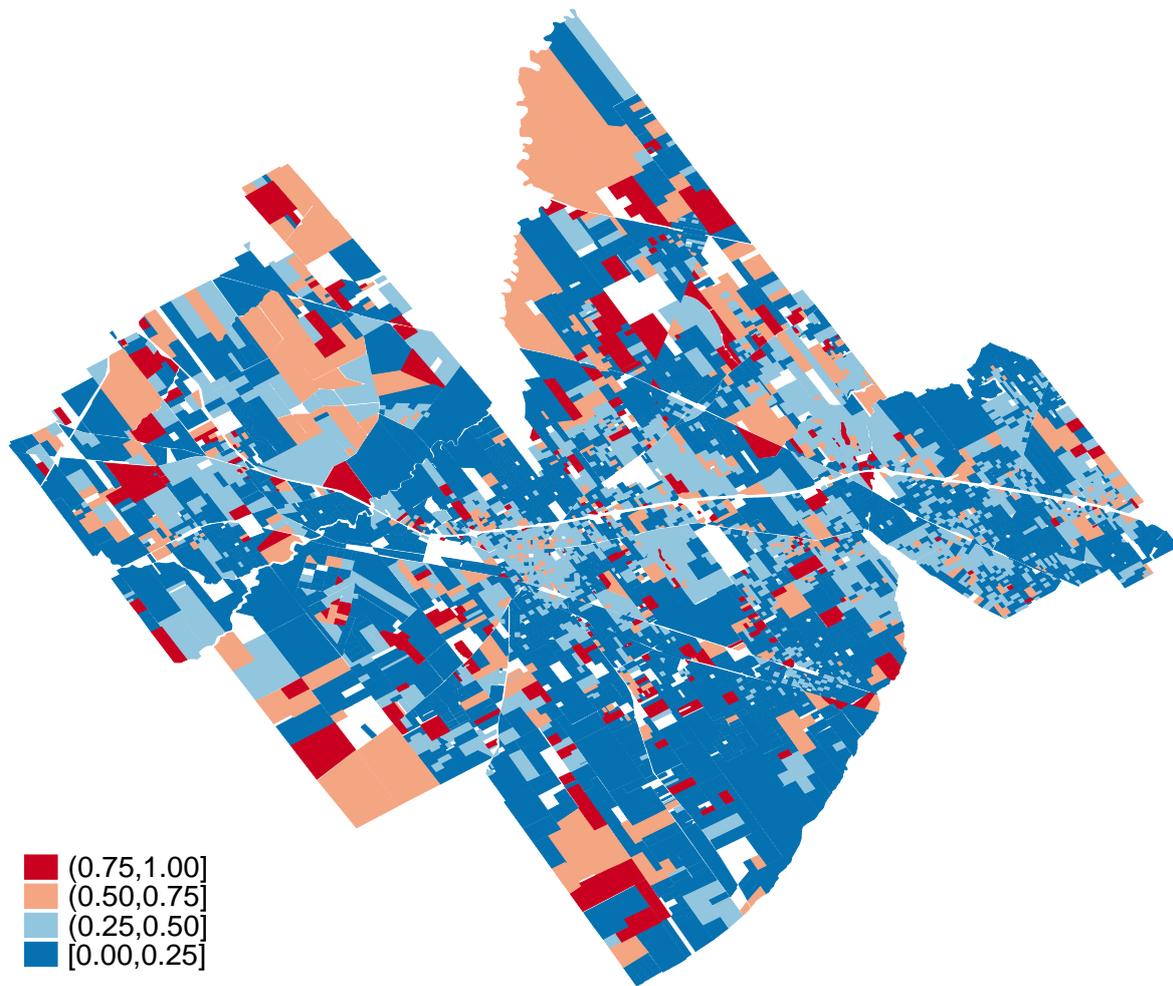
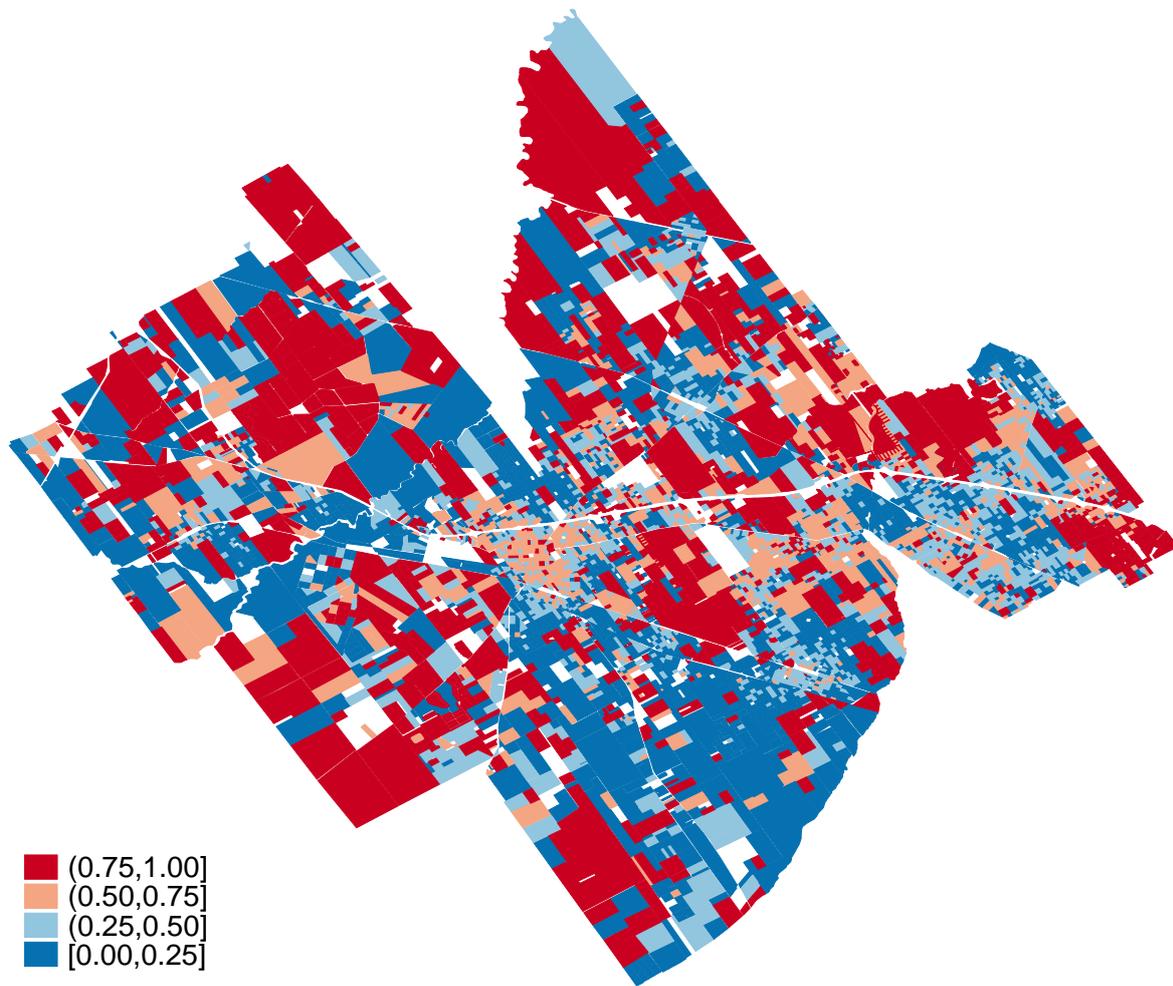


Figure 7: Compliance rate - intensive margin



*Notes:* The quantile map shows 2014-2016 average block-level compliance rate for the intensive margin (timely payment)—I(Bill paid on time). Blue areas paid less than 50% of its liabilities on time for the entire pre-treatment period. Dark blue areas paid less than 25% of its liabilities on time. Red areas paid more than 50% of its liabilities on time for the entire pre-treatment period, and dark red areas paid more than 75% of its liabilities on time for the entire period.

Figure 8: Compliance rate - extensive margin



*Notes:* The quantile map shows 2014-2016 average block-level compliance rate for the extensive margin (anytime payment)—I(Bill paid anytime). Blue areas paid less than 50% of its liabilities on time for the entire pre-treatment period. Dark blue areas paid less than 25% of its liabilities on time. Red areas paid more than 50% of its liabilities on time for the entire pre-treatment period, and dark red areas paid more than 75% of its liabilities on time for the entire period.

Figure 9: Infrastructure work



*Notes:* Both informative and promise treatments receive this tagged map showing which and where infrastructure work was done, and also an invitation to visit the official website.

Figure 10: Informative text



**Avanza el plan de mejoramiento de calles**

Empezamos un plan integral con obras de mantenimiento, consolidado, pavimentación, repavimentación y bacheo de calles. Ya consolidamos 600 calles en todo el distrito. Bacheamos más de 5.000 cuadras, repavimentamos arterias principales e invertimos en la compra de la maquinaria necesaria para asegurar el trabajo de todos los días en obras.

**Obras en la ruta 234**

Junto al Gobierno Nacional estamos ampliando y repavimentando la ruta de acceso a Derqui. Además, realizamos nuevos cruces peatonales, dársenas y refugios de colectivos para las 6 líneas que pasan por ahí y sus 60.000 usuarios.

**Plan hidráulico Pilar: 33 obras de enlace**

Pusimos en marcha el primer plan hidráulico integral para minimizar inundaciones y los efectos de las lluvias. En esta etapa se ejecutaron 33 enlaces para optimizar la salida del agua desde los barrios hacia los arroyos.

**Nuevas veredas**

Construimos 45 cuadras con nuevas veredas, una de las demandas más frecuentes de nuestros vecinos.

**Salud: mejoras edilicias en Centros de Atención Primaria**

Concretamos la primera etapa de mejoras en los edificios de los Centros de Atención Primaria (CAPs) de Pinazo, William Morris, Los Cachorros, Derqui, Manzanares y Manuel Alberti.

**TU BARRIO AHORA TIENE MÁS OBRAS, MÁS INVERSIONES Y MÁS TRABAJOS REALIZADOS. SIGAMOS CONSTRUYENDO JUNTOS EL PILAR QUE QUEREMOS.**

Figure 11: Promise text



**Avanza el plan de mejoramiento de calles**  
Empezamos un plan integral con obras de mantenimiento, consolidado, pavimentación, repavimentación y bacheo de calles. Ya consolidamos 600 calles en todo el distrito. Bacheamos más de 5.000 cuadras, repavimentamos arterias principales y compramos maquinaria para obras. Este año vamos a pavimentar y repavimentar 400 calles.

**Obras en la ruta 234**  
Junto al Gobierno Nacional estamos ampliando y repavimentando la ruta de acceso a Derqui. Además, hicimos nuevos cruces peatonales, dársenas y refugios de colectivos para las 6 líneas que pasan por ahí y sus 60.000 usuarios. También vamos a construir veredas y colocar luminarias.

**Plan hidráulico Pilar: 33 obras de enlace**  
Pusimos en marcha el primer plan hidráulico integral para minimizar inundaciones. En esta etapa se ejecutaron 33 enlaces para optimizar la salida del agua desde los barrios hacia los arroyos, y se continuará con la limpieza de arroyos.

**Nuevas veredas**  
Estamos construyendo nuevas veredas, una de las demandas más frecuentes de nuestros vecinos. Ya completamos 45 cuadras y la meta para este año es concretar la construcción de 30 kilómetros de vereda.

**Salud: mejoras edilicias en Centros de Atención Primaria**  
Concretamos la primera etapa de mejoras en los edificios de los Centros de Atención Primaria (CAPs). Además tenemos planificada la inauguración de 4 nuevas Unidades de Complejidad Intermedia.

**TU BARRIO ESTÁ DENTRO DE NUESTRA PLANIFICACIÓN PARA PRÓXIMAS OBRAS Y PRONTO TENDRÁ MÁS INVERSIONES Y TRABAJOS REALIZADOS. CONSTRUYAMOS JUNTOS EL PILAR QUE QUEREMOS.**

Figure 12: Timeline

