E-Government and provision of public services: Economic, social, and political determinants of citizen complaints

Marianna Sebő [φ] & Germà Bel [φ]

[φ] *Universitat de Barcelona & OAP-UB*

(Forthcoming in *International Public Management Journal*)

Marianna Sebő: Department of Econometrics, Statistics and Applied Economics. John Keynes 1-11. 08034 Barcelona, Spain. Email: marianna.sebo@ub.edu ORCiD: 0000-0001-8238-8974

Germà Bel: Department of Econometrics, Statistics and Applied Economics. John Keynes 1-11. 08034 Barcelona, Spain. Email: gbel@ub.edu ORCiD: 0000-0002-1330-8085

Conflict of Interest statement: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Grant numbers and funding information: This research was supported by the Chair of Local Economic Policy at University Pompeu Fabra (Barcelona), and the Spanish Ministry of Science and Innovation (PID2019-104319RB-I00). The funding sources were not involved in any of the steps of this research.

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Abstract: Today's technological advances have created new channels for the collaboration of local governments with citizens, who can perform the role of both partner and customer in public service delivery. This article examines an initiative in Barcelona in which citizens monitor and evaluate public services using a feedback system to register their complaints. Specifically, it analyzes how socioeconomic factors, political activism, and partisan alignment influence citizen complaints about eight urban public services in Barcelona. Using a panel of monthly district-level observations from the city's feedback system for 2014 to 2019 and fixed-effect estimations, the results show that political participation is related to a higher propensity to complain, while economic status, educational attainment, and partisan alignment do not have a significant association with complaints. These findings are then considered and discussed in relation to a survey of citizen satisfaction with urban public services in Barcelona.

Keywords: e-government; service evaluation; citizen complaint; citizen satisfaction

INTRODUCTION

How public goods and services are delivered has broad implications on citizen satisfaction with public service delivery and governments' legitimacy. Citizen satisfaction positively influences trust in governments (Christensen and Lægreid 2005, Kampen, De Walle and, Bouckaert 2006; Van de Walle and Bouckaert 2003; Van Ryzin

2007) and local governments specifically (Gustavsen, Pierre, and Røiseland 2017). Thus, citizen satisfaction is key in the relationship between the government and citizens.

Whereas the traditional methods of citizen surveys have been developed and used to measure citizen satisfaction, how this measurement relates to actual public service performance is a complex problem. Importantly for our research, this relationship is problematic due to predispositions that may exist in citizens' evaluation of public services and their propensity to make complaints, mainly related to socioeconomic factors (Liang, He, and Qiu 2021; Loeffler and Bovaird 2016; Tavares, Moreno Pires, and Teles 2022) political activism (Kowalewski 2019; Schmidthuber, Hilgers, Gegenhuber et al. 2017), or partisan bias (James and Van Ryzin 2017; Jilke 2018; Jilke and Baekgaard 2020; Tilley and Hobolt 2011).

This article aims to analyze citizen satisfaction observed as a type of innovative "citizen sourcing" tool - part of a broader e-governance and e-participation platform. Specifically, we focus on the economic, social, and political influences on citizen complaints about urban public services. We study eight local public services with the most complaints in the period 2014-2019.

We contribute to the existing literature in two ways. Firstly, we create a database by merging various datasets relating to the city of Barcelona. With these data, we conduct an empirical analysis of complaints, which is the first study of its kind, to the best of our knowledge, and adds to the literature on e-governance and citizen sourcing. Since most cities register the complaints made by citizens and hold data on economic, social, and political factors, the design of our model can be applied in a variety of contexts.

Secondly, our empirical analyses focus on theory-based variables and make use of their intra-city variation. As Barcelona is divided into ten administrative districts, we had a unique opportunity to compare districts within the same city.

The article is organized as follows. First, we review the background on e-government and citizen participation, and the determinants of citizen satisfaction with public services. Next, we discuss the foundations for using data on citizen complaints to analyze citizen satisfaction, as well as some limitations. We then review the institutional and geographical context of the city of Barcelona, before providing details on our data, explaining our methodology, and setting up our models. Lastly, we present the results and discuss their relationship to the hypotheses and several policy implications.

THEORETICAL AND EMPIRICAL BACKGROUND

Early literature on governance and information and communication technology (ICT) in public administration has highlighted the possibilities given by innovation in governance and public service delivery. The new forms of e-government and "we-government" can encourage more activity and add to the existing possibilities of the citizen to act apart from a customer in the delivery of public services and also as a collaborator (Linders 2012; Meijer and Bolívar 2015). Whereas such collaboration in the past has taken more traditional forms (e.g., neighborhood watches), technological advances, interconnectivity, and communication between citizens and government can enable coproduction on an incomparably bigger scale. ICT-facilitates various types of coproduction (see Linders 2012), and local governments with more experience with such technology can reap its benefits at an increasing level (Faber, Budding, and Gradus 2020).

Citizen sourcing can have many forms (Allen, Tamindael, Bickerton et al. 2020). Citizen collaboration is particularly important for our research: Citizens are the provider and governments are the beneficiary of the public service (Loukis 2018). This way, the public can participate and add to the effectiveness and quality of public services. Whereas governments are responsible for the delivery, citizens are enabled to voice their satisfaction or dissatisfaction to direct the service and raise awareness in case of failures. Citizen-sourcing may be present in every stage of the service delivery, from its design to the phase of monitoring and evaluation, which is the object of this study. This stage involves the identification of deficiencies and gives information on the citizens' satisfaction with the service. Satisfaction is a complex issue, which involves prior attitudes and expectations. However, this bias is lower when specific questions about a specific service are asked. Citizens can reach out to politicians, vote for them, or organize themselves when needed. Another example of voicing dissatisfaction is by complaining. Blame is a form of voice, that can be directed to several groups that participated in the delivery, from the producer, provider, and those who are politically responsible for it (Van de Walle 2013).

E-participation and e-rulemaking can lead to a more efficient dialog between the needs of the public and the government and higher transparency (Bisogno, Cuadrado-Ballesteros, and Santis 2022). Several platforms can enable this interaction, such as social media or specific platforms that can record and store information (Criado, Sandoval-Almazan, and Gil-Garcia 2013). E-participation may also be related to better performance in urban service request accomplishments. Especially, when services are complex and

multiple agents are involved, citizen feedback can help local governments to monitor and evaluate public services (Allen, Tamindael, Bickerton et al. 2020). It can also foster risk resilience, as it plays an important role in identifying several types of risk and giving information about them, particularly in case of disasters or any occasion when municipalities must understand the context and the public's needs fast (Wukich 2022). Such a mechanism can increase acceptance and loyalty (Haustein and Lorson 2021).

Despite the growing number of possibilities offered by e-governance, the predictors of online participation seem to be related to those of offline participation. Motivation is key for political resources to convert into political activity (Saglie and Vabo 2009) and political expression (see Lane, Do, and Molina-Rogers 2022). When citizens are interested in politics, they are more likely to inform themselves, discuss politics on social media (Ahmed, Madrid-Morales, and Tully 2022), and get involved both online and offline (Guo 2022). Therefore, the new ways of e-government may reinforce the already existing predispositions, giving additional opportunities to those citizens who have already shown political motivation and interest (Lee 2022). Overall political interest is the characteristic that active citizens of traditional and newer platforms share (Best and Krueger 2005). Technology can nevertheless enhance efficiency and effectiveness by making data storage and processing more affordable. Whereas the values of effectiveness and efficiency are important from the managerial point of view of public administrations, it additionally increases responsiveness (Moon, Lee, and Roh 2012).

Apart from giving information about service failures and dissatisfaction, this type of citizen-sourcing can lead to higher accountability (Moon et al. 2012), which is among the basic requirements of good governance. Accountability benefits from performance measures being established. Outputs might be easier to measure and monitor in most public services, but measuring other outcomes (e.g., accessibility, quality, or equality) is more difficult. Most indicators for public services still relate to costs and cost-efficiency, rather than other outcomes (Lindholst, Hansen, Randrup et al. 2017).

Accountability becomes more complex when the division of responsibilities is blurred. While there may be no reward for better performance, the incumbent is punished through a "functional responsibility" mechanism (Boyne, James, John et al. 2009). Even if political actors do not directly produce the outcome, different from cases of causal responsibility, they can still be held accountable (Jilke 2018). Thus, in the event of delivery failure, informed citizens tend to blame politicians via public redress (James, Jilke, Petersen et al. 2016).

Complaints and Socioeconomic Characteristics

Citizens that take action to hold the government accountable tend to be those more affluent (Haque 2000). This is explained by higher demand efficacy among wealthier citizens, as well as higher awareness, which increases with education, as a prerequisite for initiating a complaint (Thomas 1982). Generally, citizens who give more feedback on service delivery, negative or positive, tend to belong to the wealthier and more educated strata of the population (Gilad and Assouline 2022, Loeffler and Bovaird 2016). For

instance, environmental complaints are explained by the demand for higher urban environmental quality standards, while variables such as income and education or literacy rate were shown to be important (Carvalho and Fidélis 2009). Lower levels of complaining behavior have been found in empirical analysis all over the world (e.g., Dasgupta and Wheeler 1997, Liang et al. 2021, Raval 2020, Tavares et al. 2022).

Based on the theoretical foundations and evidence of the positive correlation between the frequency of complaints and both income and education, we formulate our first hypothesis:

Hypothesis 1: The propensity to complain about public services is higher in areas with higher income and educational levels.

Complaints and Citizen Involvement

Apart from socioeconomic class, the electoral-interest theory also studies modes of political participation and citizen involvement, such as elections or citizen-initiated contacts as a demand for representation (Mladenka 1977). In a recent systematic review, Purwanto, Zuiderwijk, and Janssen (2020) listed personal and political drivers of citizen engagement in open government that have been identified in the literature. Schmidthuber et al. (2017) argue that citizens' willingness to interact with open local government can be seen as voluntary contributions to public service improvements.

However, for the intrinsic motivation for successful 'citizen sourcing,' the feeling of belonging to the community and enjoyment of interaction are also important factors, as well as personal interest (Wijnhoven, Ehrenhard, and Kuhn 2015; Wirtz, Weyerer, and

Rösch 2018) and the belief in influencing the outcome (Bovaird, Loeffler, van Ryzin et al. 2014). O'Brien, Offenhuber, Baldwin-Philippi, Sands, and Gordon (2017) view such open government platforms as another outlet for political and civic engagement that can also be influenced by other personal factors. Thus, complaints can be seen as a mechanism for participation in public issues that is additional to more formal mechanisms, such as participation in elections. Citizens who are more politically active will tend to be more active in making complaints (Tavares et al. 2022). Based on these insights, we formulate our second hypothesis:

Hypothesis 2: The propensity to complain about public services is higher in areas with higher political participation.

Complaints and Political Partisan Biases and Rewards

Citizen satisfaction with public services is affected by the role of party identification - partisan bias- in shaping political perceptions (James and Van Ryzin 2017; Jilke 2018, Jilke and Baekgaard 2020; Tilley and Hobolt 2011). However, the partisan loyalties' effect is weaker when actual performance and direct experience are evaluated instead of using general perceptions (Taylor 2015, Tilley, and Hobolt 2011).

From the supply side of the service, there may be other additional reasons that explain electoral behavior and citizen satisfaction. The literature on distributive politics has modeled and shown evidence of the allocation of public goods and services to specific groups - core constituencies and swing voters- with diffusing costs (Weingast, Shepsle, and Johnsen 1981). Overall, politicians motivated to retain public office can use

distributive allocation and, in exchange, incumbents are rewarded by the voters (see meta-analysis by Golden and Min 2013).

This "area reward" mechanism (Glassberg 1973) is a form of patronage, by which a neighborhood that has been crucial in helping a political party win power receives its payoff in the form of better services (Cingranelli 1981). The so-called "machine politics' (Dixit and Londregan 1995) of parties allocating better public services to their core voters are especially important when there are voters who are more likely to abstain. In that case, the standard theory of distributive politics would predict that politicians target loyal voters (Stokes 2005). Based on these insights, we formulate our third hypothesis:

Hypothesis 3: The propensity to complain about public services is lower in areas with greater support for the governing party.

Using Citizen Complaints to Measure Citizen Satisfaction

Citizen reporting is a useful tool for citizens to communicate issues and track their progress. Hence, it reflects satisfaction (Harvey and Green 1993) and can be seen as evidence of service performance. Additionally, it has been shown that dissatisfied citizens tend to complain more (Devereux and Weisbrod 2006). Studies on citizen satisfaction with public services are of interest to practitioners, as they can be used as a monitoring device, providing feedback to assess quality in public service delivery (Deichmann and Lall 2007) and to track performance (Brown and Potoski 2004).

Complaints can provide an instantaneous assessment and they represent an ongoing form of participation, unlike voting (Hansen 2017, White, and Trump 2018).

Since the earliest studies using complaints, such as Cantrell (1980) on environmental issues in Virginia, complaints have been used as a proxy for satisfaction with the local government (Kosecik and Sagbas 2004), or to measure the perception of environmental quality (Carvalho and Fidélis 2009). Complaints are also a way to monitor information on community participation (Carvalho and Fidélis 2011; Dasgupta and Wheeler 1997).

The 311-complaint program in the US was a milestone in terms of using citizen complaints for policy-making and public management purposes. The first pilot version of the program started in 1996 in Baltimore as a non-emergency phone number for reporting problems, later extended to other regions of the US and found its equivalents in several countries (Minkoff, 2016). Similar platforms emerged afterward [e.g., SeeClickFix, Cambridge iReporters in the US, FixMyStreet in the UK, CitySourced, and Ushahidi in several countries (Offenhuber 2015)].

Following the use of these new programs and technological progress, data on complaints have increasingly been used to evaluate citizens' propensity to participate (White and Trump 2018) and to capture the intra-city variation of local public goods by Minkoff (2016), in the context of New York City. The 311 system has increasingly been used to gain insight into the urgent needs of the city. The collection of complaints in Barcelona is like the 311-complaint program in the US as it has spread in equivalent form throughout many countries.

Using citizen satisfaction and citizen complaints in empirical studies on public services is not free from criticism. Measuring citizen satisfaction with public services has traditionally been a difficult task for various reasons, among which concerns about

representativeness are primary, as disadvantaged groups may not be equally represented (Terrill and Ingram 2015) and, generally, whether complaints should be seen as an approximation for public or private concerns (Offenhuber 2015). Validity concerns have arisen from issues such as indifference, memory, and socially desirable responses in the case of self-administered questionnaires (Hickman and Poore 2015).

However, objective evaluations have proven reliable for evaluating performance (Andrews and Van de Walle 2013), and respondents' perception is hard to influence through manipulating expectations and is accurate when measuring performance (Van Ryzin 2013) compared with objective measures (Van Ryzin, Immerwahr, and Altman 2008).

INSTITUTIONAL AND GEOGRAPHICAL CONTEXT

The city of Barcelona (1.65 million inhabitants; City Statistics 2019) is at the center of the Metropolitan Area of Barcelona (5.4 million inhabitants) in the region of Catalonia (Spain). Based on the administrative fragmentation of the metropolitan area, the city/municipality is governed by a mayor and the local government. The City Council is elected in municipal elections held every four years. The whole city is a single electoral district for election purposes. City-wide party lists obtain seats on the City Council in proportion to the number of votes obtained in the city (d'Hondt system, with a minimum threshold of 5% of the votes to be allocated seats). In its first meeting after each election, each city councilor casts a vote for a member of the City Council to be elected as mayor. If no city councilor obtains an absolute majority of votes of the city council in the first

round, the head of the party list that obtained the highest number of votes in the city is automatically elected mayor. The mayor appoints a government formed by members of the City Council, who will be responsible for the different management areas.

For administrative purposes, the city of Barcelona is divided into 10 districts: Ciutat Vella (1); Eixample (2); Sants-Montjuïc (3); Les Corts (4); Sarrià-Sant Gervasi (5); Gràcia (6); Horta-Nou Barris (8); Sant Andreu (9); and Sant Martí (10) (see Figure 1). The most populated district is Eixample (269,095 inhabitants), and the least populated district is Les Corts (82,591 inhabitants). Although the political decisions in the municipality are heavily centralized, the district is the unit of reference for certain administrative tasks, as well as for some supervisory functions concerning city services.

<<< Insert Figure 1 about here>>>

DATA AND METHODS

Data

Our data relates to the city of Barcelona. Data on complaints were obtained from the Open Data BCN portal, which gives access to several datasets as part of Barcelona's Smart City Agenda (Charnock, March, and Ribera-Fumaz 2021) and is steered by principles of inclusive citizenship (Russell, Beel, Rees Jones et al. 2022) through smart city governance (McGuirk, Dowling, and Chatterjee 2021). Complaints have been registered since 2013 (2014 being the first full year included) and the registry is up to date. Because data for most of the variables used in the analysis is only available until 2020, we decided to use data up to December 2019, so that COVID-19 disruption does

not distort the analysis. Data in the registry of complaints contain detailed information on the time, date, and geo-location of the contact made (but do not include information on the personal characteristics of the citizen making the complaint).

From 2014 until 2019, 1,041,649 contacts were made with the local government. The government grouped them into 1) Acknowledgement (0.25%) 2) Service request (6.16%) 3) Suggestion (6.21%) 4) Complaint (16.77%) 5) Query (20.23%) 6) Incident (50.36%). The "Types" are further divided into "Area", "Element" and "Detail". According to the City Council's methodology, incidents mean "notification of irregularity", while complaints mean "notification of dissatisfaction".[1] Therefore, in our database, we use both incidents and complaints observations, as both represent service failures.[2]

The queries are grouped into 31 main categories. Looking at the subgroups and bearing the subject of our article in mind, we selected the services for which the highest number of complaints have been made considering the average number of complaints per month and districts higher than one. These include (1) Maintenance of Urban Space; (2) Waste Collection; (3) Street Cleaning; (4) Prevention and Safety; (5) Sanitation and Public Health; (6) Mobility; (7) Urban Planning, Works and Housing; and (8) Christmas Decorations.[3] Of these eight services, *Maintenance of Urban Space* generated the most complaints (receiving 217,159 complaints in 2014-2019), while *Christmas Decorations* generated the fewest (891 complaints in 2014-2019). The representativeness and relevance of our choice of urban services are illustrated by the fact that the selected public services accounted for more than 99% of total complaints made (Open Data BCN).

Table 1 includes the most important -top five- details about which the complaints were received in 2019.

<<< Insert Table 1 about here>>>

Variables

Dependent Variable

Citizen Complaints: Our independent variable is the number of complaints received (per 10,000 inhabitants) in each district, for each of the eight services considered. We had monthly data available for the period 2014-2019. Our data source is Open Data BCN.

Independent Variables

Income Level: Considering our first hypothesis on the effects of the citizens' socioeconomic characteristics on the quality of service they get, we introduced *Income Level* into the model at a district level. This is expressed with base BCN=1, where 1.00 represents the average income of the city of Barcelona. This index is used until 2017, it is not constructed anymore. To be able to use an up-to-date measure of income, we have looked at the growth rate of the measure of disposable household income. This growth rate was used to construct the missing values for the years 2018 and 2019 of the original Income Level variable.

Educational Attainment: This is another socioeconomic variable we consider relative to our first hypothesis measured by the ratio of people in the district having finished at least pre-university studies. While both *Income Level* and *Educational Attainment* are associated with the first hypothesis, we model them separately because of

their high correlation. Yearly data was available for the period 2014-2019.

Political Participation: According to our second hypothesis, residents who are more active in political participation make more complaints. Like Tavares, Moreno and Teles (2022), we use the electoral turnout in the district in the municipal elections held in 2011, 2015, and 2019 as a proxy for *Political Participation*. In the years in which elections were held, we consider the new outcome starting from July of that year (as newly elected local governments take office in June). Yearly data was available for 2014-2019.[4]

Partisan Bias: Voting in favor of the party to which the mayor belongs is associated with partisan bias (in favor of the city government) and with the so-called "reward effect". According to our third hypothesis, districts that give a higher portion of their votes for the governing party get a higher quality of public service in return. We included three election years in the data: 2011, 2015, and 2019. In the years in which elections were held, we consider the outcomes starting from July of that year as newly elected local governments take office in June.

Controls: We include controls for other factors that may influence citizen complaints in the districts, such as the *Population* and *Population Density*, as the demographics of each district can influence service delivery and consequently the number of complaints. How local public services are delivered, in terms of efficiency, quality, and output, depends on both scale and density (Ladd 1992). However, as we are conducting a study with a multi-service approach, we do not have any expectation as to a systematic direction of the relationship between controls and the outcome.

These measures are also important from the citizen's point of view. It has been argued that both *Population* and *Population Density* are related to civic and political participation (Tavares and Carr 2013), so they are important control variables.

Data for all independent variables were obtained from Open Data BCN and City Statistics. Overall, our panel data consisted of six years of monthly observations of the variables defined above. Table 2 shows an overview of the variables and data sources. Table 3 displays the descriptive statistics.

<<< Insert Table 2 about here>>>

<<< Insert Table 3 about here>>>

Methodology

To model intra-city variation in complaints, in line with our hypotheses stated above, we model the complaint function as follows:

$$Complaints = F(Socio - Economic\ Status, Political\ Participation, Partisan\ Bias, Controls) \quad (1)$$

If the dependent variable was treated as a discrete variable, the starting point would usually be the Poisson regression model (Cameron and Trivedi 2013). In our case, the Poisson specification's equi-dispersion criterion is not satisfied, and applying a panel setting has better robustness properties (Wooldridge 2010,763). Using the dependent variable in *per capita* terms allows treating it as continuous, for which the techniques we

choose to use, and their implications, are well established. To test our hypotheses, we estimate a panel data model of the ten districts for a period of six years (2014-19) as:

$$Complaints_{it} = \beta_0 + \beta_1 IncomeLevel_{it} + \beta_2 EducationalAttainment_{it} + \beta_3 Electoral\_Turnout_{it} + \beta_4 VotesxMayor_{it} + \beta_5 Population_{it} + \beta_6 PopulationDensity_{it} + \varepsilon_{it} \quad (2)$$

In this specification, *i* stands for one of the ten districts in Barcelona, *t* denotes one of the 12 months over the period of six years, while ε represents the error term. Firstly, we looked at the variance inflation factor (VIF) to check the relevance of multicollinearity in our model. We obtained an average VIF of 5.33, and the variables *Educational Attainment* and *Income Level* reached values of 21.27 and 19.00, respectively (having a pairwise correlation of 0.94). Hence, we chose to estimate two specifications of our model (Model 1 and Model 2) as follows:

Model 1:

$$Complaints_{it} = \beta_0 + \beta_1 IncomeLevel_{it} + \beta_2 ElectoralTurnout_{it} + \beta_3 VotesxMayor_{it} + \beta_3 Population_{it} + \beta_5 PopulationDensity_{it} + \varepsilon_{it} \quad (3)$$

Model 2:

$$Complaints_{it} = \beta_0 + \beta_1 EducationalAttainment_{it} + \beta_2 ElectoralTurnout_{it} + \beta_3 VotesxMayor_{it} + \beta_4 Population_{it} + \beta_5 PopulationDensity_{it} + \varepsilon_{it} \quad (4)$$

RESULTS

The results of our estimations are shown in Table 4 and Table 5. For Model 1, the mean VIF was 1.84 and the highest individual VIF reached was 2.42. Similarly, in Model 2, the mean VIF was 1.91, while the maximum individual VIF had a value of 2.89. Therefore, separating the two socio-economic variables resolved the issue of multicollinearity.

Applying panel data estimation methods, we conducted estimations with fixed and random effects models. In both specifications, we performed the Hausman test to select our preferred structure. The p-values obtained (shown in Tables 4 and 5) were all $p<0.10$, except for the estimation for *Sanitation and Public Health* with *Educational Attainment* ($p<0.123$). As we could reject the null hypothesis of no systematic difference in coefficients in all cases but one, the fixed effects specification was the preferred choice. We conducted all estimations with time (year) effects.

The results for Model 1, which takes *Income Level* as the socioeconomic variable, are shown in Table 4. All our fixed effects panel estimations are robust (F-tests are all below 0.001). Our first target variable, *Income Level,* is not significant in any estimation. This is inconsistent with our first hypothesis (income level is positively associated with complaints).

In contrast, in most estimations, six out of eight, our second target variable *Electoral Turnout* shows highly significant ($p<0.01$) and positive coefficients, which is consistent with our second hypothesis (political participation is positively associated with complaints). To correctly interpret the coefficients from our estimations, it is worth considering that data for this variable range between 0 and 1. Hence the coefficients are

easier to interpret if divided by 100, to see the implications of one additional percentage point in those independent variables. For instance, a 1 percentage point increase in electoral turnout in the district is associated with 0.66 more complaints per 10,000 inhabitants about the service of Maintenance of urban space (per month in the district, on average).

Regarding our third target variable, *Votes for Mayor*, coefficients are not significant for almost all estimations, except for *Mobility*, for which the coefficient is positive and significant ($p<0.05$). Hence, our results do not support our third hypothesis, namely, that the propensity to complain about public services is lower in areas with greater support for the governing party. Finally, concerning our controls, *Population*, does not appear to be significant, while several coefficients for *Population Density* are positive and highly significant ($p<0.001$).

Table 5 presents the results from our fixed effects panel estimations when *Educational Attainment* is used in place of *Income Level*. Once again, *Electoral Turnout* tends to show a positive and significant ($p<0.001$) relationship with complaints, for six out of eight services. It is interesting to note that signs and significance levels are equivalent, and coefficients are practically the same.

In the case of *Educational Attainment*, the coefficient for *Urban Planning, Works, and Housing* is positive and significant at a level of 5 %. However, we do not find a significant association for most services (seven out of eight). The results we obtain for *Votes for Mayor* are similar: in the case of most services, we do not find a significant association with complaints. In two cases (*Mobility* and *Christmas Decorations*), the

coefficients we obtain are weakly significant, at 5%, but the signs are opposed (positive and negative, respectively). *Population* tends to lack significance, as does *Population Density*, for which significance falls from five to three services. To check the robustness of our result, we extended the analysis by observations of 2020 - using data on months that were not affected by COVID-19 confinement. These results are shown in the appendix.

As explained above, we chose to use panel estimation because the Poisson specification's equi-dispersion criterion of the Poisson distribution was not satisfied. Nevertheless, to check the robustness of our results across estimation techniques, we conducted Poisson fixed effects estimations for both specifications, and the results obtained (available upon request) were confirmed.

<<< Insert Table 4 about here>>>

<<< Insert Table 5 about here>>>

Citizen Satisfaction

We are aware that the interpretation of our results might be susceptible to an ecological inference fallacy, as we are assuming that the relationships observed at a district level imply that the same behavior exists at the individual level (see, e.g., Russo 2017). To better understand whether our interpretation of the results concerning our hypotheses is robustly grounded, or rather it could reflect deficiencies in the complaint system as a measuring device, we checked the annual survey on citizen satisfaction conducted in the city of Barcelona at an individual level. By doing so, we aimed to contrast the relationship (or lack thereof) between economic, social, and economic factors

with active complaints, with the relationship (or lack thereof) between citizen satisfaction and their individual economic, social, and political characteristics. We analyzed the annual citizen satisfaction surveys (2014-2019) concerning the categories corresponding to -or best representing- the services analyzed above (categories in Table 3) and found the results of pairwise correlations displayed in Table 6.

<<< Insert Table 6 about here>>>

To go one step further, we have estimated in Table 7 Income Level with Electoral Turnout as an independent variable, and in Table 8 Income Level with Vote for the Mayor using the citizen satisfaction survey.[5] First, we have found a negative and significant association between the evaluation of satisfaction and the citizens' income for almost all services under study (six out of eight) in the pairwise correlation, which was confirmed by the estimations in Table 7 and Table 8. Hence, the lack of correlation between complaints and income does not imply that high-income citizens are more satisfied with city services.

As such, our interpretation that our results reject the hypothesis that richer citizens have a higher propensity to complain is robust. Although wealthier citizens' evaluation of city services is lower (as suggested by Thomas 1982), our results on complaints run contrary to insights on the higher propensity to complain among wealthier citizens in Loeffler and Bovaird (2016).

A possible explanation for this result may be drawn from Hirschman's (1970) exit, voice, and loyalty approach, which has been applied to the analysis of complaints in local politics (see Tavares et al. 2022). If wealthier citizens have more options to address low

satisfaction with public services through the exit (e.g., turning to private service providers), then they may be less inclined to voice their concerns. It may be the case that lower evaluations of satisfaction by wealthier citizens in surveys might reflect their higher demands for quality.

<<< Insert Table 7 about here>>>

<<< Insert Table 8 about here>>>

Second, looking at the pairwise correlations in Table 6, we found that the level of educational attainment is significantly associated with satisfaction in all eight services, but the sign of the relationship is not systematic. For three services (*Maintenance of Urban Space*, *Prevention and Safety*, and *Christmas Decorations*), educational attainment was positively associated with satisfaction, but the opposite was found for the five remaining services, for which satisfaction decreases with educational attainment. Additionally, the estimations of Table 9 and Table 10 show similar results for Educational Attainment as for Income Level, except for *Christmas Decoration,* for which we do not observe any statistically significant result.

Furthermore, no correlation is observed between satisfaction and complaints. As such, our interpretation that our results reject the hypothesis that citizens with higher educational attainment have a higher propensity to complain is robust.

Next, we found that citizens who are politically more active (those who voted in the last local election held before the survey date) tend to have a lower level of satisfaction with city services. We observe this relation already in Table 6, of pairwise correlations, and it is confirmed by the estimations of Table 7 and Table 9. This is

consistent with political participation being positively associated with complaints. Hence, the confirmation of hypothesis two seems robust, in line with the results in Tavares, Moreno and Teles (2022).

Finally, we find a positive and strongly significant association between having voted for the mayor's party in the last election held and satisfaction with city services represented in Table 8 and Table 10. This is consistent with the theory that party identification and partisan bias play a role in shaping political perceptions (James and Van Ryzin 2017; Jilke 2018; Jilke and Baekgaard 2020; Tilley and Hobolt 2011). However, our results on complaints and support for the mayor's party, shown in Table 4 and Table 5, did not indicate a lower propensity to complain, which would be consistent with suggestions by Tilley and Hobolt (2011) and Taylor (2015) that partisan bias is weaker when actual performance is evaluated and citizens have direct experience of the service, which is a prerequisite for making complaints.

<<< Insert Table 9 about here>>>

<<< Insert Table 10 about here>>>

DISCUSSION AND POLICY IMPLICATIONS

Our study aimed to analyze economic, social, and political determinants concerning citizen complaints about eight local public services. The analysis was conducted for eight local services with data for the city of Barcelona at a district level. Data on complaints were obtained from a 311-style complaint program initiated in 2013. We did not find any systematic association between income level, educational attainment, and partisan

alignment with the mayor's party concerning citizen complaints. In contrast, a higher level of political participation was associated with a higher frequency of complaints.

The literature emphasizes the existence of economic, social, and partisan biases in citizens' evaluation of local services, as expressed in satisfaction surveys. Our results suggest that such biases might be weaker when citizens have direct experience of the service and actual performance is evaluated, which is a prerequisite for making specific complaints. Hence, our research reinforces concerns that this type of evaluation might not be satisfactory for assessing the performance of local public services. While they may provide some useful information, we suggest complementing them with an analysis of data from complaint programs, which can moderate the biases observed in satisfaction surveys. As an increasing number of cities -to varying extents (Budding, Faber, and Gradus 2018)- are using information technologies to implement efficient complaint programs, in terms of barriers of entry and time required, our exercise can be generalized to other cities, making more valuable and less biased information on citizen satisfaction with local service performance available to elected officials and public managers.

It should be noted that the use of satisfaction surveys and complaint programs is not without its limitations in terms of assessing the performance of local services, due to issues of representativeness, bias, and potentially noisy information (see Saylam and Yıldız 2022). Therefore, direct monitoring and supervision of service performance should be conducted. Furthermore, another limitation of our study was a lack of available data on the individual characteristics of complainants. More detailed information would allow future research to take this analysis further. These limitations notwithstanding, we believe

that our results can prove useful beyond the specific context in which the research was conducted, namely the city of Barcelona. As an increasing number of cities are using information technologies to implement efficient complaint programs (in terms of barriers of entry and time required to make the complaint), our study can be generalized to other cities. As a result, more valuable information on citizen satisfaction with local service performance could be made available.

Equitable allocation of public services is an important normative issue, and communities should determine what is fair. This issue is difficult to tackle for local politicians, public managers, and urban planners when making decisions on public services, and improvements in delivering them should focus beyond the notion of cost-efficiency (Boyne 2002; Boyne 2003). Having access to sensitive evaluations of public service provision in terms of social welfare is a complex task, and citizen satisfaction surveys have widely been used for that purpose. Moreover, citizen complaint systems are increasingly used throughout the world, driven by technological developments that make it easier and less expensive to administer this type of system, both for citizens and governments.

Overall, when evaluating the performance of services based on feedback data, our results suggest that local governments should bear in mind the different behavior of the public. As mentioned, lower satisfaction among wealthier citizens might reflect higher demand for quality features rather than objective service failures. The opposite might be the case for citizens who are less active politically, either because they opt out of participating or because they do not have equal participation rights (e.g., immigrants). To

alleviate this last issue, special attention should be paid to zones with lower levels of political participation and more social exclusion. Providing more and better information on the possibilities for making complaints and giving feedback is important for this purpose (Eriksson 2022). Thus, complaints programs should be promoted (Minkoff 2016). Apart from potentially higher allocative efficiency (Chandrashekeran and Keele 2022), this would also provide a way to increase the ability to hold politicians (including non-elected) accountable, reinforcing the government's legitimacy.

NOTES

[1]See: https://opendata-ajuntament.barcelona.cat/data/es/dataset/iris

[2]As an example, our first observation is Type="Incident", Area= "Collection and cleaning of the urban space", Element= "Clean streets and/or squares", Detail="Objects to clean / remove".

[3]We did not include *Public Transportation* in our study, because this service is provided and managed by the Metropolitan Area, in contrast to *Mobility*, for which the city government is responsible. A total of 1,338 complaints were received regarding the Public Transport service in 2014-2019.

[4]We are aware that there may be concerns about reverse causality between political participation and citizens' complaints: more complaints (less satisfaction) with public services could trigger political participation. We believe, however, that potential endogeneity is not a relevant issue in our research, given the way the measures are obtained. Political participation is measured at the time when local elections are held, while citizens' complaints are measured in the four years after local election. Given the time span of our sample (2014-2019) and the timing of local elections within our time-period, the lag between citizen complaints and political participation leads us to believe that reverse causality is not a relevant concern.

[5]When measured at individual level, both electoral turnout and Vote for Major are dummy variables, each taking values 1 (if Yes) or 0 (If No). When estimations are run with both in the model, the collinearity is extremely high, so that robust results cannot be obtained. For this reason, we decided to contrast each of these variables in different estimations.

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Table 1. Description of the Variables and Sources of Data

Variable	Description	Source
Complaints (x 10,000 inhabitants)	Complaints in the zone per 10,000 inhabitants	OpenData BCN
Income Level	Territorial income distribution, 1.00 being the average of the whole city	OpenData BCN
Educational Attainment	Number of inhabitants having completed pre-university level, as % of population who entered the educational system	OpenData BCN
Electoral Turnout	Turnout in the last local elections held, as a % of total number of citizens with right to vote.	bcn.cat
Votes for Mayor	Votes received by the mayor's party in the local elections as a % of total votes	bcn.cat
Population	Number of inhabitants in the district	bcn.cat
Population Density	Density of population (inhab. per Km2) in the district	bcn.cat

Table 2. Descriptive Statistics of Variables

	Count	Mean	Standard Deviation	Min.	Max
Complaints (x 10,000 inhabitants) (1)	720	18.76	6.96	7.02	86.41
Complaints (x 10,000 inhabitants) (2)	720	9.48	6.31	1.72	40.74
Complaints (x 10,000 inhabitants) (3)	720	6.35	3.46	1.34	32.26
Complaints (x 10,000 inhabitants) (4)	720	3.24	1.71	0.35	13.01
Complaints (x 10,000 inhabitants) (5)	720	2.22	2.12	0.24	44.05
Complaints (x 10,000 inhabitants) (6)	720	2.09	0.83	0.27	5.41
Complaints (x 10,000 inhabitants) (7)	720	0.87	0.50	0	4.23
Complaints (x 10,000 inhabitants) (8)	720	0.08	0.15	0	1.15
Income Level	720	1.01	0.36	0.54	1.88
Educational Attainment	720	0.56	0.13	0.33	0.79
Electoral Turnout	720	0.59	0.07	0.42	0.72
Votes for Mayor	720	0.26	0.08	0.10	0.48
Population	720	161,560	53,524	81,200	266,416
Population Density	720	196.48	85.03	72.55	356.36

Table 3. Results from Fixed Effect clustered estimations (with Income Level as independent variable).

Variables (Dependent variable is complaints per 10,000 inhabitants)	(1) Maintenance of urban space	(2) Waste collection	(3) Cleaning of urban space	(4) Prevention and safety	(5) Sanitation and public health	(6) Mobility	(7) Urbanism, works and housing	(8) Christmas decoration
	FE cluster	FE cluster	FE cluster	FE cluster	FE Cluster	FE Cluster	FE Cluster	FE cluster
Income Level	-26.477	2.269	7.971	0.119	-0.292	1.616	0.648	-0.062
	(12.791)	(4.617)	(5.058)	(1.576)	(2.208)	(1.507)	(1.021)	(0.152)
Electoral Turnout	66.461**	58.729***	29.836***	4.214**	11.801***	-0.700	1.205	1.269***
	(13.903)	(6.395)	(4.923)	(1.116)	(2.437)	(0.913)	(0.778)	(0.236)
Votes for Mayor	-0.262	0.797	-1.894	0.837	0.490	0.968*	0.382	-0.082
	(2.468)	(3.395)	(0.962)	(0.448)	(0.601)	(0.350)	(0.561)	(0.064)
Population	0.001*	0.001	0.000	-0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population Density	-0.041	0.166*	0.089***	0.082***	-0.049*	0.004	0.020**	0.001
	(0.044)	(0.071)	(0.012)	(0.010)	(0.020)	(0.013)	(0.005)	(0.001)
Constant	-95.019*	-187.888*	-37.092	0.495	-23.426	-19.078	2.580	-0.890
	(37.747)	(64.885)	(29.038)	(8.514)	(12.146)	(9.247)	(2.956)	(0.695)
Observations	720	720	720	720	720	720	720	720
Hausman test (p<)	0.001	0.000	0.000	0.000	0.076	0.036	0.000	0.000
Time	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.331	0.507	0.151	0.114	0.073	0.246	0.090	0.038
F-stat	218.35	56,016.73	357.52	2,611.59	673.94	14.51	24.03	44.05
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table 4. Results from Fixed Effect clustered estimations (with Educational Attainment as independent variable)

Variables (Dependent variable is complaints per 10,000 inhabitants)	(1bis) Maintenance of urban space	(2bis) Waste collection	(3bis) Cleaning of urban space	(4bis) Prevention and safety	(5bis) Sanitation and public health	(6bis) Mobility	(7bis) Urbanism, works and housing	(8bis) Christmas decoration
	FE Cluster	FE cluster	FE cluster	FE cluster	FE cluster	FE Cluster	FE Cluster	FE cluster
Education Attainment	4.800	172.572	11.170	1.436	2.625	-3.969	20.521*	1.587
	(71.301)	(91.284)	(34.332)	(13.633)	(9.601)	(8.259)	(8.472)	(0.984)
Electoral Turnout	66.145**	57.699***	29.854***	4.206**	11.780***	-0.659	1.086	1.259***
	(13.938)	(6.867)	(4.808)	(1.145)	(2.422)	(0.866)	(0.688)	(0.252)
Votes for Mayor	-2.224	-2.660	-1.568	0.815	0.415	1.165*	-0.003	-0.120*
	(2.700)	(2.923)	(1.320)	(0.522)	(0.634)	(0.432)	(0.591)	(0.0483)
Population	8.52e-04**	0.001	-0.000	-1.03e-04	1.80e-04	1.06e-04	-5.28e-05	1.50e-06
	(2.49e-04)	(0.000)	(0.000)	(5.86e-05)	(9.91e-05)	(6.68e-05)	(2.47e-05)	(3.64e-06)
Population Density	-0.058	0.067	0.087**	0.081***	-0.051*	0.007	0.009	-0.002
	(0.057)	(0.116)	(0.026)	(0.016)	(0.022)	(0.017)	(0.007)	(0.001)
Constant	-147.621*	-250.265**	-26.133	0.167	-25.001	-14.447	-4.112	-1.622
	(48.546)	(68.021)	(28.780)	(10.671)	(12.530)	(11.318)	(5.909)	(0.780)
Observations	720	720	720	720	720	720	720	720
Hausman test	0.013	0.000	0.000	0.000	0.123	0.056	0.000	0.000
Time	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.326	0.515	0.148	0.114	0.073	0.245	0.108	0.039
F-stat	118.04	2,915.98	2,076.86	1,476.76	88.69	9.88	69.84	14.65
Prob > F	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table 5. Pairwise correlations between economic, social, and political characteristics and valuation of citizens' satisfaction on the Barcelona Municipal Services Survey (2014-2019)

Variables	(1) Maintenance of urban space	(2) Waste collection	(3) Cleaning of urban space	(4) Prevention and safety	(5) Sanitation and public health	(6) Mobility	(7) Urbanism, works and housing	(8) Christmas decoration
Income Level	0.010	-0.049***	-0.069***	0.011*	-0.023***	-0.077***	-0.040***	-0.019***
Educational Attainment	0.058***	-0.038***	-0.019***	0.069***	-0.053***	-0.037***	-0.026***	0.051***
Electoral Turnout	-0.225***	-0.123***	-0.185***	-0.182***	-0.067***	-0.163***	-0.185***	-0.182***
Votes for Mayor	0.072***	0.029***	0.064***	0.084***	0.014*	0.048***	0.079***	0.065***

*** p<0.001, ** p<0.01, * p<0.05

Source: Authors, based on Municipal Services Survey (*Enquesta de Serveis Municipals)*

Table 6. Clustered estimation with Income Level and Electoral Turnout as independent variables based on the Barcelona Municipal Services Survey (2014-2019)

Variables (Dependent variable is survey evaluation)	(1) Maintenance of urban space	(2) Waste collection	(3) Cleaning of urban space	(4) Prevention and safety	(5) Sanitation and public health	(6) Mobility	(7) Urbanism, works and housing	(8) Christmas decoration
	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster
Income Level	0.023*	-0.037***	-0.060***	0.026***	-0.030*	-0.059***	-0.021*	-0.014
	(0.008)	(0.007)	(0.009)	(0.003)	(0.012)	(0.011)	(0.007)	(0.009)
Electoral Turnout	-0.925***	-0.446***	-0.742***	-0.813***	-0.361***	-0.600***	-0.674***	-0.599***
	(0.032)	(0.024)	(0.036)	(0.040)	(0.025)	(0.037)	(0.025)	(0.035)
Constant	6.510***	7.556***	7.306***	5.903***	4.909***	6.084***	6.808***	7.490***
	(0.065)	(0.048)	(0.044)	(0.050)	(0.078)	(0.057)	(0.071)	(0.061)
Observations	26,642	26,858	26,884	26,264	26,413	26,077	24,983	23,288
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
District FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.061	0.020	0.039	0.062	0.031	0.034	0.043	0.039
F-stat	113.75	32.52	67.05	114.99	59.71	61.99	72.79	66.31
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table 7. Clustered estimation with Income Level and Votes for Mayor as independent variables based on the Barcelona Municipal Services Survey (2014-2019)

Variables (Dependent variable is survey evaluation)	(1) Maintenance of urban space	(2) Waste collection	(3) Cleaning of urban space	(4) Prevention and safety	(5) Sanitation and public health	(6) Mobility	(7) Urbanism, works and housing	(8) Christmas decoration
	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster
Income Level	0.030*	-0.053***	-0.066***	0.028***	-0.029*	-0.060***	-0.020*	-0.030*
	(0.010)	(0.007)	(0.010)	(0.005)	(0.010)	(0.012)	(0.008)	(0.010)
Votes for Mayor	0.302***	0.127***	0.298***	0.369***	0.112**	0.219***	0.284***	0.244***
	(0.047)	(0.026)	(0.051)	(0.040)	(0.026)	(0.044)	(0.048)	(0.034)
Constant	5.531***	7.126***	6.583***	5.091***	4.605***	5.446***	6.072***	6.803***
	(0.045)	(0.048)	(0.054)	(0.025)	(0.059)	(0.067)	(0.057)	(0.050)
Observations	13,685	13,760	13,766	13,456	13,511	13,478	12,971	12,110
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
District FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.016	0.008	0.016	0.045	0.027	0.012	0.012	0.013
F-stat	14.65	7.18	14.32	41.48	27.32	9.162	9.896	11.05
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table 8. Clustered estimation with Educational Attainment and Electoral Turnout as independent variables based on the Barcelona Municipal Services Survey (2014-2019)

Variables (Dependent variable is survey evaluation)	(1) Maintenance of urban space	(2) Waste collection	(3) Cleaning of urban space	(4) Prevention and safety	(5) Sanitation and public health	(6) Mobility	(7) Urbanism, works and housing	(8) Christmas decoration
	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster
Educational Attainment	0.059**	-0.063***	-0.052**	0.090***	-0.082***	-0.048**	-0.049**	0.031
	(0.014)	(0.010)	(0.012)	(0.012)	(0.017)	(0.013)	(0.011)	(0.017)
Electoral Turnout	-0.929***	-0.487***	-0.826***	-0.819***	-0.424***	-0.654***	-0.703***	-0.633***
	(0.026)	(0.017)	(0.038)	(0.034)	(0.018)	(0.036)	(0.029)	(0.036)
Constant	6.327***	7.682***	7.367***	5.606***	5.180***	6.132***	6.915***	7.355***
	(0.064)	(0.059)	(0.035)	(0.060)	(0.090)	(0.073)	(0.066)	(0.087)
Observations	34,941	35,248	35,292	34,364	34,585	34,166	32,563	30,167
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
District FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.063	0.022	0.040	0.064	0.032	0.033	0.044	0.041
F-stat	153.04	47.62	90.57	154.4	80.47	79.96	98.14	89.56
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table 9. Clustered estimation with Educational Attainment and Electoral Turnout as independent variables based on the Barcelona Municipal Services Survey (2014-2019)

Variables (Dependent variable is survey evaluation)	(1) Maintenance of urban space	(2) Waste collection	(3) Cleaning of urban space	(4) Prevention and safety	(5) Sanitation and public health	(6) Mobility	(7) Urbanism, works and housing	(8) Christmas decoration
	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster
Educational Attainment	0.041**	-0.086***	-0.078**	0.088***	-0.094***	-0.068***	-0.058***	-0.009
	(0.011)	(0.014)	(0.017)	(0.017)	(0.019)	(0.013)	(0.010)	(0.017)
Votes for Mayor	0.289***	0.139***	0.324***	0.343***	0.123***	0.226***	0.309***	0.238***
	(0.047)	(0.022)	(0.052)	(0.048)	(0.022)	(0.046)	(0.058)	(0.039)
Constant	5.402***	7.273***	6.619***	4.789***	4.777***	5.469***	6.146***	6.677***
	(0.054)	(0.058)	(0.054)	(0.060)	(0.090)	(0.057)	(0.058)	(0.092)
Observations	16,609	16,706	16,715	16,309	16,390	16,333	15,688	14,595
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
District FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.016	0.016	0.008	0.014	0.046	0.029	0.010	0.014
F-stat	17.41	9.23	14.56	50.60	34.81	9.68	13.06	12.53
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

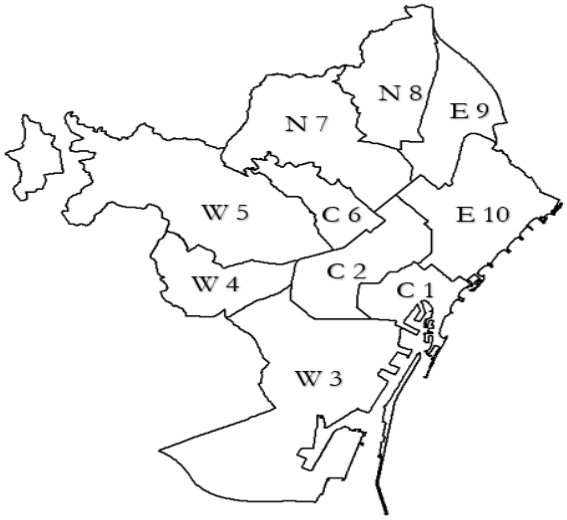
Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

APPENDIX

Table A1. Main categories with Details that have received the top 5 most complaints in 2019.

(1) Maintenance of urban space	(2) Waste collection	(3) Cleaning of urban space	(4) Prevention and safety	(5) Sanitation and public health	(6) Mobility	(7) Urbanism, works and housing	(8) Christmas decoration
Sidewalk incidents	Objects to clean/ remove	Cleaning service streets/squares	Occupancy of public space	Rats or mice in public spaces	Abandoned motor vehicles	Nuisance works on public roads	Christmas lighting
Lighting incidents	Containers to clean incidents	Urines, animal excrement	Dogs on public roads and/or parks	Insects/arthropods in public spaces	Motor vehicles, road discipline	Lack of cleaning or maintenance	Abandoned fir trees on the street
Tree pest or blight treatment	Container, garbage incidents	Bin incidents	People, collectives disturbing public space	Pigeons in public spaces	Abandoned bicycle	Incidents about information or participation	
Tree incidents	Abandoned furniture	Paint or poster in public space	Concentration people making noise	Bees/ wasps	Bicycles, road discipline	Affectations mobility during works	
Traffic light incidents	Paper/plastic/glass containers	Paint or offensive poster private buildings	Neighborhood coexistence	Cat colonies	Reservation of places	Superblocks Eixample	

Figure 1. Territorial Division of Contracted Zones of Waste Collection



Note: C: Centre (1: Ciutat Vella; 2: Eixample; 6: Gràcia); W: West (3: Sants-Zona Franca; 4: Les Corts; 5: Sarrià-Sat Gervasi); N: North (7: Horta-Guinardò; 8: Nou Barris); E: East (9: Sant Andreu; 10: Sant Marti)