Does Destroyed Social Capital Cause Higher Contributions: Evidence from Ecuador

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Abstract

I present evidence that households contribute more to local public goods in the presence of a communtiy organization based on cross-sectional household survey data collected from low-income neighbourhoods of Quito, Ecuador. The observed differences in household contributions are attributed to the ability of a community organization to coercively induce households to commit their time to community projects. This coercive power is argued to have historical origins traceable to the formation of a neighbourhood as an illegal settlement. This power is suggested to have been an accidental by-product of households voluntarily contributing to the organization in return for protection against government eviction of the entire community. A location with specific geographic characteristics served an important role in providing natural protection and also in legally qualifying the organization to seek a global title over the invaded land. Using exogenous variation in these geographic characteristics, I find that the presence of a community organization has a positive effect on household time contributions to two public goods: trash collection in public areas and community patrolling.

Key words: time contributions, local public goods, state capacity, community organization, illegal land invasions, land title.

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1 Introduction

Low-income neighbourhoods of large and medium-sized cities in the developing world, commonly referred to as 'urban slums', experience disproportionate underprovision of

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local public goods by the government (e.g. trash collection, sewerage and water supply) both in absolute terms and relative to the more affluent urban areas of the same cities. (United Nations (2003)) This issue is of global concern because urban slums accommodated approximately 31 % of the world's urban population in 2001. (United Nations (2003)) A potential solution that could considerably alleviate underprovision in these areas may lie in the *ability* of a grassroots community organization to effectively organize collective action among residents of the community. In this context, residents' contributions could serve as an important source of informal tax revenue that a community organization could use for the provision of local public goods.

Understanding the specific logic of sustaining an informal tax system in urban slums, many of which have historically been founded as either 'illegal' settlements and/or have a significant fraction of 'untitled' residents, is crucial for the design of effective public policies. A particular concern is that titling policies might undermine the *ability* of grassroots community organizations in urban slums, to sustain both high participation rates and contribution levels that are essential for the provision of local public goods in these urban areas. (Field (2004)) One possible explanation of this result could be that the titling process abruptly destroys the *historical cohesion*[1] of a community, in part because community members no longer share the common goal of providing security to the entire community. Historically, the existence of a credible eviction threat in a particularly hostile towards illegal settlements environment has served as an important motivating factor for squatters to derive high benefit from *voluntarily* contributing their time and money to an organization capable of providing protection to the community. In this context, one of the accidental and paradoxical by-products of an extended period of property insecurity has been the dual use of voluntary contributions for the provision of local public goods (e.g. protection) as well as for the accumulation of 'state capacity' that provided a community organization with the necessary infrastructure, in terms of administration, monitoring and enforcement, to *coercively* raise revenue from

[1]For the sake of clarity, historical cohesion refers to the cohesion that existed at the time a neighbourhood was formed and is associated with the common goals shared by the residents of the community.

its members.

An important empirical question that emerges is whether the historical accumulation of state capacity by a community organization is sufficiently strong to undermine the power of recently acquired individual property rights when it comes to raising contributions from community residents for the provision of local public goods. A suitable setting for studying this question could be found in low-income neighbourhods of Quito, the capital city of Ecuador. The absence of formal governance structures at the neighbourhood level allows for a direct comparison between an informal tax system run by a community organization and a voluntary-based funding system in neighbourhoods with comparable fractions of titled residents as well as other socio-economic characteristics. Furthermore, the unique geographic characteristics of Quito provide suitable variation that could be empirically associated with important legal aspects of a neighbourhood's history.

To study this question, I rely on cross-sectional household survey data collected by Lanjouw and Levy in 1998 in a stratified sample of low-income neighbourhoods from Quito, Ecuador that contains rich data of household- and neighbourhood-level characteristics. In this data, I am able to distinguish between an informal tax system and a voluntary contributions-based system by observing either the presence or the absence of a community organization registered as a housing cooperative in a given neighbourhood. For historical and legal reasons, I argue that the only plausible explanation for observing a housing cooperative years after the formation of the neighbourhood is a history of a former 'illegal' settlement. In this context, the housing cooperative is argued to have played a dominant role in providing protection against government eviction of the entire settlement. To demonstrate the intimate link that exists between a housing cooperative and the neighbourhood's roots of an 'illegal' settlement, I provide both anecdotal evidence drawn from the anthropological literature as well as empirical evidence based on geographical and historical data extracted from various maps and atlases.

In this paper, I pursue an IV empirical strategy to estimate the causal effect of a community organization on household contributions by exploiting exogenous variation

in neighbourhoods' geographical endowments. OLS estimation is likely to lead to biased estimates for two reasons. First, the historical cohesion of the community, which is unobservable to the researcher, is likely to have been driving the relationship between household contributions and the process of accumulating state capacity in a community organization. Secondly, household contributions are likely to have a persistent effect and current contributions may correlate with unobservable to the researcher contributions in the past that were used for the accumulation of state capacity.

The IV strategy, on the other hand, is based on the premise that the historical cohesion of the community does not drive the relationship between the presence of a community organization and household contributions through any other channel than the accumulated amount of state capacity exhibited by the community organization. An underlying part of the exclusion restriction is that the two geographic characteristics are associated with favourable conditions for the establishment of an illegal settlement. To give credence to these instruments, I provide a detailed institutional background supported by anecdotal evidence drawn from the anthropological literature. Furthermore, I provide empirical evidence to rule out two alternative explanations for the emergence of illegal settlements in Quito that could be plausible for these two geographic characteristics but would otherwise invalidate the identifying assumption.

A key result that sheds light on the main question posed in this paper is that the presence of a community organization predicts a 42 % and 122 % higher household time contributions to trash collection in public areas and to community patrolling respectively. Furthermore, informal tax systems are also associated with a broader 'tax base', indicated by a larger fraction of residents making positive contributions. The main results survive a variety of robustness checks, including inclusion of control variables. These controls are suggested to be associated with four alternative mechanisms that could potentially undermine the main results. In addition, I compare the estimates from the baseline 2SLS model to OLS and provide the results from several IV post-estimation tests.

This paper aims to contribute to the social capital literature (Alesina, Baqir and

Easterly (1999), Alesina, Baqir, and Hoxby (2004), Easterly and Levine (1997), Miguel and Gugerty (2005), Khwaja (2002), Baland and Platteau (1998) and Dayton-Johnson (2000)) that studies the relationship between cohesion and the provision of public goods.[2] A particular challenge in this literature is to establish the exogeneity of a heterogeneity measure. For instance, Alesina et al. (1999) try to address this by including fixed effects and all their controls, the effect of heterogeneity becomes insignificant or even positive. In this paper, I establish the causal link between cohesion and household contributions by claiming that the titling process has destroyed the historical cohesion of the community and such cohesion could only be manifested through the accumulated state capacity by a community organization.

This paper also emphasizes the crucial importance of the process of accumulating state capacity. It argues that the end result of this process helped a community organization sustain an informal taxation system, which relates this paper to recent work (Besley and Persson (2009, 2010), Vanden Eynde (2011), Olken and Singhal (2011)) on state capacity and informal taxation by highlighting the conditions required for inducing households to continue contributing to the organization. The idea that state capacity is accumulated over time is borrowed from Besley and Persson (2009, 2010) and extended to a grassroots organization. Consistent with the predictions of their model, I suggest that the presence of a common threat to all residents leads to accumulation of state capacity. Vanden Eynde (2011) who describes this process for a rebel group whose ability to 'tax' farmers depends on the size of its rebel force but the tax rate influences the occupational decision of an individual - whether to remain a farmer or to become a rebel. Finally, Olken and Singhal (2011) highlight the coordinating role of community leaders and public officials and the importance of social sanctions by other community members in sustaining an informal taxation system, while this paper suggests that the reliance on sanctions becomes rather centralized with the accumulation of state capacity.

Last but not least, the findings of this paper also bring together recent work on land reform and/or titling policies and research on local governance (Field (2004), Hammond

[2]For a comprehensive survey of the literature, see Banerjee, Iyer and Somanthan (2007).

(2008)). Hammond (2008) finds that property insecurity may emerge partly as customary institutions collapse in response to the implementation of a land reform granting individual titles to members of the community, in which they previously jointly owned the land. This is because formal institutions, including courts, lack the capacity to interpret the customary tradition, one if present could have provided a legal basis for the resolution of property rights disputes. In this paper, I argue that individual title individual titling does not necessarily imply that a community organization is more likely to be dissolved and its tax base to collapse if a community organization maintains an ability to impose binding decisions on *all* members of the community.

This paper is organized as follows. First, I discuss the institutional background of neighbourhood organizations in Quito, Ecuador. Second, I describe the data used in this study. Third, I discuss the empirical strategy. Fourth, I discuss the main findings and present key robustness checks. In the final section, I offer concluding remarks.

2 Institutional Setting

2.1 Origin of Quito community organizations

The existing legislation in Ecuador does not allow for governance structures at the neighbourhood level that have the ability to impose binding decisions on the residents of the community; instead, officials are appointed by the municipal government. An exception to this framework is present in some of Quito's neighbourhoods, in which grassroots community organizations had legal grounds to be registered as housing cooperatives. According to the Law and Regulation on Housing Cooperatives (LRHC), a housing cooperative has a governance structure with elected officials that is able impose binding decisions on its members, who for historical and legal reasons include *all* residents of the neighbourhood. The LRHC also specifies that the legal form of a housing cooperative could be adopted only in neighbourhoods formed as a result of subdividing agricultural land, where the assigned role to a housing cooperative is to purchase a piece of land on behalf of its members.

The presence of a housing cooperative as a community organization long after the formation of the neighbourhood, however, reveals historical traits of a former 'illegal' settlement.[3] This empirical regularity could be best understood in the context of the legal framework of a housing cooperative. In particular, the LRHC dictates that the objectives of a housing cooperative are threefold and must be completed in the following sequential order: (i) to purchase land on behalf of its members by obtaining a global title to the property; (ii) to distribute individual titles to its members; and (iii) to be dissolved upon the distribution of *all* individual titles to members of the housing cooperative. When taking these threefold objectives into account, legitimate suspicions are raised for the inability of a housing cooperative to complete the process of distributing all individual titles years after a neighbourhood has been formed.

Historically, the legal form of a housing cooperative has turned out to be the most common for the incorporation of agricultural land into the urban area of Quito. (Burgwal, 1995) On the supply side, sellers preferred dealing with a single buyer, while on the demand side, '...for the members the formation of a (pre-)cooperative[4] gave at least some sort of protection in their attempt to get a plot of their own...' (Burgwal, 1995). Secondly, for many low-income households '...subdivisions of agricultural land in the most peripheral zones of Quito were the only way of acquiring a house of their own...' They were both residents of Quito as well as migrants from other parts of Ecuador, the latter contributing to the rapid population growth that Quito experienced during the second half of the 20th century. (Burgwal, 1995).[5] One of the key implications has been a discrepancy between a rapidly growing population and affordable housing capable of accommodating the influx of predominantly low-income migrants. (Burgwal, 1995)

Finally, the legal tools available to a housing cooperative have been particularly useful for the purposes of a community organization throughout the life-cycle of an

[3] In the Quito context, a settlement that has formed as a result of the subdivision of agricultural land but has not received a license by the municipal government that acknowledges these subdivisions are deemed 'illegal'. (United Nations (2003))

[4] There is a legal distinction between a pre-cooperative and a cooperative in the LRHC with respect to the possession of a global title by the organization.

[5] During the period 1950-2001 Quito's population grew from 200,000 to 1.4 million. (UNHSP, 2003))

illegal settlement. In the early stages, the legal framework of a housing cooperative provided an (invading) community organization with a legal recognition to claim that the intention of the organization has been the purchase of the invaded land. But, ultimately, it is the intersection of all of the above factors that helps shed light on the reasons why a large number of illegal settlements were formed since the 1970s and also why housing cooperatives have played a dominant role in this process. (Burgwal, 1995) They also offer a plausible explanation why a housing cooperative is likely to be observed in neighbourhoods that are deemed 'illegal' by the government but not in those that have attained legal recognition by the government. Dosh (2010) suggests that the underlying reason may lie in the ability of an (invading) community organization to withstand two key challenges during its life-cycle.

2.2 Location of 'illegal' settlements - strategic considerations or limited geographic endowments

A useful analytical tool that puts a framework on these issues is a 'tree' diagram (figure X) provided by Dosh (2010) that describes the life-cycle of an invading organization[6] and captures key stylized facts of invading organizations in Peru and Ecuador. He identifies two main threats for the survivorship of an invading organization that emerge from this 'tree' diagram: the 'nascent stage' and 'the security trap'. The 'nascent stage' of an invading organization is characterized by lack of property security for the entire settlement, while the 'security trap' is associated with declining participation rates to community projects and in severe cases the collapse of the organization once property security has been attained.[7] Interestingly, community organizations have taken a range of active steps to successfully deal with either of these threats to the community organization.

There is considerable amount of anecdotal evidence pointing to the strategic considerations that have dominated the choice of a location for an illegal settlement in response

[6]Once a land invasions is successful and squatter settle into the area, the invading organization effectively becomes the community organization of the settlement.

[7]From a legal perspective, the 'nascent stage' and the 'security trap' occur *before* and *after* respectively an invading organization obtains the global title to the invaded property.

to the hostile towards illegal settlements climate in Quito. (Invading) community organizations, in order to register as housing cooperatives, sought land that was classified in official registers as agricultural. Such land had to meet two additional requirements to be deemed suitable for the formation of an illegal settlement: the piece of land would be sufficiently large in size to accommodate a large number of squatters and would also offer natural protection against a government eviction.[8] Jointly, these two additional factors provide ideal conditions suitable conditions to summon up a large group of settlers at just few key locations in the settlement that thus serve as an effective deterrent against eviction attempts.[9]

But an important empirical question is whether the geographic characteristics on which illegal settlements were settled were only driven by strategic considerations. An alternative explanation could be that the choice of location was merely imposed by the geographic characteristics of the available unsettled land at the time the illegal settlement was formed. In fact, a careful look at the geographic characteristics of the Guayllabamba valley, in which the city of Quito was built, provides no conclusive support for either hypothesis.

There are three main geographic characteristics of the Guayllabamba valley that need to be taken into consideration in order to refute either of these hypotheses. First, the territory of Guayllabamba valley has a flat floor (with a slope of less than 5 %) and is also surrounded by (steep) mountain slopes from all sides. Secondly, the area of the Guayllabamba valley could possibly be viewed as a fixed geographic area. A substantial fraction of this area was not incorporated into Quito in 1970 when starting illegal settlements sprawling through the valley. At the same time, due to the rapid expansion of the city most of the Guayllabamba valley was settled by the end of the 20 century. A careful examination of a Quito map from 1998 would reveal patches of

[8]Burgwal (1995) and Dosh (2010) generalize that (invading) community organizations are well aware that in the hostile towards illegal settlements environment they face it is a prerequisite to reach a settlement with the original owner and pay for the invaded land in order to achieve legal recognition. In this context, the intention of the invade-first-pay-later strategy most often has to do with pushing the price of the property below its market value.

[9]The increased probability of casualties in the event of a clash between police forces and the summoned squatters could be associated with an increased political cost.

agricultural land to still have not been incorporated into the city. Finally, in addition to being a fixed geographic area, the shape of the Guayllabamba valley severely limits the direction of possible expansion of Quito. The elongated on its North-South axis 'I'-shape of the Guyllabamba Valley imposes a North-South expansion of the city.[10]

The first key fact that the territory of Guayllabamba valley, which has a flat floor (with a slope of less than 5 %) and is also surrounded by (steep) mountain slopes from all sides is consistent with each of the two interpretations. Maps 4 and 5 strongly suggest that illegal settlements were formed on steeper terrain predominantly on the edges of the Guayllabamba valley. But it remains unclear whether strategic considerations dominated or simply the flat lands of the valley were already settled and steeper locations were only available. An argument in favour of the latter argument is that the Guayllabamba valley could be viewed as a fixed geographic area and it is possible that over time the flatter land of the valley was occupied first. It is plausible that illegal settlements had to be formed on steeper terrain because they were more recently formed. On the other hand, careful examination of historical Quito maps reveals that agricultural land with various characteristics (in terms of slope) could still have been settled even in 1998.[11] Nonetheless, the rapid expansion of the city since 1970 makes it difficult to assess how limited was the choice in front of a community organization.

Perhaps the best support for the strategic considerations hypothesis comes from the account of Burgwal (1995), in which he notes a peculiar feature in the process of illegal settlement formation. According to his account, the majority of illegal settlements chose to spread out on the very narrow East-West axis of the city, '... in this way spreading to the least accessible corners of the city, like hills and ravines...' (Burgwal (1995). He also points out that this expansion has run contrary to the physical configuration of the Guayllabamba valley, which imposes a North-South urban development. To further advance the argument of strategic considerations, it could be noted that Quito was founded by its Spanish conquerors in 1534 as a 'natural fortress' in a hostile Indian

[10]The Guayllabamba valley has a highly elongated North-South axis (about 40 km long) and a very narrow East-West axis (about 5 km at its widest).

[11]The Lanjouw-Levy dataset that is used in the empirical section of this paper was compiled in 1998.

countryside. (Minchom, 1994) The settlement that existed under the Incas on this location served a similar defensive function. (Minchom, 1994)

A careful examination of the cross-section of Quito neighbourhoods in 1998, when the dataset was compiled, also reveals that the choice to squat on steeper terrain is unlikely to have been driven by lack of agricultural land located on relatively flat terrain. Although most of the valley was already settled, there were numerous and still abundant in number patches of agricultural land.

Agricultural land, notably land amalgamated in sufficiently large haciendas to accommodate hundreds or thousands of settlers, was primarily available on the north and south ends of the Guayllabamba valley for historical reasons. Minchom (1994) advances the argument that Quito was built on difficult terrain near the midpoint of the Guayllabamba valley (on its North-South axis) to possibly preserve the flat lands of the valley to the North and to the South of the city for agricultural purposes. Over time, however, the Spanish colonizers discovered the benefits of the different ecological levels of the Guayllabamba valley, whose altitude ranges from approx. 2,600 m to 3,300 m, and grew complementary types of produce. According to a colonial description by Juan and Alloa (1748)[12] reported by Minchom (1994) there were several broad categories of produce distinguished by altitudinal level: '...at the higher altitudes, the "haciendas de Paramos" produced wheat, barley and potatoes; on the plains, maize production predominated; and at lower levels, sugar cane...' Juan and Alloa (1748) also commented on the density of haciendas in the rural hinterland, i.e. on the southern and northern edges, of the Guayllabamba valley. For the purposes of this paper, this colonial description provides a critical evidence that the haciendas formed on a wide range of terrain but, importantly, further away from the historical centre of Quito. Last but not least, the hacienda system that was inherited from the Spanish remained relatively unchanged with respect to the size of the agricultural entities and ownership rights (i.e. no redistributive land policies were initiated). (Key, 1974, Burgwal, 1995)

[12]The colonial description of Juan and Alloa is based on their visit to Quito and its surroundings in the 1730s. (Minchom,1994)

A second piece of evidence that could indirectly shed light on the credibility of the strategic considerations hypothesis is the extent to which the natural surroundings played a role in providing protection for Quito's illegal settlements against government eviction. There are three well-documented cases (the Cucho Hacienda, the Herrera Hacienda and the Condado Hacienda) by Burgwal (1995) and Dosh (2010) that illustrate the importance of the geographic position of illegal settlements in thwarting eviction attempts. What all these three cases have in common is that the organizers of the three invasions picked the location of their respective 'illegal' settlement after carefully screening and assessing the suitability of the natural endowments of each location. This careful selection is also suggested to have facilitated the prevention of actual eviction attempts. For instance, the ability of the Pisuli Housing Cooperative, which invaded the Cucho Hacienda, to mobilize a significant fraction of the 2,000 squatters at a single location that dissuaded a group of approximately 50 police officers from carrying on with the eviction attempt. (Dosh, 2010) This form of collective action, however, was effective because the settlement was surrounded by inaccessible ravines from all sides except for a single bridge that connected the 'illegal' settlement to the rest of the city.[13]

2.3 'Cohesion' of the community, accumulation of state capacity and reliance on legal tools

The second main threat to an invading organization is the period following the establishment of property security, when residents see a diminished benefit from contributing to community projects. (Dosh, 2010) To escape this trap, community organizations in Quito have relied on two critical factors: the accumulation of state capacity over an extended period of property insecurity and their reliance on the tools provided by the legal framework of a housing cooperative.

Community organizations are suggested to have not possessed state capacity at their disposal during the formation of an illegal settlement. As a matter of fact, the accumu-

[13]For the strategic considerations involved in invading and later protecting the areas of the Herrera Hacienda and the Condado Hacienda, see Burgwal (1995) and Dosh (2010) respectively.

lation of state capacity was an endogenous process that was heavily influenced by the hostile towards squatters environment. The critical factor for its accumulation, however, was not the presence of an eviction threat *per se* but rather *who* in the community was its target. In illegal settlements *all* residents were squatters, while in already established neighbourhoods squatting took place in a non-organized manner. Thus, the nature of squatting determined whether only individual members or the entire community would be subjected to an eviction threat.

In illegal settlements, *all* residents of the community faced the same threat of property insecurity and a common goal of preventing eviction. This lead to the formation of the so-called *historical cohesion* that was perhaps best manifested by the voluntary contribution of squatters' time and money to an organization that was able to provide protection to the entire community. But the necessity to be always prepared for an eviction attempt over an extended period of time[14] has accidentally contributed for the accumulation of state capacity, which allowed a community organization to coercively raise revenue from its members. This is particularly important for sustaining an informal tax system once property security is attained because '... now that settlers feel secure, they do not feel the need to contribute time and money [to the community organization]...' (Dosh (2010)).

What is the role of the legal form of a housing cooperative in evading the 'security trap'? The key to this answer is rooted in two sets of legal provisions: one that governs the titling process associated with the subdivision of agricultural land and another that provides the housing cooperative with a legal framework to impose binding decisions on its members. With respect to titling, a housing cooperative obtains a global title over the territory of the entire settlement based on direct negotiations of its elected leadership with the original owner. Once the housing cooperative obtains the global title, it enjoys exclusive control in establishing the process of allocating individual titles among its members. This feature of the titling process provides a housing cooperative with a key advantage over other invading organizations in avoiding the 'security trap' by

[14]Dosh (2010 suggests that the period of property insecurity would typically last for 10 – 15 years.

strategically choosing the timing of distributing individual titles as well the number of individual titles to be distributed. Anecdotal evidence (Burgwal, 1995 and Dosh, 2010) suggests that this strategic choice is well-exploited by the leadership of housing cooperatives in Quito who are frequently engaged in delaying (not uncommon indefinitely) the distribution of individual titles to (at least) some members of the community.[15] This paradoxical situation Dosh (2010) refers to as 'secure communities, insecure individuals'. What motivates these tactics by the leadership from the perspective of preserving the organization is a provision in the LRHC stating that a HC would normally be dissolved once the process of distributing the land titles is complete.[16]

What allows a housing cooperative to delay the distribution of individual titles are key provisions in the LRHC that entitle the organization with coercive tools that it can exercise once it has accumulated state capacity. More specifically, Articles 20 and 21 from the LRHC entitle the Executive Council and the General Membership to expel members of the housing cooperative from the organization and the community if they are deemed 'disloyal' to the organization. These provisions are suggested to have had a significant impact on a housing cooperative's ability to hold individual members, even title holders, accountable to the organization if they failed to fulfill the mandated contributions by the organization. Some of the punitive measures included fines and, in the event of repeated infractions, even expulsions from the cooperative and from the community.[17] (Burgwal, 1995 and Dosh, 2010)

[15]Dosh (2010) provides an example with the Pisuli Housing Cooperative, whose leader overtly refused to distribute individual titles to the members of the housing cooperative. Others have relied on less overt tactics and have simply waited for the property to be paid in full before an individual title is granted. Taking into account that a significant fraction of housing cooperative members are low-income households, it is not surprising some members have faced difficulty in fulfilling their financial obligations to the housing cooperative.

[16]Lanjouw and Levy (1998), who conducted the survey I use in this paper, point out that the leaders of invading organizations in Quito and Guayaquil were among those who resisted land titling programs extended to all individuals the most.

[17]What has historically curbed abusive behaviour from the leadership lies in another set of provisions stipulated in the LRHC (Articles 110, 205 and 206). These articles prescribe that in the case of electoral or financial irregularities a housing cooperative can be placed under a direct state supervision. A direct state supervision would include the replacement of the elected leadership with an appointed by the municipal government official(s). In this case, the role of the appointed official would include the sale of all vacant lots, the distribution of individual titles and the dissolution of the housing cooperative.

3 Data

This paper relies on cross-sectional household-level data from Quito, Ecuador collected by Lanjouw and Levy in 1998. Households are randomly sampled from each neighbourhood in the dataset, while neighbourhoods have been stratified according to their geographical location and the average income in the community. As a result, the dataset contains low-income neighbourhoods but is representative with respect to their geographic location in Quito. The dataset contains rich information on time contributions to specific public goods (e.g. trash collection in public areas, community patrolling), property rights arrangements, labour income, and demographic information as well as some aggregated indicators for the community, including the age of the community and the presence of a housing cooperative in it. In addition, I rely on government census data for neighbourhood-level characteristics such as the fraction of uncollected trash from each neighbourhood.

I have also collected geographic and historical data from various maps and atlases for 332 Quito neighbourhoods, which constitute almost the entire population of Quito neighbourhoods. First, I have mapped the exact location and boundaries of each neighbourhood from Ediguias (1998), the year in which the Lanjouw and Levy dataset was compiled. This information was used to extract information from topographic maps about the lowest and the highest altitudes of the location as well as the distance from the lowest to the highest altitude of the neighbourhood, necessary to calculate the slope of terrain for each neighbourhood. In addition, I have collected the geographical latitude of each neighbourhood as well as that of the Quito's historical centre from http://itouchmap.com/latlong.html. These variable are used to construct the latitude distance from each neighbourhood to the Quito's historical centre on its North-South axis. Finally, I have obtained data from the 1992 and the 2002 editions of Instituto Geográfico Militar (1992, 2002) that capture two additional characteristics of Quito neighbourhoods - their legal status and the year, in which they were founded.

4 Empirical Strategy

The baseline model is given by:

$$y_{is} = \beta_0 + \beta_1 d_s + \mathbf{x_{is}'}\boldsymbol{\gamma} + \varepsilon_{is}, \tag{1}$$

where $y_i s$ indicates either the time contributions to trash collection in public areas (roads, pathways, community gardens/parks and social halls) of household i in neighbourhood s or the time contributions to community patrolling of household i in neighbourhood s.[18,19] The endogenous regressor d_s is taking a value of 1 if the neighbourhood relies on the governance structure of a housing cooperative and 0, otherwise. The error term must satisfy $\mathbb{E}[\varepsilon_{is}|d_s, \mathbf{x_{is}}] = 0$ to yield unbiased estimates.

Estimating this model with OLS is likely to lead to biased estimates for two reasons. The error term is likely to include the unobservable to the researcher historical cohesion of the community based on the methodological arguments laid off in the institutional setting. A plausible concern is that the historical cohesion of the community could be driving both the size of household contributions and the accumulated amount of state capacity exhibited by the community organization. In addition to this issue, household contributions may have a persistent effect and current contributions correlate with unobservable to the researcher previous contributions that were used for the accumulation of state capacity.

These two concerns warrant the adoption of an IV empirical strategy for estimating the effect of a community organization on household contributions. This empirical strategy rests on the identifying assumption that the historical cohesion of the community

[18] Each dependent variable is constructed in two steps. First, I compute the total number of hours per month for trash collection (per year for community patrolling) for each household member aged 10 years or older. Then, I compute the average contributions per household member aged 10 years or older.

[19] I measure the dependent variable in per household member contributions instead of in total household contributions for the following reason: the informal taxation system, according to Burgwal (1995), that a housing cooperative is likely to rely on contributions from each community member above a certain age. Penalties, including files, are applied to non-contributing individuals rather than households. (Burgwal, 1995 and Dosh, 2010) In a historical context, a housing cooperative would rely on summoning up as many community members possible at key locations of the neighbourhood to curb an eviction attempt. (Burgwal, 1995 and Dosh, 2010)

influences household contributions only through the accumulated amount of state capacity. This assumption is based on an exclusion restriction that includes two instrumental variables: slope of terrain and the latitude distance from the historical centre of Quito. Each of these two geographic characteristics correlates with features that represent the strategic considerations of an (invading) community organizations in choosing a location for an illegal settlement. In the Dosh (2010) framework, slope of terrain is suggested to correlate with features that helped the community withstand the first trap of eviction attempts. Similarly, the latitude distance proxies for the availability of agricultural land, settling on which qualified the organization to register as a housing cooperative. The legal tools available to a housing cooperative are suggested to have helped the organization withstand the 'security trap' once property security to the community was attained.

Formally, the exclusion restriction is given by:

$$d_s = \gamma_0 + \gamma_1 z_{1s} + \gamma_2 z_{2s} + \upsilon_s, \tag{2}$$

where z_{1s} is the slope of terrain and z_{2s} the distance of neighbourhood s from the historical centre (on Quito's North - South axis). For the IV estimator to be consistent, the following conditions must hold: $\mathbb{E}[\upsilon_s|\mathbf{z_s}] = 0$ $\mathbb{E}[\mathbf{z_s}\varepsilon_{is}|d_s, \mathbf{x_{is}}] = 0$ and $\mathbb{E}[\mathbf{z_s}d_s|\mathbf{x_{is}}] \neq 0$.

Several comments are in order to establish the exogeneity of z_{1s} and z_{2s} by arguing that they are 'plausibly random'. For slope of terrain, I require that land of sufficient diversity (with respect to slope of terrain) was available at the time any neighbourhood was formed and it was strategic considerations of the housing cooperative that dominated the choice to settle on rugged terrain. For the latitude distance to the historical centre of Quito, two considerations are important. First, I assume that the historical centre of Quito in the XVI century by the Spanish Empire was established for reasons completely different from those that led to the sprawl of illegal settlements since the 1970s.[20] Secondly, I assume that the only reason for the formation of illegal settlements on agricultural land was the intention of (invading) community organizations to take

[20]Quito was founded by its Spanish conquerors in 1534 as a 'natural fortress' in hostile Indian countryside on an inaccessible site bounded by ravines. (Minchom, 1994)

advantage of the legal form of a housing cooperative. An important consideration that would allow these two geographic characteristics of illegal settlements to 'stand out' in terms of magnitudes from those of other neighbourhoods of Quito is rooted in the unique shape of the Guyllabamba valley that imposes a highly-restrictive expansion of the city.

5 Results

The first column in table 3 confirms that neighbourhoods located on more rugged terrain and further away from the historical centre of Quito, measured on its North-South axis, are positively associated with neighbourhoods, in which a housing cooperative is present. In both cases, the maginitudes of the coefficients are sizable enough to provide credence to the argument that the geographic characteristics of the housing cooperative neighbourhoods differ considerably from those of the other neighbourhoods and could be attached with a strategic considerations interpretation. To illustrate, a 10 degree increase in slope is associated with 26 % higher probability of observing a housing cooperative and, similarly, the 5-km equivalent of latitude distance with a 22 % higher probability. These results provide empirical support for the argument that housing cooperatives are likely to be observed in areas where agricultural land was present due to the legal requirements stated in the LRHC. Furthermore, the presence of housing cooperatives in neighbourhoods settled on more rugged terrain provides credence to the strategic considerations hypothesis, where the terrain served an important purpose in providing natural protection against government eviction. This interpretation is plausible under the assumption that the only reason for the presence of a housing cooperative years after the formation of the neighbourhood is a history of an illegal settlement. Importantly, the results from the first column of Table 3 are consistent with the methodological arguments put forward in section 2.

Table 5 presents the baseline results. The presence of a community organization has a positive and sizable causal effect on household time contributions to trash collection. This effect implies 50 % more time contributed (per household member) to trash col-

lections in public areas and 176 % respectively for community patrolling, suggested by the respective coefficients 5.36 and 7.11 of the endogenous regressor reported in Table 6. These results are particularly important because in both neighbourhood types a significant majority of residents possess an individual title, a factor that is being controlled for at the household level.

In a community of 3,000 residents, the implied differences in terms of aggregate contributions would be 16,080 hrs. committed to cleaning public areas a month. Similarly, the corresponding figure to community patrolling would be 2,430 hrs. In the context, that on average about 12 % of the trash in the community remains uncollected the size of these contributions is likely to generate a considerable impact on cleaning public areas.

In this respect, the first three columns of table 9 provide evidence that an increase in the average (per household member) contributions is associated with a considerable increase in the household who switch to using public areas for recreational purposes. For instance, the coefficient in column (4) indicates the following relationship: the second 5 hrs. contributed to trash collection are associated with 19 % more households using public areas for recreational purposes. A similar relationship is also observed in columns (4) - (6) from OLS, when the dependent variable is a continuous variable of the time spent in public areas. The results from Table 9 indicate that households place value in the provided public good indicated by the greater usage of cleaner areas.

5.1 Alternative Explanations for the Choice of Neighbourhood Locations

An underlying part of the identification assumption is that strategic considerations dominated over the choice of location that would be used for the formation of an illegal settlement. Although this assumption is not testable, I provide indirect empirical evidence in support of the strategic considerations hypothesis. For this purpose, I rule out alternative explanations that are consistent with the observed differences in neighbourhood's geographic characteristics.

5.1.1 Does a link strategic considerations - location of an illegal settlement - housing cooperative exist?

In section 2, I argued that the only plausible explanation for observing housing cooperatives years after the formation of a neighbourhood is a history of an illegal settlement. Consistent with the strategic considerations hypothesis, this would imply that the neighbourhoods, in which a housing cooperative is present, must have qualitatively similar geographic characteristics to those of neighbourhoods formed as illegal settlements. This relationship between housing cooperatives and illegal settlements could indirectly be tested by replacing the dependent variable in the first stage regression with the legal status of the neighbourhood at the time of its formation. Two indicators that could provide empirical support for this relationship include whether the sign of each first stage coefficient and its significance level is robust to the change in the dependent variable (from the presence of a housing cooperative to the status, legal vs. illegal, of the neighbourhood at the time of its formation. For this purpose, I use data from two samples: one for the 20 neighbourhoods in the main dataset that indicates whether a housing cooperative is present or not and another that includes virtually the entire population of Quito neighbourhoods.[21]

A comparison of the coefficients from the first column (dependent variable - housing cooperative) and the second column (dependent variable - neighbourhood's legal status) of Table 3 reveal identical in sign and very similar in magnitude statistically significant coefficients for each of the two regressors. These results are indicative that the geographic characteristics of the neighbourhoods, in which housing cooperatives are present, are representative for those Quito's illegal settlements. An important qualification, however, is in order: the illegal settlements that are likely to be recorded in the dataset are those

[21] Neighbourhoods are considered to have formed as illegal settlements if they are classified as either "without approval" or "in the process of approval" in either 1992 or 2002. The long period of recognition of illegal settlements suggested by Burgwal (1995) and Dosh (2010) reduces the likelihood that the sample of legally formed neighbourhoods would be severely contaminated by undetected illegal settlements. It is, however, possible that there is a selection bias in the subsample of illegal settlements. The illegal settlements that are likely to be recorded in the data must have successfully curbed at least an initial set of eviction attempts.

that have been successful at withstanding at least an initial set of eviction attempts. This form of selection bias, however, provides an additional credence to the strategic considerations hypothesis, in which the choice of location played an important role.

5.1.2 Gradual expansion on the North-South axis

One concern is that the location of illegal settlements further away from the historical centre of Quito may simply coincide with the fact that these neighbourhoods also happen to be more recently formed. The nature of this concern is that the geographic charecteristics of the Guyllabamba valley, which impose a *gradual* expansion on the North-South axis of the valley, may be driving this relationship. At the same time, Burgwal (1995) noted that Quito's illegal settlements were formed on the least accessible areas on the narrow East-West axis but further away from the historical centre of Quito, possibly due to strategic considerations. To reconcile at least in part these two alternative hypotheses, I test for the gradual expansion hypothesis by tracing the relationship between the latitude distance from the historical centre of Quito (North - South axis) and the age of each neighbourhood.

The first column of Table 4 reveals that such empirical relationship between the latitude distance from the historical centre and the age of the community indeed exists. But breaking down the sample into legal and illegal neighbourhoods based on their status at the time they were formed, reveals surprisingly different trends. While the subsample of legal neighbourhoods reveals a strong relationship between the variables in question (reported in the second column), no clear pattern could be established for illegal settlements (reported in the third column). These results provide strong evidence against the gradual expansion hypothesis for illegal settlements. But a remaining question is to what extent do these results provide support for Burgwal's hypothesis. The shape of the Guyllabamba valley severely restricts the possible expansion of Quito and for this reason there are few (if any) plausible alternative explanations other than Burgwal's that could be offered.[22]

[22]The very narrow East-West axis of the Guyllabamba valley makes it difficult to use longitudinal

An underlying reason for observing different patterns for the two types of neighbourhoods could be that the subsample of legal neighbourhoods traces a long-term relationship over a period of over 400 years, while that of illegal neighbourhoods a short-term relationship over a period of about 30 years.[23,24] To provide comparable results, I only include in the sample only neighbourhoods formed since 1970. This restriction notably leaves the already uncovered trends unchanged (reported in columns 4, 5 and 6 of Table 4).[25]

5.1.3 Availability of land with specific characteristics

The identifying assumption is also based on the premise that land of different characteristics was available and the decision to form illegal settlements on relatively rugged terrain was based on strategic considerations. One concern is that the flatter agricultural land may have been settled earlier and illegal settlements were driven into relatively inaccessible locations. This argument is fuelled by the attached interpretation to the geographic restrictions imposed by the Guyallabama valley, whose geographic area could be viewed as fixed. In addition, illegal settlements are among the youngest neighbourhoods of Quito that are by default forced to settle on 'leftover locations' in the valley. One possible way of shedding light on this issue is by testing the hypothesis whether over time neighbourhoods were settling on more rugged terrain. As a robustness check this test could also be performed for the subsamples of legal and illegal neighbourhoods.

Table 5 reveals that a statistically significant relationship can not be observed between the slope of terrain and the neighbourhood age either for the entire sample or for the subsamples restricted to neighbourhood type (legal vs. illegal) or to a specific time period (1970 - 2002) or to both criteria. These results indicate that, despite the geographic restrictions of the Guyallabamba valley, there was no detectable pressure on

data to trace expansion on the East-West axis. This is in part because the Guyllabamba valley expands in a slight northwestern or in a slight northeastern angle at various latitudes.

[23] As noted earlier, illegal settlements took place in the period since the 1970s.

[24] From a statistical standpoint, there is a possibility that the neighbourhoods formed before the XX century are influential outliers.

[25] I have access to approximate dates of neighbourhood formation: 1760, 1888, 1921, 1943, 1955, 1971, 1983, 1987, and 2002. Source: Instituto Geográfico Militar (2002), also reported in www.zonu.com.

either legal or illegal settlements to settle on a relatively flatter or more rugged terrain as greater area of the valley was getting settled over time.

5.1.4 Revanchist motives of indigenous groups

I also assumed that the dominant reason for the formation of illegal settlements on agricultural land was to the ability of a community organization of an illegal settlement to be legally qualified to register as a housing cooperative. This assumption requires that there was no process that could have driven both the sprawl of illegal settlements during the period since the 1970s and the formation of haciendas on the North and South edges of Guyllabamba valley during the colonial era. The formation of haciendas in Quito during the colonial era, however, was associated with the *illegal* and violent dispossession of indigenous lands that could have driven revanchist motives among indigenous groups. Munchom (1994) describes the enforced contraction on Indian grazing rights by haciendas as a 'brutal process' that was ineffectively resisted by the Indian communities. He provides evidence that violent dispossession in the Guyllabamba Valley was also common and was tacitly assisted by the Spanish authorities. In addition, some major landowners acted without waiting for formal rights and counted on tacit acceptance of their illegal enclosures.[26]

The formation of haciendas during the colonial era and the organized land invasions since the 1970s bear resemblance with respect to the tactics of illegal dispossession. In addition, the reliance of tacit acceptance of the new status quo is common to both processes. But to argue whether revanchist motives are indeed present, I rely on anecdotal

[26]The hacienda system, according to Kay (1974), evolved out of two closely linked processes: enserfdom of the indigenous population and expropriation of their lands. For historical reasons, by the end of the seventeenth century, according to Kay (1974) landlords found it in their interest to settle modest tenants on their large estates. These tenants had to pay a few services when required and recognize the property rights over the estate of the landlord; they became attached to the land and increased its value as they were sold together with it. The main method of recruiting labour in the hacienda system became the expropriation of community peasant land. Kay (1974) reports a CIDA report, according to which '... a class of predial dependents was established under a variety of institutional forms. The essential condition for creating such a class was to deprive a whole sector of the rural population of access to the land and its resources...', i.e. any viable alternative livelihood. Many of the peasants from these communities were hired as seasonal wage labourers. Over time, the hacienda enterprise gradually moved away from serfdom-based tenancy arrangements to increasingly relying on pure wage labourers.

evidence about the composition of the squatters, the political affiliation of their leaders and the historical context since the independence of Ecuador from the Spanish Empire in reverse order.

First, it is difficult to defend why revanchist motives would surface so long after Ecuador had gained independence in 1830. Furthermore, the period since World War II is not associated with any regime change in Ecuador that could possibly provide a plausible link that the formation of illegal settlements was driven by historical revanchist motives of indigenous groups who would demand back the land expropriated from their ancestors during the colonial era. Secondly, the anecdotal evidence provided by Burgwal (1995) and Dosh (2010) suggests that any political involvement of politicians in the formation of illegal settlements was likely to be associated with labour unions and/or left-of-centre political parties. The views of political organizations of such 'colour' are more likely to have redistributive motives *per se* than those of restoring property rights to an earlier state.[27] Last but not least, according to the anecdotal evidence provided by Burgwal (1995) and Dosh (2010) squatters of indigenous descent were unlikely to be the dominant group in illegal settlements. Furthermore, a significant fraction of the squatters were migrants from other part of Ecuador, a fact that makes it difficult to establish a link that the squatters were demanding the land of their family ancestors.

5.2 Alternative Mechanisms - Baseline Results

Table 6 suggests that the main results are consistent with the anecdotal evidence presented in section 2. These results, however, rely on the premise that the community cohesion at the time of settlement drives household contribution through no other channel than the accumulated state capacity by a community organization. This subsection addresses the extent to which alternative mechanisms can explain the observed patterns. Perhaps the largest threat that could invalidate these results comes from the possibility

[27]For instance, the leader of the LDLP Housing Cooperative who initiated the land invasion of the Herrera hacienda was a union leader from the Ecuadorian Union Confederation of Class Organizations (CEDOC). The LDLP Housing Cooperative also received parliamentary support from the Popular Socialist Party in settling the dispute over the property rights of the Herrera hacienda. (Burgwal, 1995)

that there are remnants of the community cohesion of former illegal settlements that may not have been destroyed during the titling process. I consider three plausible channels through which any remnants of community cohesion may be driving the relationship between the state capacity of the community organization and the household contributions to local public goods. In addition, I also propose alternative mechanisms that explore the role of the demand for public goods.

5.2.1 Selection of Households with Different Characteristics

There could be underlying differences between the socioeconomic characteristics of residents living in neighbourhoods that differ with respect to the presence of a housing cooperative. These differences could be in part attributable to the selection process of settling into neighbourhoods with different characteristics. For instance, it is natural to hypothesize that squatters to this day are likely to constitute a larger fraction of the population in former illegal settlements than in other neighbourhoods. In part, relative to other residents of Quito squatters are more likely to be wealth-constrained and low-income, otherwise be unable to own a home of their own. Consistent with the theoretical public economics literature (Bergstrom, Blume and Varian, 1986), these characteristics of squatters would imply that they are more likely to have a lower opportunity cost of time and are thus likely to contribute more of their time to community projects. Furthermore, it is also more likely that squatters have more skewed political views on the right-left spectrum, which could be deduced from two empirical facts: the lack of respect for private property rights and the organized nature of squatting. Such behaviour would not be surprising to be correlated with stronger preferences for engaging in various forms of collective action, including community projects. In addition to these considerations, it is also possible that other socio-economic differences, for instance in family size or age, to be also observed. Some reasons could include that some neighbourhoods are more family-oriented or they tend to attract residents of specific age group.

To address these concerns, I am able to directly control for household characteristics such as income, age or family size. The benefit of including these controls is that

they serve a dual purpose in the absence of indicators that could measure households' political preferences or voting behaviour. Based on empirical studies on economic voting , these socio-demographic characteristics are suggested to be strong predictors of voting behaviour on the right-left political spectrum. The political economy literature also suggests that low-income, younger households with larger families are more likely to vote for political parties left of the centre.

[References needed.]

5.2.2 History of Individual Property Rights

It is also plausible that residents with different history of formality may exhibit different behavior with respect to contributing to local public goods. For instance, members who lacked a title for a longer part of their residency in the community may more closely associate the role of the community organization with the provision of local public goods to the community. This argument is based on the findings of Banerjee and Iyer (2005) who study the long-term impact of being assigned a particular land revenue collection system by the British colonial rulers in India. To argue that this channel does invalidate the baseline results, I rely on a continuous variables indicating the time spent as an informal resident as a fraction of the total time resided in the community.[28],[29] Its inclusion in the baseline regression leaves the results unaffected. This result provides an important piece of evidence that titling *per se* need not imply lower contributions of community members to local public goods. In fact, this result provides empirical support to one of the main arguments raised by Dosh (2010) that the institutional features of Quito organizations helped prevent the collapse in contributions that were observed in Peruvian former illegal settlements once titling policies were implemented.[30]

[28] A value of "1" indicates that the household was legally residing on this property since their settlement; a value of "0" indicates that the household does not have a legal document that allows them to reside in the property at the time they were surveyed intermediate values indicate residents who obtained a legal document that allows them to reside in the property at a point in time after they settled on this address.

[29] Two alternative controls include two binary variable indicating whether the household (i) possesses a title at the time they were surveyed and also (ii) whether they possessed a title at the time of settlement.

[30] Field (2004) provides empirical support for the collapse in contributions that took place in the Peruvian illegal settlements as a result of a major titling policy.

5.2.3 Titling and Institutionalized Social Capital

Last but not least, there is a possibility of different degrees of heterogeneity across communities even if the average characteristics of a number of socio-economic characteristics are comparable. The social capital literature (Alesina, Baqir and Easterly (1999), Alesina, Baqir, and Hoxby (2004), Easterly and Levine (1997)) suggests that greater within-community heterogeneity, which proxies for lower levels of cohesion, negatively influences public good outcomes. Some forms of heterogenety could, for instance, have been an accidental by-product of the selection process of household settling into neighbourhoods with different characteristics and reflected in indicators of income inequality, for instance.

The most significant threat to the identification assumption could, however, be that any titling process may have institutionalized remnants of the historical cohesion of the community instead of destroying them. Such concern is plausible because the period, in which cohesion among the community is likely to have been the strongest, has coincided with the distribution of plots among the squatters, the process that has shaped the within-community land inequality. A similar concern could be raised with an invading organization's choice to settle on agricultural land capable of accommodating a relatively large population, whose size was a contributing factor for thwarting eviction attempts. In fact, descriptive statistics reveal that the current population is larger in neighbourhoods, where a housing cooperative is present. Furthermore, the experimental literature on voluntary contributions (Issac and Walker (1988)) suggests that such concern could be legitimate because a larger population size has a negative effect on voluntary contributions.[31]

I address the issue of a neighbourhood population size by directly controlling for it. I face, however, some limitations in addressing adequately the remaining concerns as I have no access to measures of income and wealth inequality at the neighbourhood level.

[31] Such relationship may be somewhat more difficult to establish when contributions are suggested to a large extent to be coerced. Nonetheless, this result could still have an effect on a subset of the households who voluntarily contribute more relative to any minimum contributions that a housing cooperative may impose.

I am partly able to go around these limitations by constructing such indicators from the sample of households surveyed in each neighbourhood, although I acknowledge that due to the small number of sampled households such indicators may be subject to a significant measurement error.

5.2.4 Demand for Public Services

In addition to ruling out the possibility that cohesion may be driving the results through alternative channels, it is also important to investigate the possibility that the results may be driven by inherent differences in the demand for public goods. One particular concern is that the government may provide less public services to poorer neighbourhoods. In support of this claim, UNHSP (2003) provides evidence that it is a general trend in the developing world less affluent neighbourhoods to receive less services from the government. It addition, it argues that there could be an additional bias towards illegal settlements, which may not be serviceable by the government due to the lack of legal recognition. A similar concern relates to quantifying the public space in the community that needs to be cleaned.

There are several indicators at my disposal that allow me to argue that these effects are unlikely to undermine the main results. I proxy for the demand for trash collection by controlling for the fraction of uncollected trash by the municipal government at the neighbourhood level[32] and whether most of a household's trash is collected by the municipal government. With respect to the second concern, I introduce fixed effects indicating whether residents have access to a community garden/park, a social hall, both of them or neither of them. The corresponding public space to the response 'neither of them' includes roads and pathways. I acknowledge that one limitation of this control variable is that it crudely quantifies public space in part because the variable is binary in nature. Furthermore, its qualitative measurement does not well correspond to the continuous nature of the dependent variable.

There are two additional concerns, for which unfortunately I am unable to provide

[32] I rely on government census data from 1995.

direct empirical evidence. To argue that these factors are unlikely to undermine the main results, I rely on the findings of other studies as well as the anecdotal evidence provided in section 2. A plausible explanation why residents might have an incentive to spend more time collecting trash could be found in the monetary value that could be extracted from recyclable materials. 'Scavenger' behaviour, where predominantly low-income households in developing countries spend a considerable amount of time collecting recyclable materials for a living, is commonly observed in developing countries. Hernández et al. (1999), who conduct a survey on voluntary recycling in low-income neighbourhoods of Quito, find that most residents consider the only real "waste" to be products that cannot generate value to the household. In this respect, it appears unlikely that garbage collection as stated in the Lanjouw Levy survey question would have been commonly associated with the collection of recyclable materials.[33]

Last but not least, it is possible that a steeper terrain may require more time spent to collect a unit of trash *ceteris paribus*. This implies that steeper terrain, which was the technology that was used to transform household contributions into protection, continues to have a similar effect on a different public good in the present. If this hypothesis can find some empirical support, it would clearly invalidate the identifying assumption. Two main arguments from the institutional setting could be readily applied and counter-argue such claims. The steeper terrain is only associated with the boundaries of the settlements, which takes the form of steep hills or ravines. Furthermore, housing cooperatives have settled on agricultural land, which suggests that such land is arable. It appears physically implausible that land with an average slope of approximately 20 % could have been used to grow marketable crops. The likely shape of these farms or haciendas was the size of relatively small valleys located on mostly relatively flat terrain but surrounded by very steep terrain from several sides. (See Figure 7 for illustration.)

The main factor that could motivate more community patrolling are crime-related issues. Some limited evidence of two types of crime, murders and break-ins, suggests that

[33]The exact wording of the question is: 'In the last month, how much time did you spend gathering garbage in public areas? (Roads or pathways, parks, fields, community center or social hall)'

they do not appear to be driving the relationship between state capacity and household contributions. Regrettably, I cannot directly test for crime-preventative measures by the government but based on the remarkably similar rates of uncollected trash across the two types of neighbourhoods, I can extrapolate that such measures are also likely to be comparable in these two communities.

5.3 Robustness Checks

As a robustness check of the main specification, I investigate the sensitivity of the main results to the choice of the econometric model. Alongside the baseline 2SLS estimates, I present OLS estimates.Their comparison reveals that the sign of the OLS estimates are consistent with those of all IV models' estimates. The magnitudes of the OLS estimates are comparable to those of the IV models' estimates, although they are somewhat lower for the regressions.

I can also investigate the validity of the suggested mechanism in this paper by using overidentification tests. According to the methodological arguments advanced in this paper, each of the two geographic characteristics was associated with different aspects of the strategic considerations of a community organization in the process of choosing a suitable location for the formation of an illegal settlement. In this context, an overidentification test based on the Sargan statistic could have the following interpretation under the null and the alternative hypothesis:

$$H_o : \text{no strategic considerations dominate in selecting a location} \tag{3}$$

$$H_A : \text{some strategic considerations dominate in selecting a location} \tag{4}$$

The overidentifying restrictions implied by the approach in this paper is never rejected. The p-values of the Sargan test, and related results, are reported in Table 8 and 9 for contributions to trash collection in public areas and to community patrolling respectively. These results together with the suggested interpretation of strategic con-

siderations provide me with additional confidence that in this paper I estimate the effect of community organization's state capacity on current household contributions (i.e., not capturing the effect of some other variable correlated with the neighbourhood's geographic characteristics).

For completeness, in Table 8 and 9 I report the p-value from the appropriate χ^2 overidentification test. This test never rejects, except when the dependent variable is contributions to community patrolling in the absence of controls (at 5 % level). This result suggests that cannot provide with a high degree of certainty evidence that there is no additional effect working through variable other than state capacity on household contributions.

Other post-estimation tests include some first-stage results. I report the R^2 and the Partial R^2 whose values are reasonably high. I also report the first-stage F-test, whose values provide evidence that the bias of key coeffcient is likely very small (less than 1 %).

Finally, there is a concern that the standard errors of the key baseline regression might be inconsistently estimated for two reasons. First, there is an 'excess zero problem' associated with the large number of households, 37 % (79 %) of the sample, not contributing to trash collection in public areas (community patrolling) observed in the data. To address this issue, I use heteroskedastic robust standard errors. Secondly, the use of a different number of observations in the first and the second stage, according to Karaca-Mandic et al. (2003), could lead to a severe underestimation of the standard errors. One indicator suggesting that such concern is unlikely unwarranted is the estimation of the baseline regression at the neighbourhood level in both the first and the second stages.

6 Discussion

The results of this paper confirm that housing cooperatives are observed in locations that share similar geographic characteristics with neighbourhoods of Quito that were

formed as illegal settlements. This empirical regularity provides additional credence to the advanced argument that the only plausible explanation for observing a housing cooperative in a neighbourhood formed years earlier must be rooted in its history of a former illegal settlement. Facing a hostile towards illegal settlements environment, (invading) community organization are suggested to have thoroughly screened locations that would meet two criteria: (i) rugged terrain that would offer natural protection against government eviction; and (ii) agricultural land that would qualify the organization to be registered as a housing cooperative.

For historical reasons rooted in the colonial past of Quito, haciendas were formed on the north and south ends but not in the central part of the Guyllabamba valley. At the same time economic considerations later in the colonial period were suggested to have led to the formation of haciendas in different ecological zones of the valley. Exploiting the advantages offered by the diversity of ecological zones in the valley meant that haciendas were formed at different altitudes on both flat and rugged terrain. Finally, the preservation of the hacienda system into modern day Ecuador relatively intact effectively pinpointed the geographic characteristics that would be screened for by (invading) community organizations.

Each of the two geographic characteristics, slope of terrain and latitude distance from the historical centre of Quito, were suggested to correlate with characteristics that helped a community organizations effectively avoid the two traps suggested by Dosh (2010). In particular, rugged terrain provided the community with natural protection by making it possible to summon up a large number of squatters at key locations. Burgwal (1995) and Dosh (2010) provide anecdotal evidence that making use of the natural surroundings of an illegal settlement helped curb eviction attempts more effectively. Similarly, settling on agricultural land was essential in order for a community organization to register as a housing cooperative. The legal framework of a housing cooperative was argued to have served a number of important purposes but its most significant role was probably associated with the legal provisions that helped an organization withstand the security trap. The legal ability to impose binding decisions, further facilitated by accumulated

state capacity, created ideal conditions for an organization to coerce its members into contributing to community projects.

The anecdotal evidence provided by Burgwal (1995) and Dosh (2010) not only indicates that the location of an illegal settlement was *ex post* important for a community organization but also that the characteristics of such location were carefully screened well in advance of a land invasion. This overall context provides greater credibility to the strategic considerations hypothesis for the choice of location, on which the null and the alternative hypotheses of the Sargan test were based. A major impediment to such interpretation attached to the Sargan test could have lied in the geographic shape of the Guyllabamba valley, which imposes a highly-restrictive expansion of Quito and could also have driven the choice of location for an illegal settlement. To rule out such interpretation, I provided empirical evidence that the choice to settle on rugged terrain cannot be traced to limited availability of relatively flat locations. In addition, I provided indirect empirical evidence in support of Burgwal's hypothesis that illegal settlements were formed on the most inaccessible areas on the East-West axis of the Guyllabamba valley despite that the shape of the valley dictated expansion on its North-South axis.

The common threat faced by all residents of illegal settlements generated a different set of institutions from those in the legally established neighbourhoods, where predominantly non-organized individuals chose to squat. While non-organized squatters had to fend for themselves, their organized counterparts faced a strong incentive to join their efforts in preventing a government eviction of the entire community. The cohesion among squatters in illegal settlements resulted in trusting the community organization for the provision of protection to the community. This common goal of squatters in illegal settlements was manifested by the voluntary contribution of their time and money to this organization. Importantly, these contributions served a dual purpose: they were indeed used for the provision of local public goods but they also resulted in the gradual accumulation of state capacity by the community organization. The accumulated over an extended period of time state capacity implied that the organization had the ability to coercively raise revenue from its members once individual property security was

established.

The baseline results presented in this paper rest on the outlined mechanism of transforming cohesion into state capacity. The main premise of the empirical strategy was that no other mechanism drove the relationship between the presence of a community organization and household contributions to local public goods. The fact that the same mechanism was supported for two public goods, trash collection in public areas and community patrolling, suggests that the results that unlikely to be accidental.

Furthermore, I provide both empirical and anecdotal evidence, albeit imperfect, to argue that the baseline results are unlikely to have been driven by plausible alternative mechanisms. Based on the this evidence, I can claim with greater confidence that the results were not driven by any of the following mechanisms: (i) selection of households into neighbourhods with different characteristics; (ii) informal history; (iii) remnants of the community cohesion at the time of neighbourhood formation that were institutionalized during the titling process; (iv) demand for public goods.

The paper also sheds some light on the link between the raised contributions and the provision of local public goods. There is indirect empirical evidence that could be suggestive that more contributions likely translated into a greater amount of public goods provided. With respect to trash collection, the provided empirical evidence suggests that greater recreational use was associated with more input in maintaining public areas. Similarly, more time patrolling the community is associated with a lower fraction of robbed houses. These results, however, must be interpreted with cautions because the observed relationships may be driven by a range of unobserved to the researcher processes. Nonetheless, a key advantage of time contributions, at least in comparison to, monetary contributions is that they are harder to be misappropriated and put into alternative use.

7 Conclusion

Many economists and social scientists believe that social capital has an important effect on public good outcomes. A major challenge in this literature is finding an exogenous measure of heterogeneity that could establish a causal mechanism between the variables in question. To overcome this challenge, this paper takes an innovative approach by looking at social capital that was argued to have been abruptly destroyed for historical and legal reasons. The main premise of the analysis in this paper was that the destroyed cohesion of a former illegal settlement affects household contributions only through the accumulated amount of state capacity by the community organization. I argued that this mechanism was rooted in the historical past of a neighbourhood when all residents of an illegal settlement shared a common goal of voluntarily contributing their time and money to an organization able to provide protection against government eviction. But the dual use of these voluntary contributions for the provision of public goods and the accumulation of state capacity provided a community organization with tools to coercively raise revenue from the residents of the community. Once individual security was attained for a considerable fraction of the population, the community organizations resorted to the use of coercive tools in sustaining contributions for community projects

In this paper, I traced the so-called 'destroyed social capital' to the strategic considerations of (invading) community organization in picking a location for an illegal settlement. These considerations I argued correlated with a neighbourhood's geographic characteristics, which community organizations were argued to have carefully screened. The reason that these characteristics of illegal settlements would stand out from those of other Quito neighbourhoods is rooted in the unique shape of the Guyllabamba valley that imposes a highly-restrictive expansion of the city.

The empirical results, which are robust to the inclusion of a variety of controls and fixed effects, provide considerable support for the suggested mechanism. These findings could have important implications for community governance strategies and titling policies. A first set of policies could aim to introduce reforms that codify existing practices

of grassroots (organic) organizations that have historical roots of illegal settlements or in communitarian-owned land. These policies are suggested to remove the incentives of grassroots organizations to seek maintaining the status-quo of not well-defined individual property rights. Similarly, titling policies may need to be implemented with more caution to prevent collapsing provision of existing forms of public goods provision. This is particularly important because the areas that lack legal recognition are in general among those that received the least amount of public goods. (UNHSP, 2003)

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Appendix

A.1. Maps

Figure 1: **Maps of Quito: Population Growth (left) and Illegal Settlements (Right)**

urban growth.png

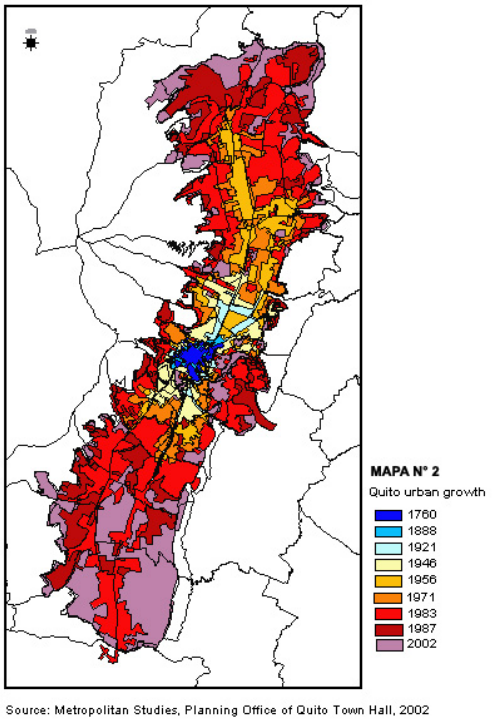

Figure 2: Quito Urban Growth 1700 - 2002

illegal settlements.png

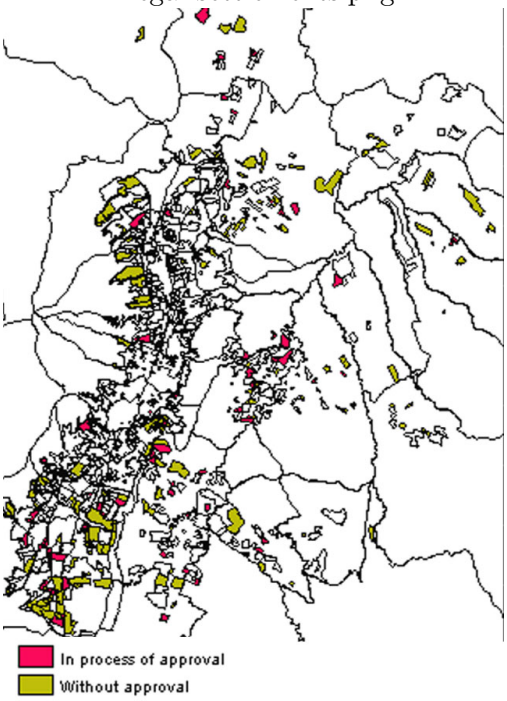

Figure 3: Quito Illegal Settlements 1992

Figure 4: **Maps of Quito: Population Growth (left) and Terrain (Right)**

urban growth.png

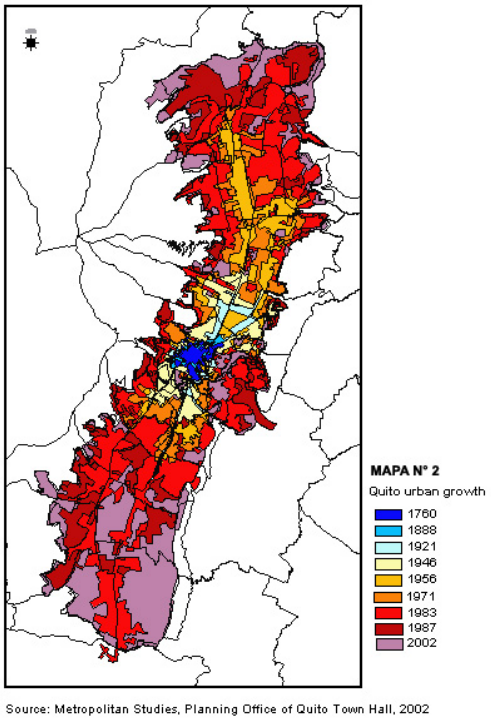

Figure 5: Quito Urban Growth 1700 - 2002

terrain.png

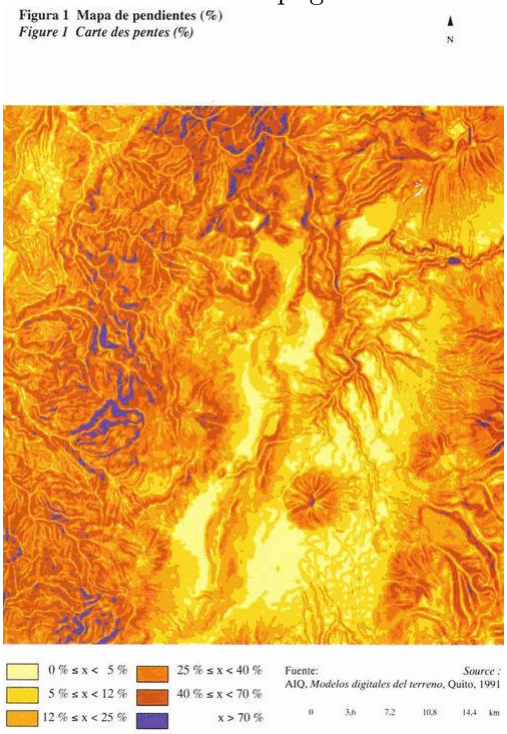

Figure 6: Terrain of Quito and Its Surroundings

Figure 7: **A Quito Illegal Settlement whose Boundaries Offer Natural Protection**

protection.png

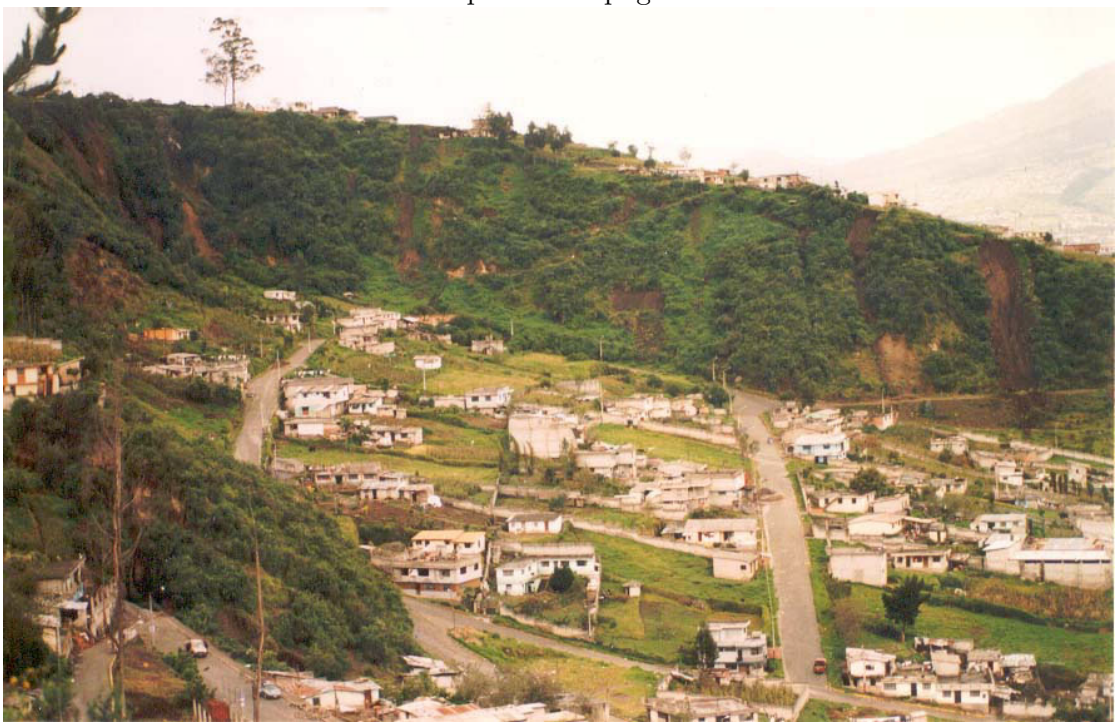

Figure 8: **Life-cycle of a Community Organization**

lifecycle.pdf

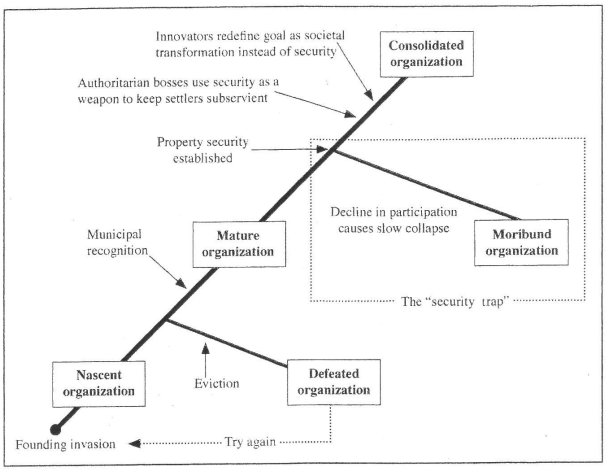

Fig. 1.3 Stages of development and the security trap

A.2. Tables

Table 1: **Descriptive Statistics**

	Housing Coop: Yes	**Housing Coop: No**	**Difference**
	Panel A		
Contributions to trash collection (per household member/month)	17.2 hrs.	10.7 hrs.	6.55*** (1.09)
Contributions to patrolling (per household member/year)	8.97 hrs	4.02 hrs.	4.95*** (0.87)
	Panel B		
Uncollected trash (by government)	13.3%	11.6 %	1.69*** (0.35)
Titled households	66 %	73 %	6.96*** (2.42)
Murders (per 1,000 residents)	4.93	4.21	0.73 (0.53)
Income (monthly)	2,724	2,803	79.03 (146.35)
Plot size (sq. meters)	138.4	215.4	77.00** (27.95)
Plot size inequality (stdev)	80,871	92,186	11,315 (7,563)
Avg. resident age	33.01	34.95	1.94*** (0.52)
Household size	5.11	5.32	0.20* (0.12)
Community size	3,495	3,059	436.32*** (125.25)

Notes: See text for a detailed data description. Panel A includes observations for 400 households in 1998. Household data is cross-sectional survey data collected by Lanjouw and Levy (1998). Panel B includes observations for 20 low-income neighbourhoods in Quito, Ecuador. Neighbourhood level data is from Lanjouw and Levy (1998). Uncollected trash is from the 1995 government census data. Panel C includes neighbourhood geographic data for slope of terrain and the latitude distance from the Quito's historical centre.

Table 2: **Descriptive Statistics**

	Neighbourhood - Illegal (status at time of formation)	**Neighbourhood - Legal (status at time of formation)**
Slope of terrain	0.225	0.141
Latitude distance (from Quito's historical centre)	0.083 (≈ 15.4 km)	0.060 (≈ 11.1 km)
N	73	255
	Housing Cooperative - Yes	**Housing Cooperative - No**
Slope of terrain	0.195	0.146
Latitude distance (from Quito's historical centre)	0.079 (≈ 14.6 km)	0.053 (≈ 9.8 km)
N	7	13

The geographic characteristics of neighbourhoods are collected from various maps and atlases of Quito.

Table 3: **Presence of a Neighbourhood Organization (Housing Cooperative)**

	Housing Cooperative (Yes = 1, No = 0)	**Illegal Settlement (Yes = 1, No = 0)**
Slope of terrain	3.552***	2.388***
	(0.320)	(0.519)
Distance from Centre (North-South Axis)	10.08***	9.80***
	(0.92)	(2.11)
Estimation	Probit	Probit
Data	In Sample	Out of Sample
R^2	9.26 %	11.41 %
N	20	332

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The coefficients from the Probit regression (left column) imply the following relationships: a 10 degree increase in slope is associated with 26 % higher probability of observing a housing cooperative (illegal settlement) and, similarly, the 5-km equivalent of latitude distance with a 22 % higher probability.

Table 4: **Gradual vs. Non-gradual Expansion of Quito (on elongated North - South Axis)**

	Distance from Centre (North - South Axis)					
Age of community	-0.303***	-0.253***	-0.403	-0.558**	-0.644**	-0.074
	(0.068)	(0.069)	(0.394)	(0.237)	(0.276)	(0.441)
Neighbourhood type (at time of formation)	All	Legal	Illegal	All	Legal	Illegal
Period	1760-2002	1760-2002	1760-2002	1970-2002	1970-2002	1970-2002
Estimation	OLS	OLS	OLS	OLS	OLS	OLS
N	328	255	73	263	192	71

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 5: **Availability of Rugged/Flat Land over Time**

	Slope of terrain					
Age of community	0.012	-0.001	0.035	0.000	0.036	0.010
	(0.176)	(0.176)	(0.026)	(0.001)	(0.025)	(0.020)
Neighbourhood type (at time of formation)	All	Legal	Illegal	All	Legal	Illegal
Period	1760-2002	1760-2002	1760-2002	1970-2002	1970-2002	1970-2002
Estimation	OLS	OLS	OLS	OLS	OLS	OLS
N	328	255	73	263	192	71

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.

Table 6: **Baseline Results - 2SLS Estimation**

	Time Contributions to Trash Collection (Hours/Month)	**Time Contributions to Community Patrolling (Hours/Year)**
Cooperative (Yes = 1, No = 0)	**5.36*** (2.10)**	**7.11*** (1.77)**
Panel A:		
History of title holder	-0.014*** (0.003)	0.0035 (0.0023)
log(Labour income)	-1.53** (0.52)	0.75*** (0.26)
Household size	0.08 (0.23)	0.54*** (0.19)
Avg. household age	0.23*** (0.07)	-0.01 (0.04)
ln(Population)	-3.48*** (0.66)	-1.94*** (0.66)
Plot size inequality (stdev)	8.18 (5.39)	-4.86 (3.04)
Panel B:		
Uncollected trash (by government)	-1.35 (8.52)	
Access to gov't collection (Yes = 1, No = 0)	8.76*** (1.42)	
Murder rate (per 1000 residents)		0.06 (0.06)

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.
The left columns also includes fixed effects that quantify the amount of public space.
History of title holder is a continuous variable that measures the fraction of a household's residence in the community during which they had a legal right to occupy the property.

Table 7: **Baseline Results - Robustness Checks**

	Time Contributions to Trash Collection in Public Areas (Hours Past Month)					
Panel A	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Cooperative	7.82***	5.90***	5.02***	6.12***	5.36***	7.44***
(Yes = 1, No = 0)	(2.47)	(1.14)	(2.52)	(1.18)	(2.10)	(1.18)
Fixed Effects	No	No	Yes	Yes	Yes	Yes
Controls	No	No	No	No	Yes	Yes
N	388	388	388	388	388	388
Estimation	2SLS	OLS	2SLS	OLS	2SLS	OLS
Panel B	**Post-estimation Tests (2SLS)**					
Sargan test (p-value)	0.3868		0.7265		0.2389	
χ^2 test (p-value)	0.5425		0.6667		0.2033	
F-test (1st stage)	222.37		354.58		432.15	
Adjusted R^2	29.21%		27.54%		37.79%	
Partial R^2	18.84 %		21.88%		28.93%	

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.
In Panel A, the 2SLS results are compared against OLS. In Panel B, several 2SLS post-estimation results are reported, including the p-values for two overidentification tests (Sargan test and χ^2 test). The Sargan test suggests that there were at least some strategic considerations

Table 8: **Baseline Results - Robustness Checks 2**

	Time Contributions to Community Patrolling (Hours/Year)			
Panel A	(1)	(2)	(3)	(4)
Cooperative	8.33***	4.95***	7.11***	5.25***
(Yes = 1, No = 0)	(1.98)	(0.98)	(1.77)	(1.04)
Controls	No	No	Yes	Yes
N	396	396	396	396
Estimation	2SLS	OLS	2SLS	OLS
Panel B	**Post-estimation Tests (2SLS)**			
Sargan test (p-value)	0.7083		0.4585	
χ^2 test (p-value)	0.0245		0.2009	
F-test (1st stage)	816.97		338.175	
R^2	19.33 %		26.54 %	
Partial R^2	19.33 %		21.93 %	

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.
In Panel A, the 2SLS results are compared against OLS. In Panel B, several 2SLS post-estimation results are reported, including the p-values for two overidentification tests (Sargan test and χ^2 test). The Sargan test suggests that there were at least some strategic considerations

Table 9: **Relationship between Contributions to Maintaining vs. Use of Public Areas**

	Recreational Use of Public Areas (Past Month)					
	Binary: Yes = 1, No = 0			**Total Hours Spent**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Avg contributions	0.146***	0.140***	0.192***	4.27***	6.55***	3.39**
	(0.042)	(0.042)	(0.045)	(1.76)	(1.12)	(1.61)
Fixed Effects	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
N	388	388	388	388	388	388
Estimation	Probit	Probit	Probit	OLS	OLS	OLS

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
The coefficient in column (1) indicates the following relationship: the second 5 hrs. contributed to trash collection are associated with 19 % more households using public areas for recreational purposes.

Table 10: **Robustness Check: Inherent Differences over Maintaining Areas Clean**

	Time spent collecting trash on own property (per household member/past month)		
Variable	**(1)**	**(2)**	**(3)**
Cooperative	-10.39**	-8.06*	-0.82
(Yes = 1, No = 0)	(4.58)	(4.75)	(4.65)
Controls	No	No	Yes
Fixed effects	No	Yes	Yes
N	397	397	397
Estimation	OLS	OLS	OLS

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.