ANOTHER PATH? THE CONSOLIDATION OF INFORMAL SETTLEMENTS IN BUENOS AIRES THROUGH THE CO-PRODUCTION OF SERVICES

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DECLARATION

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

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ABSTRACT

This thesis investigates the issue of co-production; that is, the joint provision of services involving residents, the local government and private providers. Co-production is a commonly used approach to facilitate access to basic services in informal settlements in the developing world. But, rigorous micro-econometric evaluation of its causal effects is rare. This study uses a 'natural experiment', possible due to strict technical reasons involved in the provision of gas energy to informal neighbourhoods in the Buenos Aires Metropolitan Area, to estimate the effects on the social and physical dimension of residents' investments. Estimates are created at three co-production stages: an initial social interaction stage to introduce the service; the connection stage, and; an impact stage several years after programme completion. The research measures effect on housing improvements, participatory involvement associated with the internalisation of benefits, and suggests the presence of collective capacity for furthering collaborative efforts. The latter can be associated with the significant improvement in the residents' reported trust in neighbourhood organisations at the different implementation stages. Importantly, the research measures residual effects by legal tenure conditions. Co-production has contributed to an incremental effect only for informal residents' reported level of trust in the local public sector. Trust in the family, rather than generalised trust, appears as a significant residual effect of the intervention that is positively correlated with the undertaking of housing improvements.

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I hope that this thesis will be a step, however modest, towards building knowledge on informal neighbouhoods' consolidation. If I have succeded in making such step I owe thanks to a number of people who encourage me and offered all their support.

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ACRONYMS

BAMA	Buenos Aires Metropolitan Area
BAMR	Buenos Aires Metropolitan Region
BUyF	Barrios de Union y Futuro (United Neighbourhoods for the Future)
CBO	Community Based Organisation
CO	Comunidad Organizada (Organised Community)
CPSI	Co-Produced services Intervention
DPUPBA	Direccion Provincial de Urbanismo, Provincia de Buenos Aires (Buenos Aires Province Urbanism Superior Direction Office)
ENARGAS	Ente Nacional Regulador del Gas (National Regulation Entity for Gas)
EPH	Encuesta Pemanente de Hogares (Pemanent Household Survey)
FPVS	Fundación Pro Vivienda Social (Foundation for Social Housing)
FRS	Fideicomiso Redes Solidarias (Solidarity Networks Fund)
GBA	Great Buenos Aires
GRO	Grassroots Organisations
GSS	General Social Survey
IDB	Inter American Development Bank
IPMH	Indice de Privacion Material del Hogar (Household Material Deprivation Index)
IDUAR	Instituto de Desarrollo Urbano y Ambiental Regional (Urban,
INDEC	Environmental and Regional Development Institute)
	Instituto Nacional de Estadisticas y Censos (National Institute of Statistics and Census)
LAC	Latin American Countries
LAPOP	Latin American Public Opinion Project (Proyecto de Opinión Pública de América)
	Ministerio de Planificacion Federal y Servicios Publicos (Ministry of Federal Planning, Investment and Public Services)
MDI	Material Deprivation Index
MPFIySP	Ministerio de Planificacion Federal, Inversion y Servicios Publicos (Ministry of Federal Planning, Investment and Public Services)
MVCyS	Ministerio de Vivienda, Construcción y Saneamiento de Peru (Ministry of Housing, Construction and Sanitation) of Peru
NBO	Neighbourhood based organisation
NDO	Neighbourhood Development Observatory (Observatorio de Desarrollo Barrial)
NGO	Non-Governmental Organisation
NSE	Secretaria Nacional de Energia
NUA	Union de Vecinos en Acción (Neighbours Union in Action)
OC	Organised Community (Comunidad Organizada)
OECD	Organisation For Economic Cooperation and Development
PRIM	Primavera Neighbourhoods
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

1. INTRODUCTION

I became interested in the issue of informal land development and the process of settlement consolidation more than a decade ago. At that time, my motivation was not much concerned with mainstream policies, since in countries such as Argentina most housing policies fostered by the State have focused on addressing the quantitative side of the housing deficit through the construction of new housing units (Di Virgilio, 2012). The important and persistent demand for improvements to neighbourhoods, public service provision and the qualitative deficit of the housing stock remained largely neglected. Furthermore, in the context of concerns with urban informality, there has only been sporadic attention to programmes that have aimed at regularising settlements formed through invasions on public land, and which have consistently failed to gain scale on the vast areas of privately owned land developed and sold informally to the low-income population (Clichevsky, 2002).[1] From both a research and policy viewpoint acquiring a better understanding of the process of informal settlement consolidation constitutes long-standing need in academia and beyond.

The relevance of informal neighbourhood consolidation is important from a number of different perspectives. First, and most vital, it has direct effects on residents' quality of life. Second, it takes into consideration that a guided effort to support a sustainable consolidation of these settlements - now located in the intermediate rings of Buenos Aires Metropolitan Area (BAMA) - can mitigate the low density extension through informal land occupancy by leap-frog development (Clichevsky, 2012).[2] The present pattern of growth increases the costs of

1 Land legally owned by the initial developer that was illegally developed, not conforming to planning subdivision law, land use zoning and infrastructure requirements.

2 BAMA configuration is defined by the City of Buenos Aires and two surrounding rings of municipalities. The first ring is the more populated - 4,726,311 inhabitants - and 3,839,726 inhabitants live in the second. A third ring is included when Buenos Aires Metropolitan Region (BAMR) is identified as a functional entity that does not enjoy any political power as a single administrative jurisdiction (Pirez, 2002). That ring has significant population growth and 804,095 inhabitants (INDEC, 2001). Population density gradient decreases from the city centre to the municipalities of the outer rings.

infrastructure extension and the distributive impact on accessibility (including time and transportation costs), access to services and job opportunities. Settlement consolidation may contribute to improve urban efficiency.[3]

Despite their scale, informal settlements have been largely ignored in the urban policy agenda in Argentina.[4] Once I realised the extent of the limited understanding combined with the lack of rigorous empirical information on these settlements, attention to these neighbourhoods became the base of my academic work. At the beginning of 2006, I set up the Neighbourhood Development Observatory (NDO) to collect and process robust, systematic information about these settlements that could contribute to informing and improving both public and private decision-making. This activity was intended to overcome one of the main limitations faced by researchers; namely the lack of information about areas of informal urbanisation and the inexistence of rigorous assessments of those interventions that do occasionally and inconsistently target them. I hoped that having these data and studies could help improve decisions that concern urban policy (Arnott, 2008: 27). The NDO covers the area delimited by several municipalities in the second BAMA ring, an area characterised by a fragile social conditions and a need for improvements to living conditions in terms of quality of housing and basic infrastructure, amongst other deficiencies.

Even though one of the principal limitations faced by informal settlements in BAMA is their lack of public services, the privatisation of public utilities in Argentina since 1993[5], has reinforced the perception that the private sector, especially profit-seeking institutions, cannot play a role in providing services to the poorest

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3 Quantitative evidence on the patterns of urban extension from 1990 to 2000 based on Landstat satellite imagery (Goytia and Pasquini, 2012) indicates that less than 30 percent of average territorial growth in Argentinean municipalities was due to infill, while 65 percent was due to urban extension, and the rest corresponds to leapfrog development.

4 The Latin American Housing Network (LAHN) is currently addressing this issue conducting studies in different countries. http://www.lahn.utexas.org/

5 The State Reform Act (N° 23696/1989) allowed the National State to implement an extensive programme of privatizations of the public companies, which included the state monopoly of natural gas and water distribution. The provincial public sector accompanied this process and granted in concession to the private sector the electricity distribution company, as well as the water and sewerage services of the of Buenos Aires.

segments of the population. The emphasis on market-led policies of these programmes that fostered the "modernisation" of the legal and institutional framework were motivated in the efficiency of markets (Bromley, 1990), stressing the benefits of market mechanisms and private property rights to solve conflicts over the use of scarce resources (Kessides, 2005: 95). Market-supporting institutions are enabled by changes in urban policy that includes decentralisation, privatisation of utilities, and deregulation of markets, as well as the greater attention paid to property rights (Jones, 2003; Jones and Ward, 1998). Indeed, since the mid-1980s, the importance of enabling markets – removing the impediments for the smooth action of the market – has been emphasised, while there has been little discussion of housing policy and infrastructure provision as a redistributive tool (Arnott, 2008). Indeed, the social dimension of utility provision under a private system was not considered in depth during discussions of regulatory framework reform (Foster et al., 2003). Rather, the process of utilities privatisation was encouraged on the basis of fiscal considerations together with the need to improve the efficiency and quality of the services. Besides the informal legal status of the house or plot, the absence of information regarding expenditure patterns, living conditions, resident preferences, served to increase the perception that these neighbourhoods represented high commercial risks in the provision of services.

As markets failed to get organised the only solution to service deficits was a reliance on public sector intervention. Nevertheless, in Argentina, as with many Latin American countries, the public sector has failed to provide services to this segment of the population. The reasons often cited are the absence of evidence of legal ownership that is a mandatory requirement for connection (ERSI, 1993), budget constraints (Galiani et al, 2009), a lack of managerial skills (Paladino and Blas, 2005b), poor intergovernmental coordination, especially following decentralisation (Acuña, 1994; Cetrángolo and Jiménez, 2004; Pirez, 2002), and a lack of political will. Thus, neither the private sector nor the State ends up facilitating access to services for these residents.

Gaining access to a networked service, such as a piped gas supply, which forms the central case of my research, may be extremely attractive for residents in informal

neighbourhoods since they often end up paying more for services compared with residents of formal urban areas (Galiani et al, 2009; UN-Habitat, 2006). In short, as De Soto pointed out, informality has its costs (1989: 155). Paying these higher prices may be an indication that these households have both the resources and the willingness to pay for networked public services that provide benefits in quality of life and cost savings, especially when infrastructure programmes are designed according to their financial needs. Importantly, even the poorest households in the most informal and marginal settlements, such as Villa Inflamable (Flammable City) complain about the costs of substitute goods, in the case of piped natural gas this would be the gas tank that is significantly more expensive (Auyero and Swistun, 2008: 124).

There are a number of important characteristics of public goods and services acquisition in informal neighbourhoods. First, most services cannot be obtained through progressive individual efforts. Second, a networked service cannot be obtained individually in the marketplace.[6] Thus, the consolidation stage where (networked) services are extended and connected requires public sector determination and support, and/or private utilities motivated to serve the lower income families. In addition, some degree of resident coordination is generally needed. This coordination – or collective action – may be undertaken in the form of bargaining strategy to gain attention or resources from the State or it may well be channelled to project implementation to drive down management costs – mitigating against these is the need for individual household negotiations – or to reduce installation costs through labour contributions. In many cases, programme delivery requires a participatory channel through which logistic and governance issues are framed (Joshi and Moore, 2004).

For households the benefits may include reduced costs with economies of scale, avoiding moral hazard of providers striking deals with some households, streets or communities, that are detrimental to others, and oversight of contracts and quality of work. In some cases, non-governmental organisations (NGOs), community-based

[6] Mitlin (2004: 342) calls this an “individualized (or household) market-based strategy“, as opposed to “collective self-help”, “dependency-based strategies”, or “social movements”.

organisations (CBOs) and other local organisations might back household organisation in order to dissipate the aversion risks experienced by private firms (McLeod and Mullard, 2006). At their best, these efforts to 'co-produce' services build or enhance innovative institutional arrangements that may further aid infrastructure provision, management (including affordability) and on-going governance (Almansi, 2010; Hardoy et. al., 2005).

My research interests motivated consideration of how the co-production of a normally expensive service can enhance delivery, provide savings to households, for example through the substitution of an expensive and less effective service, and thereby operate as an incentive to programme enrolment as well as deliver measurable household and neighbourhood effects. The service scheme at the centre of my research is the extension of natural gas supply to an area of low-income neighbourhoods. Residents are obliged to contribute to the financing of the scheme by means of savings generated through the substitution of energy supply. Importantly, what the research shows is that such internalisation of savings constitutes a greater motivation for resident investments in physical and social improvements that extend beyond a rigid capitalisation view prompted by formal legal title incentives, as savings internalisation applies to residents that hold both formal and informal rights to property.

2. CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS

The main questions guiding my research concern the two dimensions of individual investments, the physical and the social. Considering the first, I argue that capitalisation through savings generated by the substitution of services constitutes a significant determinant for enrolment in the co-production programme, while spillover effects on non-participants provide incentives to improve their housing. The second dimension, initially, was a consideration of how social capital affects service acquisition and settlement consolidation. However, having observed the ambiguities surrounding definitions and uses of social capital (Dasgupta, 2009a;

Durlauf, 2002; Portes and Landolt, 2000), I decided to focus on two constitutive elements. Thus, for the purposes of my research social capital is unbundled into participatory involvement in a programme or other collective action, and the role of trust (generalised and particularised) to the building of collective capacity. The examination of trust is an especially original aspect of my research. In considering it, I intend the research to investigate the role and importance of an informal institution to the process and effects of settlement consolidation. Trust should operate as an incentive to physical investment.

The research analysed the causal effects of co-production through means of a natural experiment. While experimental treatments in social science research are complex, I used a situation that was likely to mimic random assignment to a co-production intervention due to the technical nature of gas network grid extension. The different stages of programme implementation allowed the research to define the treatment and control groups and test the hypothesis of effects at three different stages: 1) the social interaction stage, 2) the service connection to the house and 3) the residual effect of the programme after the service had 'bedded in'. The research design assumes and measures how trust, through reciprocity or experience, takes time to develop.

2.1. PHYSICAL DIMENSION EFFECTS

The academic controversy on whether and how legal or tenure security incentives induce physical investment effects prompts my consideration of whether connection to the gas network assisted housing investments. Conceptually, we might hypothesise that the process operates through capitalising savings from service substitution in the case of participants (those who signed up to the programme) or by neighbourhood effects for non-participants. The complicating factor for the field research is the extent to which tenure and legality are associated with programme involvement.

At this point it is necessary to describe the incremental process of housing construction that characterises occupancy in Buenos Aires neighbourhoods. It starts

with the acquisition of a plot developed by informal developers, usually at the urban periphery and paid for through monthly instalments (Clichevsky, 2000, 2002). For most neighbourhoods there is a mixture of tenure conditions, although most of the residents, including those that have no legal rights, enjoy de facto tenure security. After the acquisition of a plot without services, the house is built progressively, to help spread the investment costs. Once a core unit is built, the house can be enlarged and upgraded. Another unit might be added for other household members or for rent, with the strategy to balance savings and needs of housing transformation through time (Ferguson and Navarrete, 2003; Ward, 2012c; and Di Virgilio el al., 2012, for Buenos Aires).

There is no consensus among academics on the sources and intensity of this progressive investment in house construction and improvements. Under the property rights approach, the process is associated with the possession of legal rights to property (De Soto, 2000). But, tenure security is considered by others to be more complex, incorporating perceived (De Souza, 2001) and psychological (Van Gelder, 2009) security. Such views can favour the process of investment even when legal rights are not present, so long as rights are defined and enforceable (Migot-Adholla et al., 1991). A crucial element to these positions is the presence or promise of services that provide a valuable incentive to investment, either with the potential to accelerate decisions to investment and/or to raise the sum invested (Strassman, 1984). In turn, it is argued, services reinforce feelings of security of tenure. As expressed by Arnott, 2008 the provision of infrastructure services to an informal neighbourhood gives it “quasi-legal status” (2008: 31).

Many researchers, however, have expressed caution about the security to investment relationship. They note, for example, that residents require resources for investment desires to be executed (Varley, 1987). A particular line of research has considered whether and how appropriate finance mechanisms might assist the incremental housing process and lower housing final costs (Datta and Jones, 2000; Ferguson and Smets, 2009). Consequently, it is feasible to hypothesise that, added to the possibilities made available by a networked source of energy the savings introduced by the substitution of more expensive service sources by natural

pipelined gas can contribute to accelerate the incremental housing process. Aligned with previous views from Strassman (1984), I argue that the provision of services in informal commercial settlements is central to the incremental process that has characterised the dynamic of settlement consolidation through time.

The contribution of this study is to assess the particular effects on those connected as well as the existence of spillover effects on those that do not enrol in the programme. The empirical part of this study asks: Does the energy co-production intervention have an effect on housing investment? Is this an incentive effect provided by the connection to the service for those residents that have received the service connection? Or, is there a spillover effect on non-adherents as well? Measuring these processes is difficult. Service provision provides households with use values that might be capitalised in perceptions of house value, but the energy cost savings might provide resources for investment, and services might provide actual or perceived sense of security. Conversely, tenure may not be a limit to investment if rights are secure and enforceable, while the age of the house or its physical permanence can be relevant for the likelihood and number of changes undertaken. Nevertheless, those people that enrol in the service programme may not be the only ones that invest in the housing unit. Through neighbourhood effects the availability of a networked service may provide positive externalities, driving incentives for housing investment for non-participants, even if their savings through substitution do not offset the costs of enrolment.

Finally, the study seeks to elaborate upon whether, how and to what extent investment is associated with involvement in co-production. Does enrolment influence the likelihood, number and extent of housing improvements? Are these effects discernible from direct involvement in the programme or due to a wider generation of trust between neighbours, an indirect effect of their participation? Specifically, I enquire on the association between trust and housing investment and on the dimensions of trust that count on people's investments prompted by intervention.

2.2. SOCIAL DIMENSION EFFECTS

2.2.1. PARTICIPATORY EFFORTS

Community participation in informal settlements has been widely studied in developing world cities. A fuller review will be undertaken later in the thesis. For now, it is necessary to identify a couple of important points. First, the level of participation has been found to be low in most circumstances and to decrease once services are obtained (Gilbert and Ward, 1984b). The expectation, therefore, is that participation will fall significantly after programme implementation; with implications for service infrastructure maintenance, if relevant, and sustainability of trust. Second, the expected marginal return from active involvement - either during the implementation or finance phases of an intervention – may not offset costs (Gilbert and Ward, 1984b; Portes and Walton, 1976). Thus, participation may be necessary, indeed a requirement, of a programme but it may be neither time nor cost effective for households with precarious livelihoods.

In the case examined in this research, the infrastructure programme is co-produced and is based on resident interaction and participation. Moreover, exogenous changes in social interactions driven by the programme have an economic motivation related to the requirement that solidarity contributes to finance the extension and connection to the grid. In order to get the pipeline and individual connections, a minimum number of residents must be enrolled within each block. Through what is called the “social infrastructure” of resident and neighbourhood organisations, people are encouraged to become active subjects at different stages of programme organisation and financing (FPVS, 2013).

Co-production, therefore, implies a different form and degree of resident involvement among people with a genuine interest in neighbourhood improvement (Abers, 1998; Almansi et al., 2010; Bovaird, 2007; Mitlin, 2008). In this process, community organisations and NGOs are central to channel resident demands that facilitate operative relations with State institutions and other organisations in order to satisfy local service demands, allowing for the development of a means through which residents in low-income neighbourhoods may interact —and even

negotiate— outside of clientelistic relations (Mitlin, 2008). Thus, the scope for individual and collective efforts through the neighbourhood consolidation ladder is presented with new demands for house upgrading, retrofitting infrastructure (Ward et al., 2011b) and provision of urban facilities (*equipamiento urbano*).

This study provides evidence that the participation in organisations and activities aimed at improving settlements, the enrolment in a co-production programme to obtain public services and the willingness to collaborate in further neighbourhood-enhancing activities is associated with the internalisation of the benefits provided by them. Since residents have the possibility of choosing their levels of investment in community-enhancing or community-neutral social capital, factors that encourage individuals to internalise general welfare will increase investment in community-enhancing social capital. Homeownership induces this internalisation since the home is an asset the value of which is tied to the improvements of the neighbourhood.[7] Importantly, once they acquire and consolidate a home, this is the most important financial legacy from one generation to the next. Not only is housing the main asset for most residents but its progressive construction constitutes a fundamental mode of wealth formation during the course of generations. The house represents more than use value or an asset for future sale but in countries with weak pension systems, such as Argentina, it serves as security for old age, and a hedge to cope with unemployment or illness (Ward et al. 2011b; World Bank, 2007b).

This means that the participation in community-enhancing activities will increase as far as the investment costs required (e.g. in time and coordination with others), are inferior to long-term benefits. Yet, tenure or legal status of the housing unit should provide differentiated investment payoffs for participation. The empirical part of this study answers the following questions: Does a co-production scheme for the delivery of infrastructure services – such as gas - have an effect in driving participatory efforts of residents in informal commercial settlements? Are these collaborative efforts sustained over time or do they cease once the service has

[7] This effects of homeownership has guided the provision of subsidies in formal housing markets as elicitor of social capital externalities (Arnott, 2008).

been obtained? Is there any effect of co-production intervention in eliciting a "collective capacity" seeking to further participatory involvement in neighbourhood consolidation efforts? Is this capacity affected by resident's tenure condition and contextual effects of neighbourhood heterogeneity?

2.2.2. TRUST

The research is interested in the notion of trust for two reasons. First, many academics believe that trust is a central feature that determines investment behaviour. Considered a "social virtue" by Fukuyama (1995), it facilitates economic transactions (Arrow, 1969, 1972), encourages economic development (Arrow, 1972; Dasgupta, 2009b) and complex transactions (Fukuyama, 1995) or affects the rate of investments (Zak and Knack, 2001). Second, development practitioners and academics from Argentina have argued that shared committed efforts through resident involvement in informal neighbourhoods may be able to elicit what is called "generalised trust" (Paladino and Blas, 2005a, 2007; Zavalia Lagos,2005). Nevertheless, we do not know with much certainty how trust is built, nor to what extent the different dimensions of trust (generalised or particularised) might be prompted by exogenous factors such as social interactions.

The conceptualisation of trust adopted in this study is based on the rational choice strategic type that prevails in most economic studies (Dasgupta, 2009a). It can be based on familiarity (Alesina and La Ferrara, 2002) and experience (Hardin, 2006). From the literature, three considerations emerge that frame an understanding of how trust is relevant as an outcome when new social interactions purposely oriented to achieve networked service provision are brought about. First, through cross sector collaboration, new "invited spaces" may be created (see Cornwall, 2008). These spaces "bridge" diverse sectors such as the municipal local government, utility firms and residents. Second, the intervention requirement of purposeful socialisation to build agreements within neighbourhood blocks, with other residents and neighbourhood organisations, that take on management and consultation on issues of day to day co-production activities. Third, family

enrolment decisions and sharing of family responsibilities demanded as part of intervention conditions. The last two are expected to affect what Sahlins (1974) called “diffused” reciprocity that links family members.

The differentiated intervention stages of programme implementation create different determinants for trust that can be empirically tested. First, expectations induced before the programme started. Second, new forms of familiarity/reciprocity elicited among all intervening parties and the service connection attainment driven by association. Based on these considerations, the study addresses a number of questions that focus on the process of eliciting trust through an exogenous change in social interactions. Does the intervention have an effect in eliciting generalised trust? What dimensions of trust are affected, if any, by programme implementation? Is trust conditioned by tenure directly, are households with secure/legal tenure more trusting, more trustworthy, or is there no tenure influence?

The research aimed to demonstrate what dimensions of trust can be associated with physical investment in informal settlements. It, therefore, tackles an informality literature that dealt with the effects on housing investment exclusively in relation with formal institutions, particularly property rights. My motivation was to assess whether the trust elicited through the new spaces generated by the intervention might allow improved information and a decrease in transaction costs that might affect housing investment. The building of trust may have an effect on housing improvements. The social capital “standard” explanation associates generalised trust to investments. Nevertheless, other dimensions of trust, including trust in the municipality, neighbours and the family, may be more relevant at a time when residents undertake a decision for housing transformation.

3. THE PARTICIPATORY MODEL FOR CO-PRODUCING SERVICES

During the two past decades, governments and firms have been looking for innovative ways to meet challenges in the provision of public services, involving

residents and social organisations (Brandsen and Pestoff, 2006). Based on these considerations co-production has been relevant when budget limitations and/or a lack of coordination among diverse public bodies have constrained the public provision of services (Ostrom, 1996). These new arrangements consist of the contributions from the state, citizens and local organisations, together with the private sector. There is something in common in all these arrangements: residents are not just "user/clients" and "passive receptors" of the services, but are now encouraged to have an active role in the production of public goods and services that have an effect on them (Ostrom, 1996: 1073).

The co-produced programme called "Redes Solidarias" (Solidarity Networks) was implemented in the locality of Cuartel V, Moreno, in the BAMA, to provide access to low-income households living in informal neighbourhoods to the gas network. It was based on a novel co-produced institutional logistic. The private company that managed the concession for natural gas services worked together with an NGO, Fundación Pro Vivienda Social (Foundation for Social Housing; FPVS), in cooperation with the local municipality, neighbourhood organisations, including residents of the target neighbourhoods. As stated by the main NGO in charge of the overall management of the co-production scheme, "The working approach of the FPVS is based on a scheme of communitarian participation designed to overcome coordination problems between demand and supply, and simultaneously, build social capital" (FPVS, 2011:3).

According to the co-production for services intervention (CPSI), the financial plans (up to five years) and the amount of each instalment are both adapted to each household's capacity to save and repay. The programme established that households connected to the new service would pay a monthly amount approximately equal to the previous monthly expenses so that the income generated in excess of the cost of new gas service is used to finance the capital expenditures of the network expansion. The cost for each household is calculated on the assumption of a high level of participation. That is intended to propitiate joint efforts aimed at increasing enrolment. Importantly, by bringing more households into the scheme, the average cost that each participant will have to

confront is reduced. Nevertheless, as a risk of default is present, the programme put in place a team of residents to help deal with payment interruption.

The co-production approach also differs from conventional mechanisms to gain access to services in other ways. Under conventional conditions, works are carried out under "the public interest", payment is compulsory and involvement requires legal ownership and use of the property as collateral for debt.[8] The public sector in such circumstances will issue certificates of debt that may be charged, even against those who have not signed the agreement for the gas connection, since the involvement of 60 percent of potential beneficiaries allows a scheme to claim "public convenience and obligatory payment". Furthermore, finance is granted to those who have proven income only (which means formal workers), and repayment usually starts early and often before service connection.

In contrast, in the case of the CPSI, lack of collateral is substituted in two different ways, based on household and neighbours solidarity. This means that the access to the service does not require residents to hold a property title, but relies upon agreement among peers and the household or family. The members of the family are involved in the decision to enrol and every member of adult age signs an agreement under the law to become a co-guarantor.[9] What is relevant to underscore is that the debt is owed by individuals and is not attached to real property. Furthermore, proof of income is obtained through labour references, which stresses the relevance of social networks in addition to their function as safety nets.

Importantly, a financial trust, Fideicomiso Redes Solidarias (The Solidarity Network Trust, FRS), is set up as a collective guarantee for the payments. It is a contract which unites beneficiaries, administrators and creditors, and covers eventual breaches in resident repayment.[10] The instrument makes possible the consolidation

[8] Municipal Ordinance N 165, from Moreno Municipality. The same type of ordinance is enacted to finance infrastructure extensions by public contributions in most BAMA municipalities.
[9] Eighteen years old or older, Law 26.579, under the Civil Code.
[10] It binds together the neighbours of Cuartel V, the FPVS, the National Fund of Social Capital (FONCAP) and the utility Gas Natural BAN S.A. According to the legal regulatory provisions

of the flow of public and private resources entering into the programme, together with the funds generated by the beneficiaries' payments once they have been connected to the service and started to pay for their share in the total debt. In that way, the trustees share responsibility for the network extension total costs. In addition, every family that participates contributes to a guarantee fund, specially set to cover problems of default. In case the fund is not used, it will be made available for future neighbourhood projects (FPVS, 2006).

From the perspective of the research design, it is important to note that the unit cost of connection is determined by the final number of programme participants. Moreover, since the debt is collateralised by family members and neighbours signing the trust agreement, there is some certainty about other people's behaviours (and the consequences of those choices). Importantly, in a context where long term financial commitments may have future consequences, such information is gathered at the first stage of programme implementation, by means of social interactions that contribute to share information among partners.

In a conventional service distribution mechanism the interaction between the company, municipality and each user-client takes place individually. Under the co-produced model, to assure the financial sustainability of the project, it is an essential requirement that at least 65 percent of 'housing units' in each block express their interest in receiving the service.[11] When less than that proportion of housing units gives consent to participate, the whole block is denied access to the gas service. This requirement guarantees the necessary economies of scale that help the profitability of the scheme. Indeed, the sequential order in which blocks are connected to the network is conditional to the order in which agreement is reached among neighbours in each block, and blocks compete among themselves to reach the necessary percentage of residents (Forni and Coniglio, 2003).

(ENARGAS, 2003) the company made its economic contribution – a bonus of 1,000 m^3 of gas for each house on completion of the connection stage.

[11] The housing unit, or dwelling in vernacular terms, is usually a single household resident in a single house, but may also include more than one household if these are resident in the same building. Households living in separate buildings on the same plot are counted as separate 'housing units'.

To facilitate this task, the NGO (FPVS) has implemented an organisation model for the enrolment process. Neighbours have been grouped in areas that covered both blocks and neighbourhoods, as spaces of social interactions and decisions. Then, neighbours interact through the block unit and at the neighbourhood scale. Promotion activities take place with the coordination of the neighbourhood based organisation (NBO) and the NGO. The neighbourhood organisations contribute to "bonding" tasks among residents, since all the works that are carried out are based on the residents' involvement within their blocks. Numerous meetings and voluntary activities are organised by residents, and also some pressure on neighbours - and within family members - might exist in order to define their enrolment and qualify for the connection.

Interactions are also encouraged on a wider neighbourhood scale. The reason for that is that there are benefits for bringing more participants, since the average costs that each household may face should be contingent on the total number of blocks and housing units that may decide to enrol in the programme. As a consequence, residents are motivated to interact with residents from other blocks, rather than just with the ones in their blocks. The NGO "Technical Team" coordinates the enrolment process, organises the activities locally and supports the building of wider "linking" interactions with different actors outside the neighbourhoods. Neighbourhood organisations support such tasks. For example, the local CBO, the "*Comunidad Organizada*" (Organised Community, CO) helped manage the interactions with local and external actors during the co-production intervention; the members of this organisation represent residents in their interaction with the NGO that is in charge of the programme management (FPVS), and also with the municipal authorities and the service utility firms.

Information is a key component of the scheme. In addition to regular meetings, several additional activities took place. First, a cadastral map was produced to monitor changing enrolment. The map was displayed in the neighbourhood's shops to provide information related to the number of enrolments already attained by each block and those needed to obtain the gas connection. These data help to make clear to residents the likelihood of obtaining the connection. Second, as part

of the dissemination strategy, and again to motivate residents to join, a monthly newspaper was published. Third, a community celebration was held once a certain percentage of enrolments had been reached, and to indicate other significant programme dates, such as the first connection.

The study considers that people's experiences of social interactions may play a central role for determining consolidation efforts. There are three stages that can be distinguished. The first is when information is shared and programme characteristics are made explicit. The second stage is defined by the attainment of the connection in the neighbourhood; the so-called point of "complete experience" when people's participation has 'paid off'. A third stage, designated explicitly for the research, is four years after the connection when the residual effect of programme implementation can be gauged.

4. THE NATURAL EXPERIMENT

In order for the research to contribute to empirical econometric studies, this study assesses the effects of a co-produced intervention for the provision of energy on house and neighbourhood consolidation. The study advances on the existing literature by considering whether the exogenous change in social space introduced by the co-produced intervention assists the physical and social dimensions of consolidation in these settlements.

Ideally, one would like to design the evaluation of co-production intervention effects by using a randomised procedure, drawing from a sample of neighbourhoods which want to participate in the programme and then choosing at random a subgroup of participants –comprising the treatment group-, and the other set of non-participating neighbourhoods that constitute the control group.[12] Although it is not feasible to conduct a randomisation trial in that way, the

[12] Such as the Moving To Opportunity programme, in which participants are randomly assigned to treatment and control groups. http://portal.hud.gov/hudportal/HUD?src=/programdescription/mto

allocation mechanism of the energy co-production model does allow the possibility of establishing a treatment and a control group that mimics a random assignment.

In order to identify the causal impact produced by the service programme, the empirical strategy takes advantage of a geographical discontinuity in its allocation. For technical reasons, the initial network extension had to be implemented in a group of neighbourhoods that were closer to the existing main gas pipeline and leave other similar neighbourhoods to a second extension stage. The allocation mechanism can be considered exogenous with respect to the characteristics of the household receiving "treatment" (connection to the gas network). These facts contribute to frame a "natural experiment". [13]

The exogeneity in the allocation of the service is related to strict technical reasons determined by the gas distribution company as to how the line gas should be extended. These technical considerations involve the distance of the neighbourhoods to be served by the low-pressure distribution mains of the gas energy grid. The temporary obstruction of the road network – notably Argentine National Route 24, President Hipólito Yrigoyen Avenue - caused by the construction works and the effects that this would have on circulation were carefully evaluated. It was decided to start with the first stage of the programme - the extension of the gas network - in an area that would not affect traffic flow and that would be closer to the trunk network.

Consequently, the gas programme was made available to one group of neighbourhoods with a subsequent group offered the programme upon completion of the first phase. The treatment group is formed from those neighbourhoods where the programme is offered and the control group is made up from members of adjacent neighbourhoods where the extension is delayed for technical reasons.[14]

[13] Then, this feature allows an evaluation of its causal effect to be made without any possible selection biases.

[14] Residents located in those neighbourhoods have given consent to join the programme.

5. CHAPTER OUTLINE

The thesis is organised in seven chapters. Chapter 2 outlines the different disciplinary contributions and theoretical approaches to informality in order to set out a frame for the empirical analysis. A discussion on urban policy institutional agendas in Latin America forces us to draw attention to the qualitative housing deficit (IDB, 2012) and deficient approaches to neighbourhood consolidation over time (Ward, 2012a; 2012b). In doing so, the theoretical "institutional" framework of the study underscores the significance of widening the "legal view" that is characteristic of most empirical econometric studies concerned with urban informality. I argue that the focus on institutions requires moving away from the economics argument centred on a formal institutions approach. It follows on from North (1990: 4) for whom the relevance assigned to both formal and informal institutions,[15] and emphasises the controversies among disciplinary approaches to informality and institutions. Importantly, since urban and development studies, as well as economics research broadly overlap in their interest on informality, this study underscores three central controversies in the academic literature.

First, the "legalising" and "upgrading" approaches, reflected in the prominence given to each in research and in policy circles. By reviewing the institutional political agendas addressing urban informality, I examine the existing controversy between the legal approach - supporting the allocation of property rights - and the tenure security view framed by a wider spectrum of conditions that include service provision. This discussion leads to the second controversy that is centred on the dominant role attributed to property rights and its effects, and which emphasise the low prominence attributed to infrastructure provision in empirical studies as well as in policy. My argument here is that the legal conceptualisation has occupied much more attention than the infrastructure or service dimension of informality, leaving it to the working of the market – or arbitrary public sector intervention- to address the conditions of informal urbanisation. Nevertheless, market

[15] The systematic structure of rules, which shape the configuration of incentives - and des incentives - for human behaviours and exchanges, are framed by formal and informal institutions (North, 1990: 3).

opportunities may be framed in such a way that can provide benefits despite legal tenure considerations (see Gilbert, 2007 for the Bogotá example). Services may induce another suitable development path as considered in the early studies conducted by Strassman (1984).

The chapter concludes with the outline of the third academic controversy. It underlines that urban economics studies of homeownership in formal housing markets have contributed to widen theoretical and empirical scholarly debates on the internalisation of benefits. Homeownership has been central to scholarly debates on social capital, drawing on conceptualisations already well known in sociology (Portes, 1998) that extend to the internalisation of social behaviours. Importantly, this strand of the literature formulates the notion of a "better citizen" – itself an attribute of homeownership - through its greater investment in community-enhancing social capital (Di Pasquale and Glaeser, 1999; Hilber, 2010).[16]

In contrast, empirical econometric informality studies have usually been biased towards formal institutions, such as property rights, and their physical investment effects. Interestingly, since a significant fraction of homeownership's effects on investment in formal housing markets are due to the length of community tenure, these studies can open up a dialogue with the critical literature focussing on security of tenure (through permanence) as a driver for internalisation from the physical and social dimension of investments. Therefore, I argue about the relevance of bridging bodies of research, widening the options associated with internalisation of benefits for individual investment by including formal and informal institutions in this type of analysis.

Chapter 3 frames the theoretical structure of both social and physical investments that work to knit together the consolidation efforts in informal neighbourhoods. The main explanation considers that the internalisation of benefits obtained by the interactions may contribute to secure more and lasting effects on investments. It

[16] What this literature indicates is that homeowner's motivation for involvement in neighbourhood activities and community affairs presents two competing arguments based on internalisation of benefits. The first one, capitalisation effects are likely to encourage local public good provision (Di Pasquale and Glaeser, 1999; Hilber 2011; Hilber and Mayer, 2009). The second one is permanence due to higher transaction costs of moving that affects homeowners.

builds on theoretical development models, such as the asset creation within the sustainable livelihoods framework, that underscore the significance of strengthening physical, social, financial and human capital (Moser, 1998). I introduce the association of the social and physical dimensions linked to the internalisation of savings through energy substitution as conceptual matters framing the potentiality of co-production as a promoter of individual and neighbourhood's consolidation efforts.

In this chapter I discuss two essential facts that determine physical and social investment. First, the internalisation of benefits requires extending the bundle of rights beyond a legal conceptualisaiton (see Feder and Feeny, 1991; De Soto, 2000). Security of tenure extends to service provision.[17] Importantly, the public, civil society and private sector involvement in the co-produced programme legitimises the achievement of greater security through investments. Second, in line with homeownership studies in formal markets, the savings made through the provision of a piped gas supply become internalised. Savings arise from the substitution of cheaper fuel for more expensive forms of energy, the enhanced use value of networked over other forms of fuel, and indirectly through capitalisation of the improved value of the housing unit which arises from general neighbourhood improvements. The internalisation of benefits may constitute a strong motivation for social investment, possibly stronger than ownership of legal rights. The main contribution of my approach is reconceptualising the benefits of interventions, considering how several dimensions of trust may reinforce complementarities between the social and physical dimension of investments. The chapter concludes by presenting the explanations that inform the empirical strategy of this research study, outlined by the natural experiment framed under the sequential implementation of the co-produced programme. It presents some avenues, to

[17] From economics (Besley, 1995; Brasselle et al., 2002; Migot-Adholla et al. 1991; Place and Hazell, 1993; Sjaastad and Bromley, 1997) and from urban studies critical constructive literature (De Souza, 2001; Gilbert, 2002; Fernandes and Varley, 1998; Gilbert, 2002; Gilbert and Ward, 1985; Razzaz, 1993; Payne, 2002a; Van Gelder, 2009; Varley, 1987, 1998) among others. Finally, Berry (1993) and Lanjouw and Levy (2002) provide evidence on the positive association between social networks or patronage, with security and investments.

extend previous knowledge on investments and considers the association between both physical and social dimensions.

Chapter 4 outlines the methodology for the research. The guiding idea of the evaluation consists in estimating a counter-factual scenario for assessing the causal effect of the energy programme. I describe the estimation method that focuses on the identification of programme impact on housing investments, participatory involvement, trust and collective capacity building. Importantly, since all the households in the treatment group were offered the programme, but not all accepted to enrol, in order to avoid a self-selection bias, all residents (those who were connected and those not), are incorporated in order to estimate what is called "the intention to treat effect", i.e., a measure of the effect of being offered the programme. As an alternative, I estimate the effect on those who enrolled in the programme.[18]

In chapters 5 and 6 the results for the co-production effects on the social and physical dimensions are discussed. Chapter 5 focuses on the social dimension of investments. It indicates that those incentives that encourage voluntary participation go well beyond the strict approach to legal rights capitalisation. The results support an internalisation effects explanation associated with permanence rather than legality of rights. This means that residents with titles, declared formal owners, and non-titled residents display an increase in involvement. Neither occupation – with or without permission – nor rental status allows residents internalisation of benefits that would have offset participatory costs and efforts. The results reinforce the notion of residents' participation "as a means" of achieving the provision of public services where effects are consistent with tenure security and service capitalisation.

The individual determinants for effective enrolment complement this analysis. There, I discuss four significant findings. First, the distribution of adherent families is almost perfectly along quintiles of income. Second, the savings generated by

[18] I explain the intuition behind both estimators, while leaving the econometric models as complementary information in Appendix 1.

energy substitution seems to be of paramount importance for driving resident enrolment and participatory involvement. Third, residents above a certain consumption threshold will be more likely to internalise the benefits from substitution through savings, regardless of current per capita income. Finally, I argue that the direction in the association between legality and services is inverted from normative approaches since in practice services operate as a means for cadastral registration, when the utility bill serves as confirmation of an address and is paid on a monthly basis.

Importantly, after the implementation of the connection, all tenure groups display higher willingness to collaborate than their counterparts in the control group. Residents that enrolled and were connected to the service (treated) display the highest disposition to be actively involved. Yet, heterogeneity among the contextual environment of nearby residents is still a significant determinant framing the marginal benefits from individual efforts (Alesina and La Ferrara, 2000; Baland and Platteau, 1997). The high level of willingness to collaborate reported several years later and for all groups (treatment and control) can be explained by the demand for attention to needs that are not covered by the local government.

Trust in the utility firm is higher for residents located in the neighbourhoods where the connection was granted and higher still for those that were enrolled in the co-produced intervention. Complementing the idea of “weak links”, it is expected that the level of trust in the municipal public sector should be positively associated to the co-production implementation. This seems to have been the case before the intervention started, indicating a possible expectation effect. After the intervention, the results suggest the opposite effect especially for residents that hold formal property rights. The results are indicative of a differentiated effect of resident relations with the municipality, indicating trust-building for those people holding informal rights to property. They benefited most from the scheme, since none of them would have received the service without the co-production framework. The study provides evidence that this upsurge in the level of trust in the public sector -during and after the connection stage- is positively associated with investments in housing by people holding informal rights.

The empirical evidence provides support for a localised process of building generalised trust. Considerable time is required to support the building of generalised trust through increased familiarity and reciprocity (Bjornskov, 2006; Hilber, 2010). The positive effect on the level of generalised trust reported after the connection was granted provides suggestive evidence pointing to the relevance of "experience" developed through time. Qualitative insights from people's perceptions of the programme contribute to substantiate the notion of a slow process of trust construction. Notably, four years after the service connection was granted, non-participants report higher incremental effects on their average level of generalised trust (and trust in neighbours, CBO and NGOs) compared with counterparts in the control group.

Importantly, the evidence related to trust indicates that family decisions for involvement in long-term financial commitments – sharing responsibilities among family members and with neighbours – oblige families to face complex decisions that affect their level of trust among all members. The informal character of occupations and the instability of income may explain families' fears of affordability risks that will lead to negotiations among members. Nevertheless, the chapter explores a second plausible explanation is related to the substitution effect between generalised trust and trust in the family. Previous evidence indicates that there is a causal association between the strength of family ties and the level of generalised trust (Alesina and Giuliano, 2011; Ermisch and Gambetta, 2010), which is associated to the degree of "outward exposure" (Ermisch and Gambetta, 2010). A broader contact and interaction with "others" decreases an individual's reliance on the family. I explore how the rise in generalised trust during the initial intervention stages might be indicative of this type of substitution through the availability of the co-production scheme.

Chapter 6 analyses the residents' ability to invest in housing improvement. The evidence provides strong support to the service co-production programme boosting housing transformations. The results support arguments in the literature, concerning infrastructure as an incentive for investment (Strassman, 1984) and adds empirical evidence that these effects are not constrained by the lack of legal

ownership rights. The chapter considers results that the programme does not affect title-holders' incentives to invest alone, as one might argue from a strict property rights perspective. Instead, the programme induces a positive incremental effect on house changes that involves people holding diverse tenure and ownership rights. In addition, the chapter looks at two other side effects. First, the evidence shows that the co-produced intervention is associated with a higher probability of informal (tenure status) residents undertaking housing reforms when compared with reports by residents in a control group (for whom service connection was not made available). This effect is greater for residents with the individual service connection. The situation for tenants is discussed to consider whether tenant savings through energy substitution complement landlord capitalisation incentives. Second, the presence of non-participant neighbours making more changes to their houses than members of the control group suggests the presence of neighbourhood effects. Both sets of findings indicate higher social returns than is usually measured from interventions in informal neighbourhoods.

The last section on this chapter is intended to shed light on the effect of trust on housing transformation. Trust in this context is considered an asset that provides utility to residents through the reduction of transaction costs (Durston, 2003). Increasing the level of generalised trust may affect economic performance, when the reduction of transaction costs increases the rate of investment. The results indicate how investments and trust work together when residents lack legal rights but are not positively associated for legal owners. Nevertheless, it is important to note that one of the main assumptions drawn from the social capital literature when I started the research, that generalised trust was related with economic development, seems not to hold. The results support arguments associating particularised dimensions of trust to physical investments.

Chapter 7 presents the main research conclusions. First, the thesis indicates that the programme induced savings -from energy substitution- positively frame the internalisation of benefits that affects the incentives to invest in physical and social change. The indirect path to capitalisation transcends legality constraints, and contests the legality-illegality distinctions made by much of the literature. Rather,

effects are determined by permanence considerations. Second, the co-production programme provided a boost to housing changes in low-income neighbourhoods of BAMA. The natural experiment contributes to demonstrate that the co-production for service provision had a higher social return than would have been estimated by considering physical investment benefits for legal beneficiary households only. Furthermore, it introduces the presence of "neighbourhood effects", a missing topic in the literature. The study, therefore, challenges the rigidity of disciplinary conceptualisations of tenure, the dimensions of investment and its effects.

The third finding concerns the incipient path of institutional change. The research indicates that it is determined by the macro institutional considerations guiding service provision and, as such, it shapes the configuration of individual incentives that favoured neighbourhood consolidation. Through encouraging participatory involvement in implementation and finance, self-help ideals are combined to market mechanisms for service provision. Relations of reciprocity are transformed in different directions, strengthening trust in local organisations, and selectively reinforcing the confidence in the local government, only for those that benefit from the internalisation of their efforts. The new interactions among parts are internalised by non-legal owners, to contribute to secure more lasting effects on investments. Housing transformations are speeded through the changes in trust in the family and the municipality. However, these policies should not contribute to promoting more confidence in the public sector, particularly among those residents that hold formal rights to their properties.

And fourth, the evidence contributes to making clear that the emphasis on collaborative schemes and self-help in policy may help in the basic task of providing services. Collective capacity is forged as a way to revert the inefficiencies of local government when the internalisation of benefits may offset the costs of such efforts, even though the balanced complementarity in the roles between the State, residents and organisations may become blurred, if residents are willing to jointly undertake duties that should be under the orbit of the local government.

CHAPTER 2: INFORMAL SETTLEMENTS AND THE INSTITUTIONS DEBATE

1. INTRODUCTION

The recognition that informal neighbourhoods constitute a significant proportion of urban economies in Latin America has alerted researchers and policymakers about the need to take new directions in urban policy (Rodgers et al., 2012: 264).[19] One of the ways in which research might contribute to framing new policy directions is by improving the understanding of the developmental process of informal neighbourhoods over time (Ward et al., 2011b). Some scholars have recently also highlighted the added value generated by other disciplinary perspectives for the development of an in-depth analysis of the urban condition, particularly the academic approach to informality (Rodgers et al., 2012). According to Rodgers et al. (2011), informality is a complex issue; understanding it requires sharing knowledge and the strengths of each discipline. They underscore the value of bringing together a diversity of knowledge related to homeownership and informal urbanisation using a wider interdisciplinary perspective. Then, econometric research may be enriched by insights from other social sciences (Rodgers et al., 2012), especially the narrative critical constructive urban studies approach.

This chapter complements the literature on informality and settlements by underscoring three existing controversies. First, the legalising and upgrading approaches to consolidation efforts; second, the un-serviced dimension of informality, which is also linked to finance and investments; and finally, the role that the internalisation of benefits has on both physical and social capital investment efforts associated with tenure and legal status considerations. In general terms, the chapter argues that the social and physical dimensions of investment in co-production and services are underexplored. I also propose that the empirical econometric literature on housing informality has been more attentive to emphasising formal institutions, discussing property rights as incentives

[19] Informal housing is today “part and parcel of Latin American modernity”, and most current urban programmes are described as “sporadic”, “piecemeal” and “disconnected” (Rodgers et al., 2012:17).

to invest for example, and thus adopts a narrow concept of institutions. This chapter presents institutional insights from across strands of the academic literature.

The outline of the chapter is as follows. Section 2 underscores the relevance of addressing the consolidation of informal commercial settlements as a specific objective of research and policy. The discussion of institutional agendas in urban policy is proceded by stressing, in Section 3, how little recent attention has been paid to the quality of housing and neighbourhood deficiencies in Latin America (IDB, 2012). This review is important to the focus of the thesis on neighbourhood consolidation which I seek to understand as generated by more than legal title or tenure security. Robust research is still needed to challenge several assumptions of the, now conventional, “legal” policies of development planning, and to introduce other dimensions of investment.

Section 4 addresses the conceptual issues that inform the academic debate on urban informality that underlines the prominence of new institutional economics in social science research and policy. It emphasises that a rigid conceptualisation of institutions that has centred on the formal-legal and paid little attention to understanding the effects that informal institutions have on settlement consolidation. The section argues for the inclusion of a broader definition of institutions, to model the configuration of incentives (North, 1990: 4).

Section 5 develops this idea from an outline of the main institutional approaches in public policy that underscore the importance given to property rights (North and Thomas, 1973; North, 1981). It contrasts this perspective with a wider view of informality through upgrading interventions and emphasises that the legal conceptualisation has displaced attention from the services dimension. This section, therefore, introduces the second controversy that underlines how the un-serviced dimension of informality is not well considered in some academic literatures, such as urban economics. I take a cue from writings on, for example, livelihood asset frameworks that stress more holistic views of poverty and policy. I also emphasise two additional factors – savings through substitution and increased security – which

constitute central elements for the internalisation of benefits that participatory efforts in services programmes may provide.[20]

Reinforcing views on institutional agendas, the macro-economic context for service provision and the service reforms in Latin America are explained, and service co-production is introduced. I note how participatory approaches as a "gold standard" in development policy, that promotes residents' participatory involvement in implementation and their contribution to finance, centred under efficiency objectives, acts to reconcile the utility company need to increase their commercial base with the unmet service demands of the populations living in informal settlements. Finally, this section introduces a discussion of social capital which has run in parallel to the upsurge in interest on institutions in social sciences. The discussion provides a conceptual base for explaining economic development embedded in informal institutions, especially networks through membership of organisations and trust. I note the intersection of debates concerning "participatory urban governance" and civic engagement, "community participation" and co-production .

Section 6 addresses the bias towards property rights effects on physical investment in empirical econometric studies. It picks up how studies have widened to include a social dimension of incentives attributed to homeownership. The Section introduces homeownership as an institution for the internalisation of benefits that are central to social capital empirical econometric studies. Importantly, this literature formulates the notion of a "better citizenry" attributable to homeownership, through its greater investment in community-enhancing social capital (Di Pasquale and Glaeser, 1999; Glaeser et al., 2001; Hilber, 2010). By including formal and informal institutions in analysis, I argue the relevance of bridging both bodies of empirical econometrics and narrative studies. In a little more detail, the final sub-sections outline how studies on informality and investment effects have mostly focused on legal approaches and rural contexts, and

[20] Multilateral organisations focus on poverty reduction, emphasising access to secure land (UN-Habitat, 2003), strengthening the rights to land (World Bank, 2003b), provision of adequate shelter (UNCHS, 1996), housing finance (World Bank, 2003b) and infrastructure services provision (GNESD, 2008; OECD, 2006; UN-Habitat, 2003; UNDP, 2007; World Bank, 2004).

discusses conceptualisations of tenure security. Both constitute a central difference between empirical economics and narrative critical approaches.

2. INFORMAL SETTLEMENTS

A first approach to the analysis of informal settlements should start by defining their specific features. These are settlements that began to develop more than five decades ago in peri-urban areas and that constitute a particular sub-market of informal urbanisation (Ward, 1982; Abramo, 2003a, 2003b, 2012; Ward, 2012c). Very recently, the academic literature has encouraged the inclusion of the specific characteristics and demands of these long-standing neighbourhoods into research and policy (Jiménez and Cruz, 2011; Ward et al., 2011a, 2011b; Ward, 2012a, 2012b). Due to a combination of residents' self-build and progressive housing strategies, these settlements have developed into neighbourhoods that are now a prominent part of the conurbations in most Latin American metropolitan areas (Ward, 2001; Ward et al., 2011b; Ward, 2012a, 2012b).

A consistent remark in the literature is that most low-income households can only have access to land through a varied set of informal practices (Gilbert, 2002, Marx, 2009). Informality, manifested as a segment of the land market, includes multiple arrangements and exchanges, and is defined by very different sub-markets with different physical and spatial characteristics, from informal commercial subdivisions to squatter settlements.[21] This study is focused on informal commercial urbanisations. The legal/illegal dichotomy is particularly challenging when analysing the origin of these neighbourhoods, since they are not equivalent to squatting. The main difference is that residents have paid a developer for the plot of land rather than having invaded it; the land having been originally legally owned either by the developer or his client. It is the lack of compliance with one or several laws, subdivision standards and zoning, and servicing requirements, that reduces transaction costs for this type of market exchange.

[21] The latter are often referred to as *villa miseria*, *favela* or *barrio de ranchos*.

While informal practice has been able to make land available and mostly affordable for the poor, it does not provide adequate public goods and services – such as paved streets, public lighting, waste collection and security. Nevertheless, many scholars have argued that it may be better to use terms such as "informality" or "irregularity" (Gilbert, 2002) rather than "illegality" because the basic norms that guide ownership are followed, and unlike in the case of land invasions some legal rights exist that provide a degree of security of tenure (Fernandes and Smolka, 2004: 13; Durand Lasserve et al., 2009).

Although city peripheries across Latin America have extended areas of these informally developed low-income neighbourhoods, urban policies have been biased against these settlements. Settlements originated by invasions and centrally located on public land have been regularised more easily and have even obtained more resources than settlements as the urban peripheries where residents have been exposed to the rigours of living on un-serviced plots (Ward, 2012c).[22] In Buenos Aires specifically, these neighbourhoods were built progressively – through self-help – from the 1950s and 1960s onwards and have been outside the scope of public interventions since. Land titling and urbanisation programmes have consistently been more attentive to settlements located in central areas, despite the technical difficulties of dealing with highly irregular urban layouts and high population densities (Clichevsky, 2002; Goytia and Lanfranchi, 2009; World Bank, 2007b).

3. THE (UN-RESOLVED) HOUSING QUALITATIVE DEFICIT

A long-time unresolved issue in Latin American low-income settlements concerns the rehabilitation of the existing housing stock. Despite titling programmes and the provision of infrastructure through urban upgrading programmes (sometimes together), studies demonstrate that the qualitative deficit remains a neglected issue in urban policy (IDB, 2012). In 2001, the lack of formal tenure affected 11

[22] Informal urbanisation in Latin American countries ranges from 30 to 60 percent of the residential areas in the largest cities (UN-Habitat, 2006).

percent of households in Latin America and the Caribbean, while low quality construction materials affected 12 percent and a lack of infrastructure affected almost 21 percent of housing units (IDB, 2012).

Beyond these indicators of a lack of policy attention, other studies point to housing as a critical component of household livelihood strategies (Rakodi, 1999; Moser, 1998) and their main asset that can grant security to reverse vulnerability (Moser, 1998). Secure housing provides implicit savings through avoiding the cost of occupying rented property (Gasparini and Sosa Escudero, 2004). And improved housing provides opportunities to generate income in the form of rents or space for small enterprises (Moser, 1998). The (self-help) progressive process of improvement draws can go some way to attend to household needs. But, the poor (starting) condition of the housing stock and problems of settlement layout, even after regularisation and the provision of services is a matter of concern (Ward et al., 2011b). Self-help is limited in scope since major improvements – such as infrastructure – require coordination of effort.

4. INSTITUTIONS AND THE INFORMALITY ACADEMIC DEBATE

It is well accepted that "institutions matter" (Hall and Jones, 1999; North, 1990; Rodrik et al., 2004).[23] Nevertheless, some institutions have been thought more appropriate than others to particular circumstances and, to adopt the conventional distinction, formal institutions have been given more attention as affecting human behaviour than informal (Aghion and Howitt, 2009; North, 1990). In abstract terms, however, the new institutional economics literature argues that institutions provide the incentives, or disincentives, to channel a diverse set of social and economic outcomes (North, 1990: 3). By setting "the rules of the game" institutions give a predictable structure to human interactions, which can constrain discretionary actions by providing a determined set of choices for individual behaviours (North,

[23] In this study, the term "formal" institutions is used to refer to "legal and normative" ones, while the term "informal" is used to refer to "socially embedded" ones. Organisations are the players defined by the rules (North, 1990).

1990: 11). In other words, institutions provide "the structure that guides everyday life" (North, 1990: 4). In particular, one main contribution from the field of institutional studies has been the understanding of the "nature of human coordination and cooperation" (Poteete and Ostrom, 2004: 212). This considers non-market mechanisms that may include the sharing of information and activity coordination, besides the role of markets and the State (Poteete and Ostrom, 2004).

Consequently, this study intends to move towards a more comprehensive understanding of the institutions that may be present in informal neighbourhoods, shaping housing transformations. The narrow conceptualisation of institutions (their formal dimensions) in the empirical econometrics literature in relation to housing informality, can be contrasted with other bodies of academic literature that have conducted research suggesting that socially embedded institutions – norms, trust and networks, have an influence on a wide range of economic, social and political outcomes (see, for example, Putnam, 1993, 1995; Coleman, 1988; Fukuyama, 1995). The relevance of including social "informal" institutions in the analysis is certainly emphasised in the development studies literature, which points to the fact that analysis is generally biased towards the structure of formal institutions that support behaviours rather than focused on informal ones (Brett, 1996; Cleaver, 1999; Uphoff, 1992a, 1992b).

5. INSTITUTIONAL AGENDAS ON URBAN POLICY

This section discusses the institutional agendas in urban policy related to informality. Policy in different countries reflects the particularity of context but the broad frameworks are similar; from the structuralist paradigms of the 1970s and mid-1980s, neo-liberalism and globalisation (Ward, 2012a), and including decentralisation, institutional strengthening and good governance in the last decade (Campbell, 2003). With respect to informality the overall normative framework has been based on the same institutional pillars; strengthening property

rights and the consolidation of neighbourhoods through upgrading interventions. Sub-sections consider the merits and critiques of each before turning attention to institutional framework reform in Latin America, which sets the opportunity structure for new institutions such as co-production. The final sub-sections discuss how this opportunity for co-production fits in with debates on informal institutions and social capital, which in turn support participatory approaches.

5.1. PROPERTY RIGHTS IN URBAN POLICY

It is important to emphasise that both codifying and enforcing property rights are currently accepted as absolutely necessary to support economic development (Acemoglu and Johnson, 2005; Johnson et al., 2002; North and Thomas, 1973; North, 1981). Based on this notion, property rights have been regarded as a powerful instrumental institution to alleviate poverty (World Bank, 2000, 2003). The claim is supported by three bodies of academic literature that have been developed over the last 40 years: the tenure security approach, the property rights school and institutional economics.

The first element of the argument for property rights as a response to informality has origins in the tenure security approach. The observation of influential early researchers was that either legal or de facto security of tenure was of critical importance for the progressive development of houses in informal settlements. Turner advocated the provision of a secure tenure as a key policy instrument to resolve the housing difficulties of the urban poor (Turner, 1976). The rationale behind the conceptualisation of consolidation through self-help has been that residents will be encouraged to invest their savings and labour in housing improvements only if they do not fear a future eviction. Housing consolidation efforts will therefore achieve what neither public housing programmes nor the formal private sector has been able to do for lower-income groups (Angel, 1983).

The “self-help ideal” is broadly accepted as a significant change in the “conventional wisdom” on urban informality (Doebele, 1987) and determined a

shift away from evictions or demolitions of informal settlements. Turner (1976) and Mangin (1967) considered those settlements a solution to difficult social problems, "supporting a process of social reconstruction through popular initiative" (Mangin, 1967: 67). The adoption of these ideas in public policy was backed by the belief that both the resources and the technical capacities of governments can be directed to complement the strengths of the poor, supporting their rationality and capacities in construction (Mangin, 1967; Turner, 1976; Turner and Fichter, 1972). Self-construction and the progressive development of the housing units became two essential characteristics in the housing process for low-income households.

The second argument comes from the "property rights school". It supports the allocation of property rights, emphasising the likelihood of underinvestment when the result produced by individual investments may be grabbed by others (Demsetz, 1967; Alchian and Demsetz, 1973). Therefore, any kind of uncertainty in tenure rights should reduce the scope of an individual's investment.[24]

The third argument follows on from the second. The institutional economic literature emphasises the role that institutions play in development (Acemoglu and Johnson, 2005; De Long and Shleifer, 1993; McMillan and Woodruff, 2002; North and Thomas, 1973; North, 1981) and has become influential in urban policy (Jones, 2003). Poverty is seen as determined by political or economic institutions that discourage productive activities (North, 1990). The concept is well established in the economic literature that provides theoretical arguments focused on markets and transaction costs: so that for example negotiating, monitoring and enforcing exchange contracts is dependent on the institutional framework (Coase, 1960; North, 1990). The implication is to promote "the efficiency of markets" through property rights that permit the enforcement of exchange and lower transaction costs.

[24] Nevertheless, the absence of rights to property may reflect a lack of demand rather than a constraint in supply (Buckley and Kalarickal, 2004: 236) because, as Demsetz (1967) argues, property rights should develop only when the benefits provided by the internalisation of externalities outweighs the costs of not doing so.

Based on theoretical support from new institutional economics that suggests property rights can make markets work better, urban policy has been attracted to find ways to allocate rights to property (Baharoglu, 2002; Binswanger et al., 1995). Taking a rather unacknowledged cue from institutional economics, De Soto was able to rephrase Turner´s ideas about security of tenure to suggest that supporting property rights produces a "consolidated market-based economy" that will explicitly favour the poorest (De Soto, 2000: 223). In the De Soto version, formalisation of assets and their integration into land registers can provide incentives to invest through tenure security and constitute an essential market-supporting institution (Durand Lasserve and Royston, 2002; Fernandes, 2006).[25] In De Soto's conceptualisation, the answer to informality is focused on substantial changes in law and regulation to support the development of markets (Gilbert, 2002: 2), through legal instruments that "allow the poor to prosper in a capitalist society", providing them with the necessary confidence to save, invest and produce (De Soto, 1989: 167-168 and 257). Likewise, the legal property system provides more than just elementary security through ownership (De Soto, 2000: 235); it offers the possibility to allow the expansion of markets, through the release of the underutilised (dead) capital that lies in the assets of the poor. Under this view, rights affect the development of secondary markets, "particularly credit markets, where assets are pledged against default" (Besley and Ghatak, 2009).[26]

Despite the promotion of property rights, and more especially registration and titles, there has been no consensus that this approach delivers the expected benefits (Buckley and Kalarickal, 2004: 26; Fernandes, 2006, 2009). More precisely, the significant benefits predicted by De Soto are not confirmed by researchers who have attempted to analyse the effects of legal approaches (Arnott, 2008; Buckley

[25] De Soto's arguments have gone through two stages. In his first book, *The Other Path* (1989), he says that basic institutions must be created in order to achieve efficiency and social peace; in addition noting that the barriers that constrain access to formal activity should be eliminated, reducing the costs of legality and increasing access to capital markets (De Soto, 1989: 259). In *The Mystery of Capital* (2000), the argument is centred on the importance of property rights -and the legal system, and on the actions that states should take (Woodruff, 2001).

[26] Therefore, the formalisation of rights is praised for its ability to reverse the limited scope of transactions – in closed circles of relationships – that are characteristic of informal exchanges when constrained by transaction costs (and asymmetric information).

and Kalarickal, 2006; Durand Lasserve and Selod, 2009; Field and Torero, 2003; Galiani and Schargrodsky, 2010; Payne et al, 2009). First, studies present evidence to reject the view that property rights serve as a shortcut to economic development (Carter and Olinto, 2003; Field and Torero, 2003; Galiani and Schargrodsky, 2008; Schargrodsky, 2009), mainly because its benefits, coming from a single, central mechanism within a poverty reduction strategy aimed at reversing informality, are severely questioned (Ahiakbar, 2008; Buckley and Kalarickal, 2004, 2006; Calderon, 2007; Durand Lasserve and Selod, 2009; Fernandes, 2006, 2009; Gilbert, 2002; Marx, 2009; Mitchell, 2004; Payne et al., 2009; Galiani and Schargrodsky, 2010; Royston, 2006; Woodruff, 2001).

Second, critics draw attention to the analytical oversimplification of the rights approach, with an emphasis on a single determinant for economic growth and poverty reduction (Sjaastad and Cousins, 2008). In fact, obtaining full legal title provides little difference in households' propensity to use their homes as collateral; an argument made from research in Texas (Ward et al., 2004) and Bogotá (Gilbert, 2002). Legal rights seem to make no difference to people's engagement with formal finance. In fact they eschew formal credit mechanisms due to the lack of elasticity on payment conditions and requirements (Varley, 2002).

The basic message from the critical literature is that "no mysterious, straightforward capitalist panacea can address all of the shelter problems faced by low-income families in developing countries" (Buckley and Kalarickal, 2004: 26). The caution in terms of 'shelter problems' can be extended to titling programmes as the sole solution to address urban poverty (Marx, 2009). Overall, even promoters of a legal approach to informality request a more cautious approach to titles as a mechanism within policy (Durand Lasserve and Selod, 2009; World Bank, 2007: 12, 2009).

5.2. THE UN-SERVICED DIMENSION OF INFORMALITY

In practice, the lack of titles has been used as a screening scheme to regulate the flow and number of beneficiaries of infrastructure despite, quite often, the length of time an informal settlement has been in existence (see Henderson and Feler, 2010). Yet, in much of the academic literature and in urban policy, property rights approaches and upgrading strategies have tended to be regarded as competing positions or at least unconnected (Ward, 2003; Fernandes and Smolka, 2004). From the De Soto perspective, for example, property rights enforcement is linked with a "law and order" duty of the state, while services should be provided by the market (De Soto, 2000). Hence, intervention is very often limited to the granting or registration of deeds, dissociated from service access (Fernandes and Smolka, 2004: 13). The main rationale is that land information – through the registration of property – should grant the opportunity for the market to provide low-income households with infrastructure services (Deininger and Feder, 2008). It is perhaps unsurprising therefore that evidence on regularisation interventions suggests that granting title to property alone has not enabled improvements in public (and private) service provision to settlements. Based on research in Brazil, Smolka and Biderman (2009) reveal that changes in tenure rights have had no effect on access to sewer systems; only five percent of municipalities show a high level of progress at providing sewerage systems and tenure rights, while the municipalities experiencing a large reduction in untitled households had the worst access to sewer services. In Lima, less than 50 percent of titled owners in regularised settlements have been supplied with water and sanitation services (MVCyS Peru, 2011).

The point is that the relation between legal formalisation programmes and provision of services has not been considered strongly enough in the institutional framework for urban policy. In other words, the provision of services in conditions of urban informality has been given too little consideration by the attention afforded to property rights despite the role of both rights and infrastructure in poverty reduction (World Bank, 1993, 2003, 2009; UN-Habitat, 2003, 2006; UNDP, 2007). Although a case has been made that services can have an impact on poverty reduction and economic growth (Estache, 2008; Raj, 1993; Willoughby, 2004), it

needs to be strengthened with conceptual thinking and empirical research. Moreover, rather than being assessed in isolation from property rights change, as either titling or gaining security of tenure more generally, the case for services needs to be developed in relation to and combination with changes to rights.

5.3. SERVICE INSTITUTIONAL REFORMS IN LATIN AMERICA

The widespread institutional reforms of infrastructure provision carried out during the 1990s in Latin America did not take poverty, or poverty alleviation, as a significant issue (OECD, 2008: 26, Batley, 2006). Most reforms were committed to safeguarding investment rather than the social impacts that might be obtained had the poorest been provided with greater service access (Haselip, 2004). As stated by Ward (2012c: 568), during this last decade of fiscal sustainability and increased citizenship responsibilities, urban programmes for the installation of services were mainly based on the expectation that consumers could (or soon would) afford the service charges, leading to self-sustainability of provision. Yet, several basic determinants constrain the access of residents living in informal neighbourhoods to infrastructure, under regulation reform conditions or otherwise. These involve financial matters, the restricted view that requires mandatory legality, the characteristics of the low-income market, and the constraints of the regulatory framework and logistic capacities.

First, one of the main arguments for exclusion is that poor neighbourhoods are considered less secure for the new, privatised or concession operators. The financial capacity of residents is limited and not everybody is thought capable of covering the full costs for improved services (Carrera et al., 2004). Consequently, when tariffs are established to fit within socially acceptable limits, the financial returns may be too low for investors in relation to the high risk they have to assume (Banerjee and Somanathan, 2005). But, if tariffs are not kept low then affordability is severely impacted and households may default. Lower or subsidised tariff rates have been implemented in some countries (such as Chile), while in others (such as

Argentina) special conditions have only been applied for the most basic service such as electricity. This means that the institutional framework is extremely relevant in relation to the needs of the poor, to compensate for the economic interests of the private sector (Nickson and Franceys, 2003; UNDP, 2006), which remain dominant in the utilities market.

Second, infrastructure provision has been inhibited by legality requirements. Residents in many informal neighbourhoods do not have the mandatory legal rights to property. Even when utility firms have been contractually enforced into a progressive extension of coverage, informally urbanised areas have not been targeted for provision. And third, serving lower-income neighbourhoods might be constrained by limits on large-scale forecasting, institutional and technical efforts, which lag behind capacity in relation to engineering and grid capabilities (Estache et al., 2001; Iwanami and Nickson, 2008; Prud'homme, 2005).

These shortcomings have empowered advocates of alternative measures for service provision. As discussed below, these promote institutional innovation to relax legal constraints, means to involve residents to contribute finance to service network extension, and mobilisation of social organisations to support coordination to solve logistic constraints.

5.4. SERVICE CO-PRODUCTION

The argument is often made that shifts in contextual politics have the power to modify the opportunities for action (Newman et al., 2004; in Taylor, 2007). The privatisation of public utilities during the 1990s, combined with decentralisation, created the conditions for an institutional change to affect the process through which public goods and services are produced and distributed (Ostrom, 1972, 1995, 1996; Parks et al., 1981; Whitaker, 1980). This new mechanism is the co-production for service provision interventions (CSPI).

Based on concepts originally developed in the late 1970s, co-production promotes a decentralised approach where beneficiaries become actively involved in the

production, design and implementation of their own services (Ostrom, 1996). In the academic literature, scholars as diverse as Tendler (1995), Ostrom (1996) and Mitlin (2008) contribute to challenging the idea that there should be a strong dividing line between the public and the private realms – the state/market dichotomy – or between government and civil society, rather than a "blurred" line (Tendler, 1995). Most importantly, in this new political context, awareness is raised about the way in which strong limits derived from rigid disciplinary visions about institutions hinders the potential for synergetic outcomes involving public, private and civil society organisations (Ostrom, 1996). Co-production focuses on the potential complementarities between the "regular" producer of services and those seeking to benefit from them. Three particular dimensions can be identified.

First, co-production subverts the mainstream approach that is organised around a single producer and many consumers (Ostrom, 1996). The institutional innovation is related "to the inputs used to provide a good or service", which are now supplied by "individuals who are not from the same organisation" (Ostrom, 1996: 1073). Second, co-production emphasises complementarities as the essence of synergistic production (Ostrom, 1996: 1079) that changes the scope of the efforts made by actors from the public and the private sector, but especially those of residents and local CBOs, when their involvement is included in the organisation of demand, project design, financing and maintenance of the service. Co-production is broadly justified by analysing whether the production of a service would be best if jointly produced by the public and the private domains – rather than entirely produced by either the public or private spheres. The answer is contingent upon the inputs that each provides production process (Parks et al., 1981; Ostrom, 1996).

Finally, co-production takes advantage of new urban governance structures, notably the greater role of municipal governments via decentralisation efforts that have shifted responsibilities for resource collection and expenditures (UN-Habitat, 2006). The joint production of public services might also involve NGOs that have assumed a central role between the State, individuals, and other associations (Mitlin, 2004; Taylor, 2010), and the participatory involvement of citizens (Ostrom,

1996). Thus, both a new form of governance and new logistics for service provision are enabled (Joshi and Moore, 2004: 41).

Low-income residents in informal settlements in Buenos Aires, who seek access to services, are involved in this institutional framework, and this makes their access to pipelined services possible. Development scholars point to the fact that by initiating CPSI, the State accepts the need for micro-level collaboration to address resource or financial constraints, but also considers this collaboration with the State as desirable.

5.5. INFORMAL INSTITUTIONS AND SOCIAL CAPITAL

In parallel with the institutional approach, the concept of social capital has been a central issue of research across the social sciences since the 1990s. It provides economics and political science studies with the conceptual bases embedded in socioeconomic behaviours, already known in sociology and transposed into these other disciplines (Portes, 1998). It has also been widely spread in development practitioner circles as a required component to achieve a great variety of socioeconomic and developmental outcomes, either as a property of individuals and families or aggregated as a feature of communities, cities, and countries (Grootaert 1998; Portes, 1998; Putnam et al., 1993). Importantly, it gained attention in the form of community participation in development interventions, as part of urban governance notions of the 1990s (Campbell, 2003) and within institutional frameworks that sought efficiency and sustainability through social capital building and empowerment. [27]

The social capital concept has drawn attention because of seminal works developed by Putnam (1993, 1995), connected to the mechanisms of civil society (Putnam, 2000; ., 1993). It refers to “features of social organisation such as networks, norms,

[27] The discussion on whether social capital’s attractiveness is due to its intrinsic value as a complement to markets and the state (Bowles and Gintis, 2002) or because it works as a powerful low-cost strategy that is able to address a variety of social and development aims (Portes, 1998).

and social trust that facilitate coordination and cooperation for mutual benefit" (Putnam 1995: 67; also Coleman 1990; Portes, 1998; Schuller et al., 2000).[28] Putnam's evidence supports the notion that community interactions through organised activities or clubs foster the formation of social capital.[29] In this view, participation is at the heart of civic life (Schuller et al., 2000). Other researchers, such as Coleman (1988) have provided evidence on the functional role of social capital on human capital accumulation, associated with lower school dropout rates, made feasible by family and neighbourhood relations. Nevertheless, other studies have been more ambiguous at identifying assets constituted by social relationships, either noting access to benefits or the reproduction of inequalities (Beall, 2001; Moser, 1998; Portes, 1998).

Researchers have raised concerns about the conceptualisation and measurement of social capital, and the potential pitfalls of conceptual overstretch, becoming a kind of "one size fits all" concept that embraces a variety of issues, from local problems to wider development issues (Durlauf, 2002; Portes and Landolt, 2000). Some key conceptual problems underscore the way in which different objects like beliefs, behavioural norms and interpersonal links (networks) are gathered together without a clear philosophical or practical reason to include them in a single definition (Dasgupta, 2000: 327). In order to help eliminate conceptual vagueness, this study unbundles social capital to two of its main components: membership of organisations and participatory involvement and trust. Trust and participation are considered productive assets in different strands of the development economics (Besley et al., 1993; Ostrom, 1996) and urban livelihoods literatures (Moser, 1998).

Networks generated by social interactions and participatory involvement through membership in organisations can help improve income and access to assets (Di Gregorio et al., 2008; Moser, 1998). Networks can also help build reciprocity among different members and may act as a channel through which some benefits can be

[28] There are other definitions of social capital, such as "the ability of actors to secure benefits by virtue of membership in social networks or other social structures" (Portes, 1998: 6).

[29] The choice of indicators to measure social capital is a matter of debate (Fukuyama, 2002: 12). For example, Poteete and Ostrom (2004) discuss whether should be measured at an individual or community level.

internalised, for example if members become a source of loans (Lourenço-Lindell, 2002; Moser, 1998) or collective savings (Beall, 2001), both of which can help the improvement of housing (D'Cruz and Satterthwaite, 2005). Social networks enable access to information, for example, about employment opportunities or resources and services provided by the State (Beall, 2001).

Trust has been associated with economic outcomes in the academic literature. Arrow (1972) argues that trust constitutes a necessary input in all economic exchanges and acts to reduce transactions costs (Arrow, 1969, 1972), thus facilitating transactions that encourage economic development (Arrow, 1972; Dasgupta, 2009b). In low-trust environments the rate of investment is significantly reduced (Zak and Knack, 2001). The channels for trust enhancement may include sharing information, but also improved coordination and group formation (Durlauf and Fafchamps, 2005).

Research has adopted three conceptualisations of trust. In Fukuyama's view (1995) trust constitutes a relevant "social virtue" – equated to social capital – that helps improve the economic performance of any community, from the family to the nation. This conceptualisation of trust is associated with shared moral norms which are derived from culture, institutions and religious heritage. Trust, in this form, constrains opportunistic behaviours and enhances the capacities for the development of more complex relations, transactions, and governance processes among different actors and organisations. In societies where generalised trust is low, any trust behaviour is limited to close groups, such as the family or immigrant communities, and there is a strong hierarchical and centralised organisation of society and less participatory involvement in horizontal links and "club-like" organisations. Therefore, low growth performance characterises countries where the average level of trust is low (Fukuyama, 1995).

The second view, associated with political scientists such as Uslaner (2002, 2008a; Uslaner and Brown, 2005) goes even further towards the conceptualisation of generalised trust as a moral dimension, which assesses "unconditional" values ("altruistic trust" in Mansbridge, 1999: 290). Rather than a rational attitude, in this

conceptualisation trust reflects the moral standards of society. Scholars that support the conceptualisation of generalised trust in its moral dimension, highlight the sense trust conveys of “optimism and control” (Erikson, 1968; Uslaner, 2008a: 291). It is interesting to see that in this approach, trust is referred to as “a sense of individual well-being and supportive community” (Uslaner, 2002: 34). Of relevance is the idea that meaningful life experiences should determine an individuals’ level of generalised trust, including negative events such as “a lifetime of disappointments and broken promises [that] leads to distrust of others” (Uslaner, 2002: 35). The main difference between the moral value conceptualisation and a rational view of trust is that, as a value, trust is considered stable over time and depends neither on reciprocity nor on personal interactions. People do not expect it to vary due to circumstances over time; a condition which applies only to particularised dimensions of trust (Uslaner, 2002; Uslaner and Brown, 2005)

The third conceptualisation of trust, and the one adopted in my research, involves a rational risk calculation. Trust is understood as a "rational" response to the perceived trustworthiness of others’ behaviours. It can be based on familiarity (Alesina and La Ferrara, 2002) and experience (Hardin, 2006) and it is the one that is most commonly used in economics (Dasgupta, 2009a). According to this view, social interactions and interpersonal networks that elicit reciprocity may have an effect on economic outcomes when members develop and maintain trust. Nevertheless, despite experimental games (see Berg et al., 1995; Glaeser et al., 2000), the underlying process in which trust is built (and dissipated) is empirically under-examined (Dasgupta, 2009a).

My research focused on the local level aspects involved in the forging of trust as a result of the implementation of a co-production intervention and, second, the association of trust and housing investment. Building a purposeful oriented network through the process of acquiring services in informal settlements could become an “experience”. So, trust in this case can be an “active matter” through reciprocity links in different social instances (and distances) presented in the “invited spaces” of co-production. It is argued that social interactions and face-to-face contact help in the generation of trust and reciprocity, a factor that

contributes to the reduction of transaction costs (Collier, 1998). It constitutes a key element for cooperation because promises are kept by "mutual enforcement" mechanisms for agreements (Dasgupta, 2009a). Furthermore, it enables the existence of transactions that involve a synchronicity between the purchase and the delivery of the goods. This is the case of credit schemes or the beginning of partnerships.[30] Based on these concepts the following sections present the institutional agenda based on participation and outline the association between the internalisation of social behaviours and homeownership.

5.6. PARTICIPATORY APPROACHES IN DEVELOPMENT AND URBAN PROGRAMMES

The theoretical conceptualisation of participatory approaches responds to different ideological views, often dichotomised into participation as an end in itself, supporting efficiency and effectiveness, or as a means of advocating views of empowerment and a more equitable sharing of power, particularly as regards the inclusion of the most poor or socially/politically excluded (Hickey and Mohan, 2007; Mohan, 2007). The latter also supports a higher level of political awareness for disadvantaged groups leading to social transformation.[31] Indeed, some view participation as a means to support "participatory citizenship" (Hickey and Mohan, 2007), people's potential to be "active subjects" (Taylor, 2007) and to shape the government (Morison, 2000: 119).

Although gaining a growing profile in development studies, the concept of participation is well known in urban policy. It was popularised in response to shortcomings of top-down development efforts. In the 1960s and 1970s, "community participation" ideas emerged. In the words of UN-Habitat, participation represents "the voluntary and democratic involvement of people in

[30] It is important to note that the use to which the networks are put will determine the quality of their expected effects, since other types of effects, such as exploitative or hierarchical ones (i.e. patronage, street gangs or clientelism, in Dasgupta, 2000; Gambetta, 1993) are also possible.

[31] In contrast, participatory schemes in the UK such as the 'Big Society' have been about civil society replacing the state but with no pretence to social transformation or mobility for specific groups (Ishkanian and Szreter, 2012).

the decision-making, execution and maintenance of projects which directly affect their lives" (UN Habitat, 1984: 10; also Narayan, 1995; Chambers, 1997). People were now to assume responsibility for the improvement in their living conditions, through sharing decisions and even power and finance (UNRISD, 1979). The concept and practice of participation constituted the "good practice approach" across a range of development interventions (Bamberger, 1991; Mansuri and Rao, 2004; Paul, 1987). Multilateral financed projects promoted the expansion and institutionalisation of participation into the development agenda (Paul, 1987). This mainstream approach combined several objectives: building beneficiary capacity and the sharing of costs through input of work or money; participation to better design; aid post project maintenance through users taking 'responsibility'; and raise implementation efficiency by 'crowding in' groups that might oppose programmes (see Gilbert and Ward, 1984a; Mansuri and Rao, 2004).[32]

Critiques often pointed to the tokenist "rubber stamping" or functionalist motives for participation in both development and urban contexts (Cooke and Kothari, 2001; Rahnema, 2010).[33] Participation tended to be controlled by the State or others, and rarely involved self-initiated mobilisation that disputed wealth and power distribution (Rudqvist and Woodford-Berger, 1996 in Cornwall, 2008). In such spaces, the residents' participation is support for the achievement of project objectives such as reducing costs. Even so, some observers argued that participation in itself could be empowering, regardless of the actual activity undertaken, because individuals' contributions (i.e., of labour) facilitate developing ownership and responsibility (Cleaver, 1999).

By the 1990s and through 2000s, the support for participation extended beyond projects and communities to broader "participatory development" and notions of "participatory urban governance" (Mitlin, 2004). At the same time, an agenda for social capital and poverty reduction, especially in Latin America, was framed (Fukuyama, 2002). Under the increased roles for markets within neo-liberal

[32] Titling programmes, which had not involved participatory efforts, later adopted guidelines to improve implementation and sustainability (World Bank, 2006a).

[33] Adapted from Arnstein's ladder of participation (1969), which includes non-participation, tokenism and power control; then refined by Pretty (1995) using a typology of participatory spaces.

economics, the State adopted the role of “enabler” rather than “provider”. NGOs, CBOs or GROs took greater responsibility for welfare and service delivery, and all three were understood, theoretically at least, to promote democratised and accountable practices (Chant and McIlwaine, 2009; Lewis and Kanji, 2009). Public policies have increasingly included many more and different organisations, drawing upon interaction and bonds established by residents in informal settlements and their organisations (Mitlin, 2008; Satterthwaite, 2008), as well as more formal partnerships, and with the poor as either “client’s” or “citizens” (World Bank, 2000).

Concerns have been raised about whether participatory approaches merit the support it has acquired in some development circles. Cornwall (2008), for example, notes that setting out participatory spaces may be welcome but it may not be enough as to use of them people will have to overcome a numerous constraints. Age or gender – including expectation on women to uphold productive and reproductive roles - may frame individual ability to participate (Cleaver, 1999). The poorest may lack the time or resources for effective participation, even in those programmes that concern meeting basic needs (Cleaver, 1999; but see Avritzer, 2006; Osmani, 2008 for cases of better resource allocation reaching the most disadvantaged and residents from informal settlements.

Others have raised caution about the way that some forms of participation emphasise an idealised concept of “community” that appears to possess a bundle of desirable values, forms of organisational structure and social, economic, cultural and political homogeneity (Cleaver, 1999). Consensus building and solidarity may therefore seem natural ingredients of everyday social frameworks (Taylor, 2010). Such a view refuses to acknowledge the heterogeneity and asymmetries that prevail among actors (e.g., gender or ethnic relations, tenure status, income inequalities, education etc.) and how these distinctions may influence willingness to participate and decision-making (Cleaver, 1999; Mansuri and Rao, 2004). Low levels of participation are reported in settings characterised by ethnic or racial heterogeneity, income inequality and high mobility (Alesina and La Ferrara, 2002;

Glaeser et al., 2000, 2002).[34] Existing patterns of exclusion will affect participation processes and outcomes, and participation itself may produce or reproduce further exclusion of the most vulnerable (Cleaver, 2001).

Based on theoretical and empirical concerns, the promotion of participation as a necessary but often rather vague and occasionally rather "modest" initiatives within development has provoked some observers to liken it to a "tyranny" or a rhetoric that should be abandoned (Craig and Mayo, 1995; Cooke and Kothari, 2001). My research does not set out to go support or dismiss participatory approaches per se. Rather, it takes the concrete example of participation – the co-production of services – and in the light of the above critiques considers its effects on low-income households' investment decisions and confidence in their neighbours and others across different tenure and housing conditions.

6. HOMEOWNERSHIP AND THE INTERNALISATION OF BENEFITS

Econometric studies on housing informality have been focused on the effects of formal/legal institutions on physical capital investment incentives. In contrast, the homeownership literature in urban economics explains incentives to invest as associated with the internalisation of benefits. The main arguments that explain the association between the role of homeownership and the participation in community-enhancing social capital and local goods provision are benefit internalisation through capitalisation effects and the transaction costs from moving which tend to encourage permanent residence in the property. This literature presents theoretical and empirical evidence of incentives given to owner-occupiers, rather than renters, to maintain their properties (Hilber, 2003, 2010; Rohe and Stewart, 1996). As the house is the most substantial item of wealth for a typical

[34] The economic literature shows theoretically and empirically that imbalances associated with the costs and benefits to which different groups are exposed, and the kind of internalisation of benefits, including issues of elite capture (Hildyard et al., 2001; Platteau, 2004), that income inequality can sometimes prompt greater incentives to participate (Bardhan, 2007).

household and most people's portfolios lack diversity they have a greater incentives to at least maintain property values and protect wealth from risks (Dietz and Haurin, 2003). Residents are motivated to be "home voters"; they vote in accordance with their concerns about house values (Fischel, 2005), and community enhancing investments (Di Pasquale and Glaeser, 1999; Hilber, 2010; Hilber and Mayer, 2009). They are also likely to support actions that are intended to provide either individual or neighbourhood benefits (Rohe and Stewart, 1996), prevent free riding (Di Pasquale and Glaeser, 1999; Hilber, 2010; Hilber and Mayer, 2009) and encourage reciprocal cooperation and trust that reinforce social capital build-up (Di Pasquale and Glaeser, 1999; Hilber, 2010).

To some extent, homeowners are described as "better citizens", when compared with renters, because of homeownership's potential to elicit greater community-enhancing social capital investment incentives (Di Pasquale and Glaeser, 1999). The empirical evidence shows that in the USA, homeowners are more likely than renters to engage in local activities and participate in voluntary organisations. Di Pasquale and Glaeser (1999) found a positive correlation between homeownership and votes in local elections, involvement in the solution of local problems or being acquainted with the head of the school board, all of which is recognised as community-social capital enhancement.[35] In contrast, renters do not have such incentives since they are not able to reap the benefits from increased house values because they may be forced to pay higher rents.

Permanence is often raised in the economic literature as an argument for homeownership investment incentives. Homeowners differ from renters because of their greater permanence, which is prompted in part by greater transaction costs they must face for purchasing elsewhere and vacating the house (Haurin et al., 1996; Rohe and Stewart, 1996). This stability argument, explained in Dietz and Haurin (2003), sees transaction costs as the major barriers for mobility that homeownership rights create (Di Pasquale and Glaeser, 1999; Dietz and Haurin,

[35] Evidence indicates that homeowners are more likely to be involved in local political activities (Rossi and Weber, 1996) and more committed to their neighbourhood (Austin and Baba, 1990). In addition, the high level of social capital of homeowners helps them raise their children better (Coleman, 1988, 1990).

2003). Such enhanced permanence in the neighbourhood, elicits a greater willingness to invest in building relationships, and increases their involvement in the activities of the neighbourhood.

This means that “permanence in the neighbourhood” is a highly significant fact to explain homeowner’s involvement in community efforts. Therefore, the direct effects of a greater involvement in social and political affairs attributed indiscriminately to homeownership requires nuance. A great part of the positive influence of homeownership in the formation of community-enhancing social capital occurs because, in such markets, homeownership increases permanence (tenure). Both Di Pasquale and Glaeser (1999) and Aaronson (2000) isolate the stability effect of homeownership affecting households’ behaviour. Di Pasquale and Glaeser provide causal empirical evidence, stating that “a significant fraction of the effect of homeownership occurs because homeownership is associated with longer community tenure” (1999: 383). Importantly, the authors have argued that any limits to a resident’s mobility may cause similar effects to those of homeownership: increasing the level of investment in community-enhancing social capital and the voluntary participation in the provision of local amenities. This factor can be associated with the low residential (social) mobility that is specific to residents in informal neighbourhoods.

Empirically, there are still some concerns related to the robustness of econometric methodological approaches and whether these results can be generalised to different housing markets. First, establishing causality through longitudinal data, including before and after observations, has led to doubts over some of the findings. For example, longitudinal data has indicated that homeowners are more likely to participate in neighbourhood and block associations, but not in other types of community organisations (Rohe and Stegman, 1994), and an experimental, empirical identification strategy found no impact of homeownership on social capital or on local amenities (Englehart et al., 2009).

Second, this strand of the urban economics still has to address the differences in housing markets, which would provide meaningful differentials to the

homeownership analysis. One of the few findings about the distributional effects concerning different income groups in formal markets provides evidence of a minor impact of homeownership on the social capital investment made by residents who are at the bottom end of the income distribution. Therefore, for low-income people, when compared with those on high-incomes, homeownership has no influence on organisational membership (Di Pasquale and Glaeser, 1999). Speculatively, therefore, we might propose that low-income residents who 'own' informally might participate as much as better-off homeowners in formal.

The homeownership issue also involves two contextual features that need to be considered in relation to individual, social and physical investment. First, is the presence of "neighbourhood effects" affecting individual investment decisions, an argument discussed and reviewed by Dietz (2002) and Haurin et al. (2002). There is evidence of local homeownership rates affecting individual investment in the provision of amenities (i.e., such as gardening). Peer pressure and neighbour-to-neighbour monitoring explain the greater individual provision of local amenities when homeownership rates are high (Hilber, 2003). As with other studies of social capital investment, socio-demographic heterogeneity can support or constrain individual incentives to participate or to invest in community efforts, unless the benefits of such efforts offset their costs (Alesina and La Ferrara, 2000, 2002).

Second, housing transformations may be influenced by neighbourhood effects. Ioannides and Zabel (2008) found that housing improvements can be partly down to individuals following the behaviour of their neighbours. This neighbourhood effect has also been acknowledged by Park (2008) in his study of the determinants of housing valuation, where he argues that the decision to make improvements is influenced by the attitude of neighbours, imposing both costs and benefits in terms of real appreciation of properties. The trends and attitudes of neighbours can influence the way people make decisions about their own houses. In this case, the resident's decision to invest in his/her house may be affected by improvements in the neighbourhood, which provide an indirect measure of trustworthiness in the neighbourhood development.

What can we take away from these studies that might be relevant to a study of investment in Buenos Aires under conditions of informality, service deprivation, and social and economic exclusion? Broadly, the benefits attributed to homeownership, materialised in greater investments in community-enhancing social capital, are not considered in empirical studies of informality. Indeed, the permanence in a place over time, a characteristic situation of most informal, commercial settlements, may, without the need of holding any legal title, cause effects on the type of incentives for investing in community-enhancing social capital. These effects may be similar to those attributed to having low residential mobility due to high transaction costs in formal housing markets. As a consequence, residents' involvement in participatory efforts might not be correlated to the presence of formal titles. Rather, it is possible that support for neighbourhood enhancement is associated with the internalisation of benefits that residents might obtain from their involvement. The "property rights effect" is extended to include the social dimension whereby tenure conditions associated with informal ownership motivates housing improvement.

Nevertheless, conditions "on the ground" are more complicated with informal settlements covering a range of different occupancy arrangements – from full rights ownership, rental to rooming – and property holding that ranges across legal to 'illegal' occupancy. The following section outlines the range of empirical studies on the relation between property holding and physical investment under broadly 'informal' conditions. I raise conceptual and methodological issues.

6.1. TENURE SECURITY IN EMPIRICAL STUDIES

Academic debate about the legalisation of land tenure initially focused on rural land, and mostly centred on agrarian institutions in developing countries. Most of these studies are based on the legal aspects of institutions and none of them considers infrastructure and property rights together (Deininger and Feder, 2008; Durand Lasserve, 2009). The literature in economics has examined collective action and cooperative efforts in rural communities, based on the management of common-pool resources and the provision of public goods (Baland and Platteau,

1996; Bardhan, 2000; Ostrom, 1990). Theoretical and empirical studies have additionally provided evidence on institutions or “rules of the game” to encourage cooperative actions. Among them, well-defined rules specify the costs and the benefits, and there is a well-balanced match between the share of the costs/expenses and the share those beneficiaries undertake individually (Baland and Platteau, 1996; Ostrom, 1990). Socio-demographic characteristics determine the incentives and constraints to cooperate; richer agents tend to play a leading role in collective action (i.e., taking the initiative in the mobilisation of labour to manage common lands and in undertaking of measures of conservation), since their internalisation of benefits will be greatest (Baland and Platteau, 1997: 452).

The conceptualisation and measurement of tenure security and insecurity in empirical studies forwards two considerations. First, there is a focus on the number of rights that are held or, second, on the presence or absence of key land rights, such as the right to alienate. For example, the conceptualisation of security in the economics scholarship on informality has been constantly related with the possession of registered title deeds (Feder et al., 1986), or to the legal evidence of rights (Deininger and Feder, 2008); security is therefore generally seen as only involving legal rights. On many occasions, the lack of a legal title is matched to tenure insecurity, not considering other informal sources of rights that may provide tenure security (but see Migot-Adholla et al., 1991 for a more flexible definition of security).

Importantly, transferability may be valuable to increase the ability to transact and to obtain some benefits, and this attribute of legal titles is not substituted by other specifications of the bundle of rights. Yet, several empirical studies on rural property have found that even limitations in transfer rights do not affect investment decisions and productivity (Place and Hazell, 1993). Even where rights are in dispute, physical investment in the house may also be a driver to achieve greater security (Sjaastad and Bromley, 1997; Brasselle et al., 2002). This means that households may increase the security of their bundle of rights through their investment. Furthermore, social networks and patronage are linked to the rights

held over land and resources. Thus, security will be contingent on the residents' participation in the relevant networks (Berry, 1993).

In contrast, the literature in urban studies presents a different approach to tenure security. Many scholars are inclined to define irregular-informal tenure as a continuum involving different rights (Razzaz, 1993; Payne, 1997, 2000, 2001; Fernandes and Varley, 1998; Varley, 2002; Durand Lasserve and Selod, 2009). This vision is based on the anthropological literature from Peattie and Aldrete-Hass (1981). Rather than a discrete choice, the notion of rights is based on a spectrum of choices that depend on idiosyncratic circumstances. The continuum ranges from the most informal, such as rights of possession, to full ownership when land has been registered and is protected by a legal title. Other tenure categories are more limited in the bundle of rights enjoyed in relation to the use and transaction of the land and the house. According to this view, a proxy for security is described as a group of several elements that contemplate the duration and assurance of rights (Place et al., 1994), such as freedom from external interference, use value, and the aptitude to internalise the benefits of labour and capital investment that is done.

The ideal experimental setting allows for a comparison of residents enjoying equal security in their rights. In my research the neighbourhoods considered only differ in the provision of services through the exogenous allocation of the co-production intervention, while residents enjoy a sense of security provided by the original ownership of the land. In most cases, residents have rights over what is built on the plot. Furthermore, informal developers have often been paid for the plot, in an informal commercial subdivision. As a result, residents consider themselves owners because they have certainly assumed the monetary cost of such a transaction.

7. CONCLUSION

This Chapter has outlined four issues that are central to this thesis. At the start, it underlined the informal neighbourhoods' consolidation challenge and elaborates points that contribute to frame the scope of my research. One is the qualitative

housing deficit and the way in which institutional approaches to urban policy consistently failed to include housing improvements. It also underscores informal neighbourhood consolidation as a specific issue that deserves particular attention, despite the legalisation of rights and the upgrading of urban layout. The second issue is the un-serviced dimension of informality. Services are essential for house and neighbourhood consolidation. The relevance of this point is obscured by the strength given to the legal view of informality in literature. Hence, services are presented in this thesis as a missing topic in informality studies, which are more typically centred on formal legal institutions effects on physical investments. The thesis gives new strength to services key role to support house and settlement consolidation efforts, includes them paralleling the legality and tenure security determinants for investments, and provides some clues that will allow for an assessment of the effects on informal neighbourhoods.

The third issue underlined in this chapter is the institutional changes in urban public policy that generate opportunities for the rise of new mixed market/social institutions, such as services co-produced interventions. Importantly, this means that service provision subverts mainstream legal views of informality in public policy, when services are only provided to formal (legally) urbanised areas. The new institutional approach to co-production brings together privatised utilities requirement for extending commercial opportunities to new markets and the – unattended and long-standing – service demand in informal urban settlements that municipal government cannot afford alone. Importantly, it collects the impetus of participatory approaches in development policy, to reformulate the mainstream view for service provision through residents' contribution to finance and implementation.

Finally, the chapter outlines some theoretical arguments that extend the formal institutions approach to residents' investments, calling for widening the conceptualisation of institutions that frame resident's incentives in two ways. First, it provides conceptual arguments to extend the internalisation of benefits from the legal strict considerations to capitalisation, emphasising the relevance for formal and informal institutions and the broader internalisation of benefits from

investments. This discussion bridges research in urban economics and development studies. It outlines some conceptual matters from “homeownership” in urban economics that stresses the importance of internalisation of benefits as drivers for social capital and physical investments. In this way it underlines the association between the social and physical dimensions of investment. Importantly, it challenges the definition of informality made in legal and property rights frameworks that conceptualise the household’s internalisation of benefits motivation for physical and social investment, at the time when services are co-produced in informal settlements.

CHAPTER 3: THE PHYSICAL AND SOCIAL DIMENSIONS OF HOUSING INVESTMENT

1. INTRODUCTION

Chapter 2 outlined the gaps and controversies in the knowledge base related to urban informality. Whereas that chapter focussed on shortfalls of existing evidence, this chapter considers ways to construct robust research on investment in informal settlements. It considers the physical and social dimensions of investment, and sets out to frame the association between them. The argument is built around three key points.

First, the essential determinants of physical and social investment based on the residents' internalisation of benefits require extending the bundle of rights from a strict legal consideration. Security may be one driver for investment but services also contribute. Second, the provision of services introduces the internalisation of savings obtained from the substitution of lower quality and highly expensive alternative energy sources, increasing the use value for those that obtain the connection to the grid. Moreover, both those connected to services and non-participants will benefit through capitalisation from neighbourhood transformation. Third, the low mobility characteristic of residents located in informal neighbourhoods may constitute a strong motivation for social investment that is equivalent to ownership, following the theoretical conceptualisation framed by the homeownership urban economics literature.

In order to identify the social and physical dimensions of household investment, and the potential of co-production, the chapter addresses three groups of effects: i) participation and effective enrolment, ii) trust and collective capacity and iii) housing transformation and its association with services and trust.

2. FRAMING THE INVESTMENT INCENTIVES

The emphasis given to legal formalisation or upgrading approaches suggests that policymakers and academics do not have a single policy vision. From one viewpoint, conventional institutional wisdom grounds the causal association between legal title and security as encouraging housing transformation (Galiani and Schargrodsky, 2010; Jiménez, 1984; Malpezzi and Mayo, 1987). From the other, the strength of property rights as a requirement for investment is challenged. Development studies emphasise that tenure security is at least equally relevant in driving transformations (Doebele, 1987; Razzaz, 1992). Instead, security of tenure may be a precondition for investment but does not have to be interpreted as legal title (Payne, 2000: 6). The provision of infrastructure may boost housing transformation and progressive upgrading (Hirschman, 1984) as well as improve people's quality of life (Amis, 2001). Strassman found evidence that the earlier infrastructure is acquired, the more likely other improvements will follow immediately (1984: 744). But, it is not well identified whether tenure or legality of rights affect physical investments when a service connection is offered.

As outlined in the previous chapter, co-production of services is considered in the literature to be more than an instrumental framework. Rather, it allows for the provision of services by underlining the requirement for resident and local organisation participation to facilitate programme implementation (Mitlin, 2008). Therefore, besides the efficiency in service provision, it affects the social organisation of the urban poor (Almansi et al., 2010; Hardoy et al., 2005; Mitlin, 2008; Satterthwaite, 2008). It is argued that learning to work with other organisations within the neighbourhood strengthens civic engagement, where organisations channel citizen needs, even functioning as political actors (Moore, 2003 in Mitlin, 2008). As a result, the participation of residents and their organisations under efficiency objectives goes beyond the enhancement of civil society skills for "collective practice" (Abers, 1998; Mitlin, 2008).

Little is known, however, about the incentives faced by actors to become involved with co-production in conditions of informality. Importantly, we do not know

whether incentives to invest in community-enhancing social capital differ in cases where residents hold different tenure status. This study underlines the savings from substitution effects as a driver for enrolment in a co-production programme. The suggestion from my research is that (exogenous) change in social distance introduced by CPSI may further reciprocity, which facilitates trust-building in two different spaces and levels of interaction. First, interactions with neighbours, local associations, and within the family, where obligations turn from personal and moral to economic, where there is a strict (tacit) obligation to repay (Sahlins, 1974). Second, exchanges in wider social spaces, with unknown others, such as the municipal public sector or the utility firm, where links and exchanges among those involved contribute to the construction of new knowledge across institutional boundaries (Mitlin, 2008).

3. PHYSICAL INVESTMENT AND THE SERVICES EFFECT: BETWEEN LEGALITY AND SECURITY

A key concern is whether "legality" is important to the determination of resident's behaviour towards investment. On the one hand, some approaches reduce the notion of settlement consolidation to a legal dimension based on the promotion of property rights. This approach is characterised by a strong conceptual boundary between what is legal and illegal. Transformation of a settlement will be most effective when illegal tenure status is changed to legal (Azuela and Duhau, 1998; Jones and Ward, 1994; Varley, 1985, 1987, 2002). This view also assumes that a "virtuous" status of citizenship will arise from the allocation of full legal rights. But, on the other hand, scholars have questioned whether a formal, legal title is necessary, citing evidence that residents improve their homes even without legal ownership (De Souza, 2001; Gilbert, 2002; Gilbert and Ward, 1985; Payne, 1989; Razzaz, 1993; Varley, 1987). That is particularly true when "informal sources of rights" confer many of the same advantages as formal rights (Lanjouw and Levy, 2002:986). The issue of documents such as certificates of use or receipts of purchase for example can give a sense of security (Payne, 2001: 421). The mode of

land access and the length of occupancy may also generate a sense of security, even in circumstances where time does not bring formal rights (Durand-Lasserve and Selod, 2009; De Souza, 2001; Friedman et al., 1988: 196; Payne, 1989: 44; Van Gelder, 2009). Government actions, such as the provision of services, can reinforce the notion of security (Arnott, 2008). Investment, therefore, depends less on exact legal status and more on settlement characteristics and contextual factors (Gilbert, 2002; Payne, 2002; Van Gelder, 2009).

Taking these proxies for security in to the study neighbourhoods, data from the fieldwork show 77 percent of residents declared ownership of the house and plot, two percent defined themselves as renters, 19 percent as informal 'owners' (including owners of the house only and occupants with permission of owners), and four percent described their status as squatters (occupants without permission). A self-declared ownership status does not indicate the legal condition of the house. Only 34 percent of the residents that declare homeownership have a title deed as proof, while 40 percent possess a conveyance document[36] or a receipt, and six percent of houses have been granted legal titles through a regularisation programme. Many residents hold conveyance documents, receipts, or other undefined claims to rights that may have originated from informal transfers. Exceptional cases are related to the undivided domain of rural plots never registered as formal subdivisions, which include two percent of the houses. Only vacated plots or those shown as abandoned are occupied by squatters, who certainly enjoy less secure rights. Finally, 17 percent of the housing units do not have any document as a proof of their tenure status.[37]

3.1. PERMANENCE OF RESIDENCE

Informal settlements in BAMA are characterised by relatively low rates of mobility. Based on 2006 residence survey data, the population of the study settlements is shown to be stable: the mean value for length of permanent residence is 18 years.

[36] Preliminary purchase agreement of their housing unit, not legally registered.
[37] All data refer to 2006.

More than one-half of respondents (53 percent) had been living in the neighbourhoods for more than 15 years and 24 percent arrived more than 30 years ago. Fifteen percent were newcomers who arrived in the last five years, adding to the reproduction of informal patterns of tenure as these transactions usually took place outside formal rules (Galiani and Schargrodsky, 2012). In terms of the housing age, most were built over 15 years ago (64 percent), 28 percent were built between six and 15 years ago and eight percent were built within the last five years.

The low mobility (high permanence) of the households is determined by the improper operation of the market segment, which means low elasticity of housing supply, high transaction costs when somebody does need to move. The experiences from elsewhere in Latin America underscore that even when residents hold legal rights to property; the likelihood of leaving the neighbourhood remains relatively low. Over time residents consolidate their own homes, adding rooms or new units, which may be used for housing grown-up children staying with their families, or tenants (Ward et al., 2011b). In Latin America, and in Argentina also, homeownership provides security for old age (particularly in countries with weak pension systems); a hedge against unemployment, sickness, and other risks of the low-income environment; and the most important financial legacy from one generation to the next (World Bank, 2007). Later, a household will aim to pass the house, in whole or parts, to the next generation (Ward et al., 2011b). If consolidation has been successful then residential mobility may be affected by the high relative values (prices) compared with real incomes of potential buyers, making a property difficult to sell (Ward, 2012b).[38] A house, therefore, might represent a household's most important asset but it is often an asset that is hard to capitalise.[39]

[38] The level of turnover in informal settlements in the cities of Colombia and Mexico was assessed by a longitudinal study comparing data from the 1970s, collected as part of a previous study (Gilbert and Ward, 1985) and 2007. The data showed that over 80 percent of the original families still live in the same plot as when they arrived (Ward, 2012b).

[39] In many Latin American cities, the first generation of irregular settlers has succeeded in forging valuable assets through subsequent undertakings that extended over one generation of the residents' life (Ward et al., 2011b).

Among the housing characteristics of the neighbourhoods studied, there are 1.25 housing units per plot, and one plot can hold up to six housing units. Plots, therefore, had been subdivided and multiple family members shared the same plot. There are 4.6 family members per housing unit, the average number of rooms is two (a minimum of 1 and a maximum of 8) and 29 percent can be classified as overcrowded if compared with Unsatisfied Basic Needs (UBN) indicators. Nevertheless, housing quality is good - using the definition for housing type from the census (INDEC, 1984) - 87 percent of housing units are 'satisfactory', five percent are precarious (*ranchos*) and eight percent are shacks (*casillas*).[40]

3.2. FINANCE AND ADJUSTED BEHAVIOUR

Progressive housing faces many financial constraints (Datta and Jones, 1999). Studies emphasise the efforts that are required for securing the plot and then construct a house when mechanisms for credit are limited and probably non-existent (Datta and Jones, 2000). The upfront costs that may be charged with the potential introduction of services, therefore, can distort investment behaviour. As discussed in the urban economics literature household behaviour may be 'adjusted' to the predicted impact of a planned investment (Haurin et al., 1996; Dietz and Haurin, 2003). For example, prospective homeownership distorts saving rates and/or consumption of other goods (Engelhardt, 1996), and it may increase labour supply (and amount of hours worked) and increase female labour supply, before or during the year of purchase (Haurin et al., 1996; Dietz and Haurin, 2003; Higuchi, 1980). Therefore, it seems reasonable to expect that a decision to invest in the provision of public goods – in settlements that lack services at their foundation - may have an effect on other household decisions, especially on housing expenditures. Programmes which require a financial contribution may motivate an 'adjustment' in behaviours. Such adjustments may distort the cycle of housing transformations and lower participation in activities at the time such interventions are promoted.

[40] Based on own data (2006).

The judgement on investment behaviour, however, is more subtle than the above discussion at first pretends. Studies have documented that the poorest families living in neighbourhoods lacking basic infrastructure services must assign a significant proportion of their income to the acquisition of substitute goods (Estache et al., 2001). Consider the example of a prospective installation of a gas network to settlements in BAMA. Many households faced relatively high prices for bottled gas despite a programme called *garrafa social* ('social' gas, or bottled gas) which sets a special lower price for gas consumption; it is still more expensive and delivery is uncertain. Costs mean households can afford to eat only one hot meal a day, with all the consequent impacts that this can have on nutrition and health. Hence, the idea of the co-production programme was to induce households to finance their connection to the gas network with savings generated from the substitution of bottled gas consumption with the new lower-cost network gas. The programme established that once housing units were connected to the new service, they should pay a monthly amount similar to the previous energy bills so that funds in excess of costs would finance the capital expenditures of the network expansion.[41]

The savings are significant. A first insight indicates that for families connected to piped gas through the programme, the cost represents an average monthly reduction of 35 percent in gas expenses, only from substitution of the bottled gas used for cooking, without including other uses such as heating and hot water. For families connected to piped gas, the cost of this service represented 1.9 percent of total household income, whereas for families that were not part of the programme, the cost of bottled gas represented 5.2 percent of total monthly household income. Not only is the replacement of the bottled gas with the new energy source paid for with the savings generated by the substitution, but future savings derived from the substitution may provide possibilities to internalise savings as home investments. The research considers to what extent residents benefit from savings provided by connecting to natural pipelined gas, regardless of tenure.

[41] These resources were deposited in a dedicated fiduciary fund which was administrated by a board on which neighbourhoods, the FPVS and the gas company had representatives.

4. THE SOCIAL DIMENSION AND HOUSEHOLD INVESTMENT

The point of departure for this section is the proposition that we do not have a theory to explain the social dimensions of household investments in informal settlements. As noted in Chapter 2, research suggests that homeowners are more involved than non-homeowners in neighbourhood activities and community affairs. And as discussed above, capitalisation effects may encourage public goods provision, at the same time that residential permanence, due to higher transaction costs of moving, explains the internalisation of benefits from investment. The section explores the incentives that determine people's intervention in participatory and trust-building efforts.

4.1. PARTICIPATORY INVOLVEMENT IN INFORMAL SETTLEMENTS

The Latin American literature outlines a long but uneven history of participatory efforts in informal settlements. Studies referring to the 1960s described widespread collective and individual efforts to improve quality of life (Portes and Walton, 1976; Goldrich et al., 1970 in Gilbert and Ward, 1984b). Later studies, however, showed lower levels of participation than expected (less than two-fifths of the residents were actively involved) (Gilbert and Ward, 1984b. Nevertheless, it is possible to discern how the internalisation of potential benefits supports residents' involvement in participatory efforts.

First, there is a marginal calculus of success that drives efforts. This calculation will be affected by the perceived role of the State in the provision of services. There was no need for mobilisation to put pressure on the authorities in Bogotá or Santiago de Chile, for example, where the public sector has a history of support for service provision regardless of tenure conditions.[42] Residents are also much less likely to contribute to finance services when the public sector should be responsible

[42] Nevertheless, water, electricity and sanitation were not provided in Bogotá's settlements unless residents paid over 30 percent of the cost to the respective delivery agency (Gilbert and Ward, 1984b).

for their provision (Gilbert and Ward, 1984b). Hence, the nature of the State will affect residents' predisposition to either assist the State through contributing to finance co-produced services or to substitute for the State by their own means.

Second, people's individual considerations, such as tenure status, may affect participation (Gilbert and Ward, 1984a, 1984b), although the studies only discriminate between owners' and renters' preferences. As will be explained later, the level of inequality or heterogeneity within a settlement (i.e., in terms of income or nationality) affects the individual cost of cooperation, making reaching agreements less predictable. Third, the provision of services is a determinant for resident participation. Demand for water and electricity generally increase levels of participation, for example attendance at community meetings, provision of labour or lobbying officials (Gilbert and Ward, 1984b). Fourth, tenure plays an important role (see Lall et al., 2004: 20). The literature indicates that improvements will be capitalised in the price of the house, which benefit owners rather than renters (Durand-Lasserve et al., 2009). Hence, renters have few incentives to participate to gain services that benefit owners. But, as 'ownership' in informal neighbourhoods refers to a bundle of rights, each household is likely to internalise the benefits from service co-production in different ways.

The contribution of the research in Buenos Aires is to assess empirically effective participatory involvement, rather than willingness to participate, and the financial contribution of residents. The study considers tenure but also seniority (measured by length of residence) as contributing factors to participation. Recalling the point that high transaction costs involved in moving may be a good reason for residents to support community-enhancing social capital, and invest in neighbourhood improvements, allowing the benefits of savings to be capitalised in the house.

4.2. THE UPS AND DOWNS OF PARTICIPATORY EFFORTS

The argument emphasising the internalisation of benefits from participation may be traced by analysing the cyclical trend for residents' involvement. This literature

argues that situations are highly dynamic, and either involvement in, or indifference to collective efforts may alternate at different stages within the same community (Mangin, 1970). Portes and Walton (1976) state that community participation does not exist in a continuum and either phases of interest and willingness to collaborate or periods of "individualism and apathy" are identified (Gilbert and Ward, 1984b; also Cleaver, 1999; Mansuri and Rao, 2004).[43] Importantly, studies have acknowledged that involvement in community efforts and mutual contributions weakens, and even disappears, once tenure status is secured and an acceptable level of services has been achieved (Varley, 1987). It is at that point that individual investment in the neighbourhood, in terms of time or money, becomes elusive, and residents focus on upgrading their own house (Gilbert and Ward, 1984b).

These observations underscore the relevance of following the analysis through the stages of programme implementation. Indeed, although sustained involvement of the residents may not be common, a relative interest in collaborative efforts (i.e., for the improvement of services) may remain. Two types of participatory efforts are central to CPSI. Residents' involvement includes devoting their time and even labour, but they are also involved in the co-financing of the project. Some co-production theorists such as Ostrom, point to a low opportunity cost in using local "underutilised" resources, such as knowledge, skills, and time of the residents, for the creation of valued public outputs (i.e, infrastructure and services) (Ostrom, 1996: 1080). Such ideas are liable to over-appraise residents' availability, over-emphasising residents' time and energy to gather and process all the information that is needed. These resources are usually constrained by obligations and duties. In short, participation is not cost free (Banerjee and Duflo, 2011: 218).

The decision to be involved is not a simple one. First, self-employed residents who work on a casual basis (i.e. temporary employment) are not able to count on a reliable and regular monthly income. This lack of predictability of constrains the ability to make long-term investment decisions and obliges careful judgement

[43] The decline in community participation over time may not be inevitable. During the 1980s, neighbourhoods in Mexico where leadership and left-wing ideals were strong allowed high levels of participatory involvement (Gilbert and Ward, 1984b).

whether they will be in work when commitments have to be paid (Banerjee and Duflo, 2011). Second, investment implies a trade-off, where individuals have to re-allocate their resources and time from other activities. The ability to trade-off or combine participation and domestic duties will be especially onerous on women (Chant, 1996, 2007; Varley, 2007). Finally, any long-term commitment jointly shared with neighbourhoods involves the presence of caution and risks, when a diffused reciprocity is turned into a balanced one, with strict economic obligations substituting for moral ones.

4.3. THE COLLATERAL BENEFITS OF CO-PRODUCTION: BUILDING COLLECTIVE CAPACITY AND TRUST?

"Co-production builds on social relations" and practical collaboration among people, their organisations and the public and private sectors (Mitlin, 2008: 358). According to Mitlin (2008), "co-production offers a chance to address systemic weaknesses in service delivery to identify new solutions that support local democratic practices as well as improved services". Co-production, therefore, suggests possibilities for efficiency in service provision and the beneficial effects on "social infrastructure" that drives a process of democratic participation and representation (Mitlin, 2003; Muller and Mitlin, 2007).[44] Unlike conventional public-client arrangements, co-production promotes a reciprocity model.

Two forms of reciprocity are potentially nurtured in co-production activities. First, bonds among the residents are supported by encouraging participation in activities dealing with daily local needs. This facilitates the construction of further links between residents (Abers, 1998: 524; Bovaird, 2007: 856) and with local organisations (Mitlin, 2008: 358). The engagement means that "practical" purposeful interactions elicited by the institutional framework may be considered facilitators for the building of more robust bonds among residents with community-based local organisations and NGOs (for example, at local events) which are not within the realm of political activism, but driven by a genuine goal of

[44] Others have been more suspicious about participatory benefits as a path for a "growing control by poor people over the resources and institutions that determine their quality of life" (Gilbert and Ward, 1984b:921).

neighbourhood enhancement. As one resident commented when the Argentine president visited the neighbourhood at the start of the installation works:

> [President] *Kirchner*['s presence] *might have given a little push for this to get completed or to say "do go ahead with this". With or without Kirchner, this would have been done the same. The benefit is for us, white, black, Catholic or Protestant, Peronist or whatever; this is a good for everybody in general* (Maria P., 2006).

A second form may involve new spaces of interaction facilitated by the scheme.[45] Organisations play a key role, not only to support the needs of residents, but also to "legitimise the potential contribution of their members in State programmes through demonstrated capacity" (Mitlin, 2008: 349). Consequently, some form of "collective capacity" develops and is supported by the consolidation of local organisations, which represent resident interests. Activities organised with local organisations should lead to other activities where the existing built-up capacity is used (Almansi et al., 2010; Mitlin, 2008: 349), supporting the sustainability of efforts.[46] The literature emphasises the importance of such participation in contexts of distrust of political parties (Abers, 1998: 526) or a lack of political activism (Bovaird, 2007: 856).

The evidential support for these claims – including in Buenos Aires - have mostly relied on qualitative insights (Paladino and Blas, 2005a; Forni and Coniglio, 2003; Mitlin, 2004; Zavalla Lagos, 2005).[47] My research takes a more structured and quantitative approach. Nevertheless, it is useful to consider how resident actions can create trust, the dimensions of that trust and its sustainability once the intervention has ceased.

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[45] It is argued that the nature and depth of an active, collective organisation also elicits a positive response from politicians who need support – and votes – from groups that are neither politically aligned nor secure (Mitlin, 2008).

[46] Resident engagement in co-production goes beyond its functional aim. It also contributes to a "progressive social change", by which residents become aware of the relevance of their contribution and involvement (Mitlin, 2008: 358).

[47] In this view, co-production is a novel approach to service provision in environments where deficient infrastructure settings added to the lack of attention of the public sector to people's most pressing needs have led to high levels of distrust (Paladino and Blas, 2005: 2).

4.4. DETERMINANTS FOR TRUST

The best-known work on trust in the social sciences is Sahlins's *Stone Age Economics*. Sahlins (1974) identified three types of links in reciprocity (generalised, balanced and negative), each with differentiated social distances between actors and motives that varied from moral to economic. For the research in Buenos Aires, generalised and balanced reciprocities are the most relevant. Generalised reciprocity implies a tight social group where a flow of resources or gifts is shared. Obligations are moral rather than economic, and so are diffused. In contrast, balanced reciprocity is introduced by the CPSI. It involves equals who have a strict (tacit) obligation to repay through exchange. These obligations are less personal or moral than within generalised reciprocity. Knowing others in the group is not as important, making these groups less intimate and much more analogous to a wider social space.

Detailed empirical evidence of the determinants of generalised trust are provided by Alesina and La Ferrara (2002), using individual level data from US localities. Importantly, survey measures of trust are associated with individual and community characteristics. Although I acknowledge the different contexts for residents living in formal areas of cities and residents resorting to informal housing, the general aspects of their analysis provide a valuable insight into the topic. Importantly, among those determinants, familiarity, reciprocity and experiences are mentioned as significant for trust behaviours.

First, the "familiarity-reciprocity" argument refers to the degree of social interaction as a predictor for the level of trust among individuals. The essence of this notion is that, in common parlance, "familiarity breeds trust" (Coleman, 1990) and social interactions in general –that is, not necessarily through joining a group – may help promote trust (Putnam, 2000). Experimental games have validated these studies, finding that familiarity and increased interactions can build trust (Greif, 1993; Glaeser et al., 2000; Karlan, 2005; Feigenberg et al., 2009).

Second, membership of a group, by virtue for example of race or gender might affect trust. People who have been discriminated against, particularly, the

"economically unsuccessful in terms of income and education", may have reduced levels of individual trust (Alesina and La Ferrara, 2002).

Third, community homogeneity, particularly ethnic and income (Alesina and La Ferrara, 2000, 2002; Putnam, 2007; Rothstein and Stolle, 2008), are associated with the levels of trust.[48] Inequality should discourage trust because individuals are less likely to perceive a "common stake" with others or share "common values and norms", which makes it harder to ''predict'' others' behaviours (Hardin, 1992).

5. EXPLANATIONS AND PREDICTIONS

5.1. PROGRAMME SEQUENTIAL IMPLEMENTATION

As was explained at the end of Chapter 1, the empirical strategy in this study is based on a natural experiment. Three groups of neighbourhoods were selected for the field research. Two are identified by the CBO created to manage the gas network extension programme: Comunidad Organizada (OC), also referred to as Group 1, was offered and connected to the network; Union de Vecinos en Accion (UVA), Group 2, was offered and accepted to join the programme but was not connected at time of the research. The programme had not been implemented in Group 3, the control group, therefore had no dedicated CBO and is referred to by the general area name, Primavera.

In order to explain and justify group selection it is helpful to describe the chronology of programme implementation and to explain the hypothesis for programme outcomes. The implementation of the programme has two phases. Phase 1 is the initial stage of implementation and corresponds to the moment when the exogenous source of variation in social interactions is introduced. This stage is "the social interactions phase" when neighbours interact and have to organise themselves within their block in order to reach consensus on whether to

[48] Although ethnic origin and religious beliefs per se do not have a significant effect on trusting behaviours (Alesina and La Ferrara, 2002).

participate in the programme or not. Enrolment can only happen if more than 65 percent of housing units in each block decide to be part of the "connection phase", which means fulfilling all the necessary requirements in order to get the service.[49] The 65 percent cut-off means that in Phase 1 social networks and bonding activities play an extremely important role. In terms deployed by Sahlins, there is a shift from "generalised reciprocity" among neighbours, where obligations are moral and "diffuse" (not time-restricted), to a "balanced reciprocity" between structured equals who are involved in exchanges and assume strict (tacit) obligations to repay. Obligations are now economic rather than personal and moral.

In addition, this stage involves interactions in a wider social space, building networks with less intimate groups, such as neighbourhood organisations and NGOs, where gathering the right information to make decisions with less-well-known parties are vital. The provision of information through social interaction may help develop trust. In some short, qualitative interviews complementing the fieldwork, people talked about their initial fears at this stage, mostly concerning the sharing of private information and giving property documents to other neighbours who were in charge of the programme administrative duties. People expressed a sense of vulnerability based on the difficulties of predicting what other people's behaviour would be like.[50]

In Phase 2, the connection to the energy grid became effective and participant households were provided with a domestic service. The outcomes at this stage of "complete experience" were related to the benefits associated with having gas -- health and nutrition conditions were set to improve along with comfort due to better indoor temperature control and quality of the air. At this point, residents not only started using the service but also had to make payments for the connection and consumption, and it is now that people expected to benefit from the significant savings in service costs. In essence, the ability to realise these savings would

[49] In addition to the minimum number of residents that should be enrolled in each block to get the service, enrolment requires the completion of a set of documents by each adult dweller (FPVS, 2004).

[50] The types of informational problems involve in unobservable actions, such as moral hazard, hidden information, or adverse selection (Dasgupta, 2009).

provide the means to consolidate their housing progressively: the greater, more obvious and more timely the savings, the greater the expectation of improvement. One can propose the hypothesis that a high degree of participatory involvement is to be expected in Phase 1 of the programme when social interactions and the gathering of information occur. But, reciprocity and trust triggered by the programme might take longer to appear, and be less easily quantifiable, and expected outcomes in terms of housing improvements might take considerable time to be measurable. Hence, the research design included a longitudinal dimension to gauge programme effects four years after the energy connection was obtained.

5.2. PARTICIPATION

We might expect to see differences in participatory involvement between residents located in neighbourhoods where the co-produced programme is implemented, Group 1, and those in the control group neighbourhoods. Individual participation, however, is likely to be affected by the ability to internalise (expected) benefits, and this will vary according to implementation stage, individual determinants and contextual effects. The research design, therefore, focuses on the determinants for enrolment in the energy programme, the causal effect of the programme on participatory efforts and, finally, the building of collective capacity. To take each in turn.

First, one might propose that the drivers to enrol in the programme might include socio-demographics, income, and length of time in the neighbourhood or tenure status. We might also consider that savings from gas service substitution acts as a determinant for enrolment decisions. Thus, data on socioeconomic and socio-demographic conditions at the household level were collected to complement explanations associated with internalisation of benefits related to permanent residence or legality of property rights.

Second, individual participation in voluntary organisations and activities may occur when such activities are expected to provide a positive payoff (Glaeser et al., 2002).

Due to the internalisation of benefits, residents may choose to participate in or to allocate their efforts toward neighbourhood activities, or to alternative activities that may be "neutral" as far as neighbourhood improvements are concerned, but which mostly generate individual returns (i.e., leisure organisations). The 'payoff' is expected to vary with each phase of the programme. Initially, social interaction is part of the institutional framework of the co-production; and may vary with individual (i.e., tenure conditions) and group determinants (heterogeneity of the interacting group). Participation might be expected to increase for enrolment in the fiduciary scheme. Although this effect is anticipated, attention is placed on the residual effect of the intervention. The estimation of effects after the connection has been granted calls attention to the "means-end dichotomy" and sustainability of participatory efforts, assessing the "cyclical effect" on participatory involvement due to internalisation of benefits. An alternative explanation, associated with the building of a "collective capacity" is also plausible. Even if social interactions were scarce or ceased, its effects could persist in the form of collective capacity, as an externality produced by social interactions.[51]

The explanation for participation in organisations and activities aimed at neighbourhood progress, and the willingness to collaborate in further neighbourhood-enhancing activities, are both associated with the internalisation of the benefits provided by these activities. Hence, factors that encourage individuals to internalise the welfare of their communities will increase investment in community-enhancing social capital. Homeownership induces this internalisation since the value of the house is strongly associated with neighbourhood improvements. If one adopts a legal property rights view then this observation should be robust for owners who are more able to reap the benefits from their investment. The contrasting security of tenure view suggest gains should be more even as property serves as a hedge to cope with unemployment or illness, and as an asset in old age, even when legal rights are contested or non-existent (World Bank, 2007a).

[51] Once a programme is over, a greater willingness to undertake other collaborative efforts can be considered an indication of sustainable collective capacity.

A third explanation for investment proposes a reverse causation; investment as a means to increase security of rights. Hence when rights are limited, services can increase the level of security. Importantly, the co-produced programme inverts the title to services link and provides services as a means for cadastral registration. Therefore, programme implementation will support investment even for informal owners whose rights to the plot are either non-documented or weak.

Finally, the literature stresses that tenants are the only group who cannot internalise the benefits from their investment. This is certainly true when investments are capitalised in the value of the house, increasing rents. Nevertheless, the co-production programme has certain specificities that help challenge the universality of such an assumption. Tenant and landlord may both accrue benefits. The savings generated by substitution, which should represent a significant share of household expenditures, provide incentives for tenants to enrol into the programme. If they remain in the property then the tenants will internalise the savings from the substitution. For the landlord, this enrolment may be required to pass the required minimum participation threshold when both share the same plot or block, and the scheme should contribute to securing landlord rights through cadastral registration.

5.3. TRUST

There is scarce empirical knowledge of whether exogenous changes in interactions affect the development of particularised and generalised trust in real world situations. In my research, participatory involvement and interactions have an economic motivation: to reach the minimum number of programme participants per block and to enhance “solidarity” to finance the pipeline service. In short, co-production should affect the social distance between residents, which in turn might help further reciprocity, and facilitate the building of trust in two different spaces and levels of interaction: i) an inner circle of family members, neighbourhoods and local organisations, and ii) exchanges in a wider social space, with unknown others, such as the municipal public sector or the energy utility firm. The predictions for the

research are based on whether the programme intervention is capable of promoting particularised and generalised trust.

The first explanation for the generation of trust is based on the potential of the intervention to support familiarity and reciprocity. It considers that the “new invited spaces”, framed by the programme, can be a channel through which familiarity may increase. In this way, a balanced reciprocity among actors can be established and sustained, leading to increased levels of trust. For the extension of the gas service numerous meetings and voluntary activities were organised by residents, and some pressure was placed on neighbours and family members in order to secure their enrolment and qualify for the connection. Interactions were also encouraged on a wider neighbourhood scale in order to bring in more participants as the average costs faced by each household was contingent on the total number of blocks and housing units that decide to enrol in the programme. As a consequence, residents are stimulated to interact with people from other blocks rather than just their own.

The new interactions with neighbours and local associations turn personal and moral obligations to economic ones (Sahlins, 1974). For example, in the case of neighbours and family members, they have to agree on being jointly accountable for the economic commitments originated by the connection. This way, “diffused” obligations turn to a “balanced reciprocity” in exchanges (Sahlins, 1974). Importantly, since the debt is collateralised by family members and neighbours signing a financial trust, the exogenous change in interactions that affects the links of reciprocity may have impact on the levels of trust among parties. Being cautious could be considered a rational response at a time when residents are encouraged to interact and share efforts with others whose behaviours are not well known. Importantly, in a context where choices may have future long term consequences, having some certainty about other people’s behaviours (and the consequences of those choices), constitutes a rational strategy. Such information is gathered at the first stage of programme implementation, by means of social interactions that contribute to share information among parts.

The interactions among residents and the CBO and NGO, entail the enforcement of commitments as regards all intervening parties. On one hand, it requires loyalty to their local constituency, and at the same time, to manage the interaction with outside partners effectively. Neighbourhood organisations support such a task. For example, the local CBO, Comunidad Organizada, helped manage the interactions with local and external actors during the co-production intervention; the members of this organisation represent residents in their interaction with the NGO that is in charge of the programme management (FPVS), and also with the local municipal authorities and the service utility firms. The provision of information through social interaction may help develop trust.

Furthermore, the intervention introduced a change in the way in which interactions with the municipal public sector are handled, which may contribute to increase the levels of trust in this particularised domain. The informal neighbourhoods, neglected by municipal authorities due to irregularities in land subdivision, become the target of a programme in which the municipality is one of the main actors legitimising its implementation and providing the necessary support for its development. If these explanations hold true, we can expect to see higher levels of trust in each of the above-mentioned domains.

Then, the first explanation is based on the “familiarity” hypothesis for trust. It considers that social interactions, determined by the exogenous change in social distance, are able to generate trust. By introducing an exogenous source of social interaction, face-to-face, purpose-oriented interactions among residents and the organisations are encouraged. Weak ties that may lead to familiarity with municipal public administrators and the utility firm may be forged. Social interactions (i.e., in activities or organisations) and networks are considered by the “social capital school” as instances of socialisation that support the building of trust and reciprocity, and which can contribute to encouraging cooperative attitudes. The fact that all residents are exogenously prompted to interact due to the intervention makes the self-selection issues of more trusting or socially interested residents a less relevant circumstance, since the interaction with others is not determined by

socialisation aims, but based on economic needs: reaching “economic” consensus for service provision.

The second explanation considers trust as a result of the whole co-production experience. Critics of the “familiarity” approach argue that significant experiences are what contribute to generate trust, pointing to matters that are not based on associational interactions (Uslaner, 2002, 2003, 2008a, 2008b). The definition of experience includes the effective completion and execution of the co-produced scheme. It relies on the conceptualisation of a significant experience because it has reversed the long-standing, under-served status of the neighbourhoods. If this explanation holds true, trust as the outcome of the whole co-production intervention will be reported once the intervention is over.

Nevertheless, there are two different stages that will be considered for this explanation. The first one includes the accomplishment of the programme and its symbolic and functional relevance for residents. Now, neighbourhoods can count on a reliable source of networked gas, and those who had enrolled into the programme are now able to benefit directly from it. However, neighbourhoods still face economic commitments that may last for at least two or three years after the programme ends. This fact can develop greater demands related to the strategies families will have to employ in contexts characterised by informal or discontinued sources of employment and occupation. In this case, enrolment determines transactions that are conducted over a period of time. The time element introduces the issue of asymmetric information among the parties involved and a certain uncertainty regarding the future. The signing of the financial trust that binds neighbours and multiple parties in a legal agreement during the whole scheme represents an attempt to mitigate the problem of asymmetric information and uncertainty. However, the fears over others’ trustworthiness to honour their commitments in a context of economic instability due to informal occupations may still exist. Besides, they fear that they may not be able to comply themselves, for similar reasons. Two qualitative insights from residents help frame this notion. First, Julio N. (2009) a resident from Barrio Alem, stated:

> *But they are not going to pay for it! Not for using, nor for the connection! Here you come and sell, everyone is going to buy, but nobody will pay you ... this is a cock-and-bull story.*

Added to that view, Mario, A. (2009), a resident from San Norberto, a neighbourhood from Cuartel V, in Moreno, argues:

> *The problem is that work is unstable, and it's always going to be like that, and what if there comes the moment to put AR$50 and we don´t have it?*

Consequently, the second explanation related to experience is associated with the residual effect of the programme several years after its implementation, when the financial commitments of the residents are completely honoured. The main predictions consider that not only adherents, but also non-participants will be benefited by the overall effect on the neighbourhoods.

The third explanation includes the concept of expectation as a motivator of trust, which means that the level of trust may depend on the "anticipation" of how effectively the other party will carry out its tasks, the judgment of trustworthiness. This dimension of trust might be attributed to expectations raised by the prospective effects of the implementation. Therefore, it is neither based on experience nor on social interactions, but in the perception that residents have when considering whether others' actions should be trusted.

These different explanations are tested for the particularised and generalised levels of trust. Average effects are considered for the whole group of residents, which means those that effectively enrolled and those that did not, but is also disaggregated in order to differentiate what are the causal effects on each group.

5.4. PARTICULARISED AND GENERALISED TRUST

The answer to the question on how particularised trust and generalised trust are related to each other is not theoretically formulated. The "social capital school" considers that trust elicited at a particularised level can be extended. Hence, the experiences of cooperation and individual trusting behaviours to "particularise"

others may be extended to the society as a whole (Stolle, 1998; Boix and Posner, 1996). For example, trust in the government is associated with generalised trust (Rothstein and Stolle, 2008). Then, it may be expected that an increased level of trust involving "weaker ties", which means trust in less-known parties such as the CBO and NGO, the municipality or the utility firm, could expand to generalised trust.

In contrast, there is the idea that strong group ties constrain generalised trust (Granovetter, 1973) because they do not contribute to forging an openness to others that is central to generalised trust. First, higher levels of trust in the family are negatively associated with generalised trust according to recent studies (Alesina and Giuliano, 2010, 2011). Then, complementarities among the dimensions of trust indicate that an increase in the level of trust associated with bonds forged in horizontal relations, such as the family, can be detrimental to the building of generalised trust. Second, another possible association involves the level of trust in the CBO (or NGO) and in the municipality, in their complementary or substitute roles. Since the co-production intervention affects the social organisation of residents, supporting new ways of effective representation by CBOs, it could substitute the levels of trust in the municipal public sector for the handling of local demands.

5.5. TRUST AND INVESTMENT

It has been explained that services may provide incentives to invest in house transformations. The natural experiment allows an empirical assessment of these incremental effects and whether they are associated with tenure, legality and residential stability, beside other household characteristics, such as income. The adjusted household behaviour associated with predicting the impact of the connection may explain lower disposition to invest before the connection was obtained and paid for, while investment will increase once installation payments are completed. We might also consider two other effects. First, the association of house transformations and trust, and second the "spillover" effect that may have

been generated for those residents who did not enrol in the co-produced programme.

The first group of explanations related to trust involves the effect of the programme on generalised trust. However, others, such as trust in the municipality, neighbours and the family ought to be considered in the analysis of their association with physical investments. Importantly, the hypothesised effect of generalised trust on housing improvements is not clear. In Buenos Aires informal settlements, di Tella et al., (2007) found greater levels of trust in others in recently titled residents compared to squatters. They also observed higher investment for the titled group of residents. They interpret this higher level of trust as complementing the individualistic, materialistic, and meritocratic preferences which favoured the operation of markets (see Arrow, 1971; and studies by Coleman, 1990; Durlauf, 2002; Glaeser et al., 2002; Putnam, 1993). If this is true, we can expect a positive correlation between generalised trust and physical investment and the flourishing of more individualistic behaviours, particularly for legal owners. Nevertheless, we can also expect untitled residents to have a greater need of reliance on inner circles of trust, such as neighbours or the family. For example, building trusting relations with neighbours can help to reach informal credit sources, such as solidarity networks for micro-financing. But having a title deed can facilitate access to other, formal sources of credit (De Soto, 2000). Therefore, we can expect that the correlation among trust and improvements will not be equal for residents holding legal or informal rights to their property. In contrast to the above mentioned case, when trust in the municipality is considered, we can expect that greater trust in the municipal public sector for residents holding informal rights to property might be positively correlated with individual investment in the house.

Finally, an extensive literature points to trust in the family as a substitute for generalised trust (Alesina and Giuliano, 2011; Ermisch and Gambetta, 2010). Lower “outward exposure” and increased reliance on the family are correlated with lower levels of trust in others. Furthermore, families are more productive as economic entities when members display higher levels of trust between each other. In particular, Alesina and Giuliano (2010) provide evidence of higher levels of home

production in societies where family ties are stronger, emphasising the relevance of taking the family organisation into consideration. Based on this notion, it is feasible to expect trust in family members to be positively correlated to investment in these settlements.

6. BUENOS AIRES

6.1. INFORMAL NEIGHBOURHOOD CHARACTERISTICS

In many metropolitan areas such as Buenos Aires, there are many households that live in informal neighbourhoods, without access to basic infrastructure services and lacking legal land rights. There, households construct their houses gradually over time, starting out with precarious housing units which are replaced progressively by permanent building structures, with new rooms added at a pace that is mainly determined by financial capability. Although self-help is central to the construction process, someone -other than the 'owner'- usually helps –such as a relative, friend or fictive kin – or is hired such as a builder or building apprentice to assist with the task.[52]

Two principal factors have determined the origin of areas of informal urbanisation in BAMA during the twentieth century. First, the process of rural-urban migration, which was especially significant during and from the 1930s, increased as the import substitution process drove population concentration in large urban centres (Clichevsky, 2000). Second, and as a result of the intial phase of demographic expansion there was a rapid increase in population from 1960 (Pirez, 2002). In the BAMA, 12.7 percent of households are located in areas of informal urbanisation (EPH, INDEC, 2013), extending to 16 percent of households when the whole metropolitan region configuration is considered (INDEC, 2013).

[52] This fact is a constant in progressive housing processes in different cities or regions (Choguill, 1999)

Low-income households followed three paths to address their housing needs. First, through invasions of public or private land, second, by increasing population density of existing shanty towns, known as *villas miseria* or *asentamiento, and* third*,*and the central focus of this study, the creation of informal settlements (*loteos populares*) through the subdivision of private land by informal developers without provision of networked services. It is important to underscore that, unlike the squatter settlements (*villas miseria or asentamientos)*, *loteos populares* (popular subdivisions) were developed on private land that was legally owned by the developers at the time when plots were sold, generally converting rural into urban land, but without providing basic services or observing land use laws. This differentiation between types of settlement is central to policy formulation, since the instruments should be catered to the specificities of each.

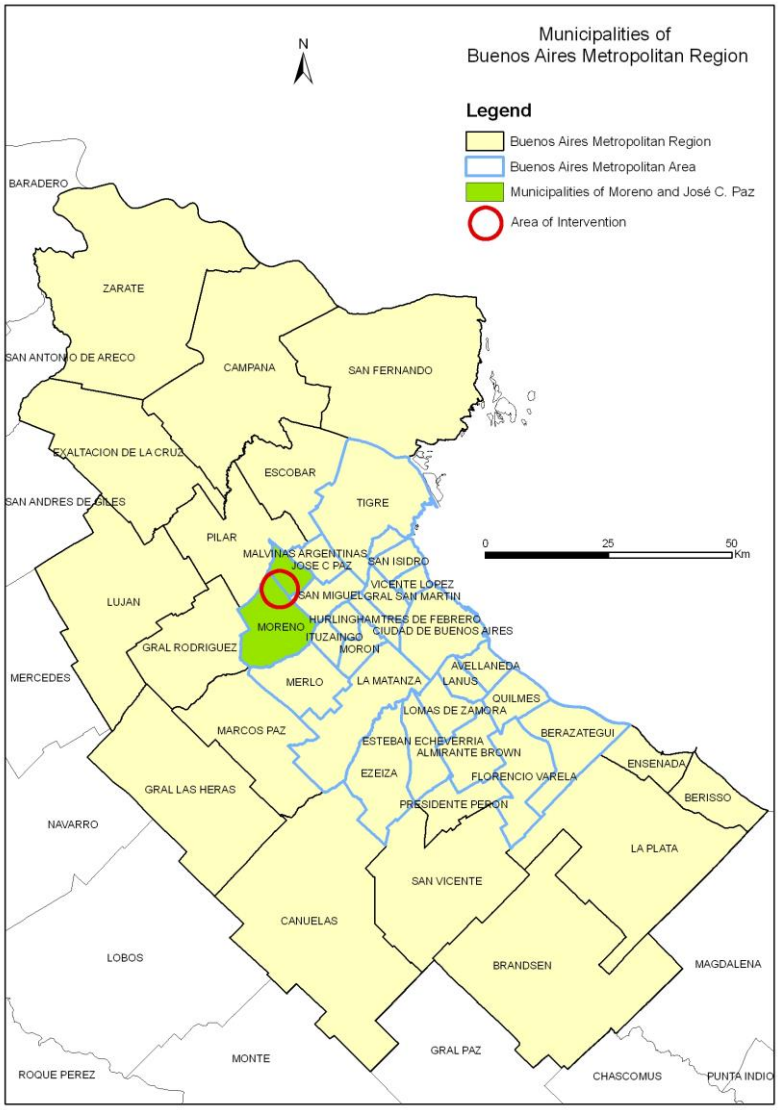
The three groups of neighbourhoods under study (OC, NUA and Primavera) were formed as *loteos populares*, located within the contiguous Municipalities of Moreno and José C. Paz. The two jurisdictions belong to the second metropolitan ring of Buenos Aires (see Chapter 1 for definition of BAMA rings). Figure 3.1 shows the location of the neighbourhoods in the west part of the metropolitan region. Figure 3.2 provides information about the strong spatial correlation between lack of service access (such as connection to water in the kitchen and toilet, to the sewerage network, to piped gas, paved streets and public lighting) and other conditions (such as informal tenure, deficient housing units in terms of low quality construction materials,[53] overcrowding,[54] and the household's material deprivation index (MDI).[55] It is indicative that the households located in the neighbourhoods under study, from both municipalities, are below the average level of infrastructure coverage in the metropolitan area.

[53] According to the Census, a housing unit is defined as deficient (Type B) when it has at least one of the following conditions: an earth floor or loose bricks, it does not have a domestic piped water supply or does not have a toilet with water discharge. The most precarious or irrecoverable houses are huts or shanties.

[54] Three or more people sharing a room (INDEC, 2001).

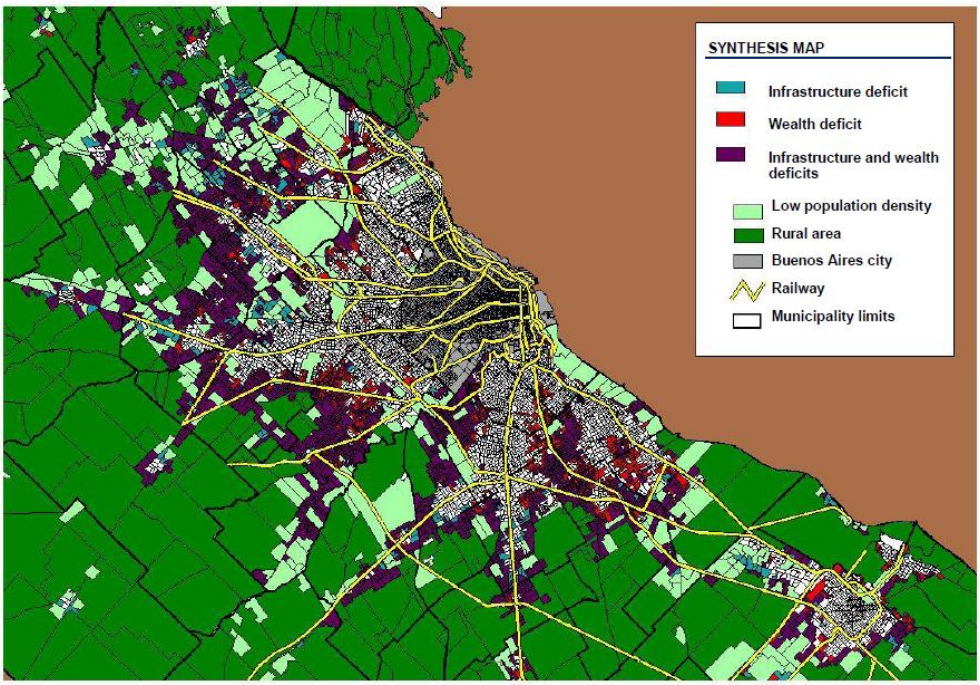
[55] HMDI definition (INDEC, 2001) identifies the household's material deprivation in terms of current resources. It is the closest to the income census measure that indicates households' economic capacity to purchase goods and basic services for subsistence.

FIGURE 3.1 MORENO AND JOSÉ C. PAZ MUNICIPALITIES AND BUENOS AIRES METROPOLITAN REGION (2001)



Source: Author using information provided by INDEC (2001)

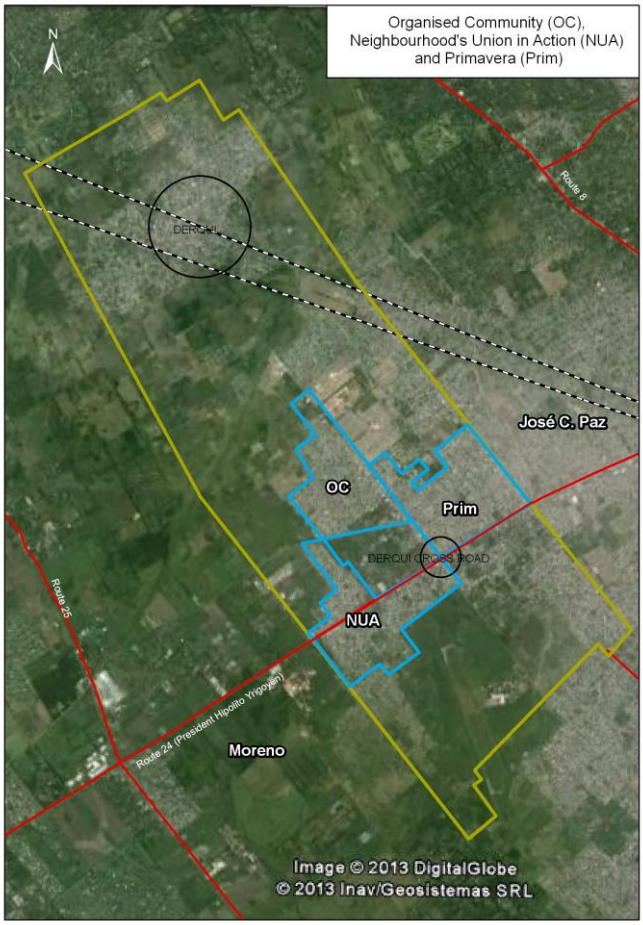
FIGURE 3.2 BAMA INFRASTRUCTURE SERVICES DEFICIT AND HOUSEHOLD'S WELFARE CONDITIONS (2001)



Source: Goytia and Lanfranchi (2009)

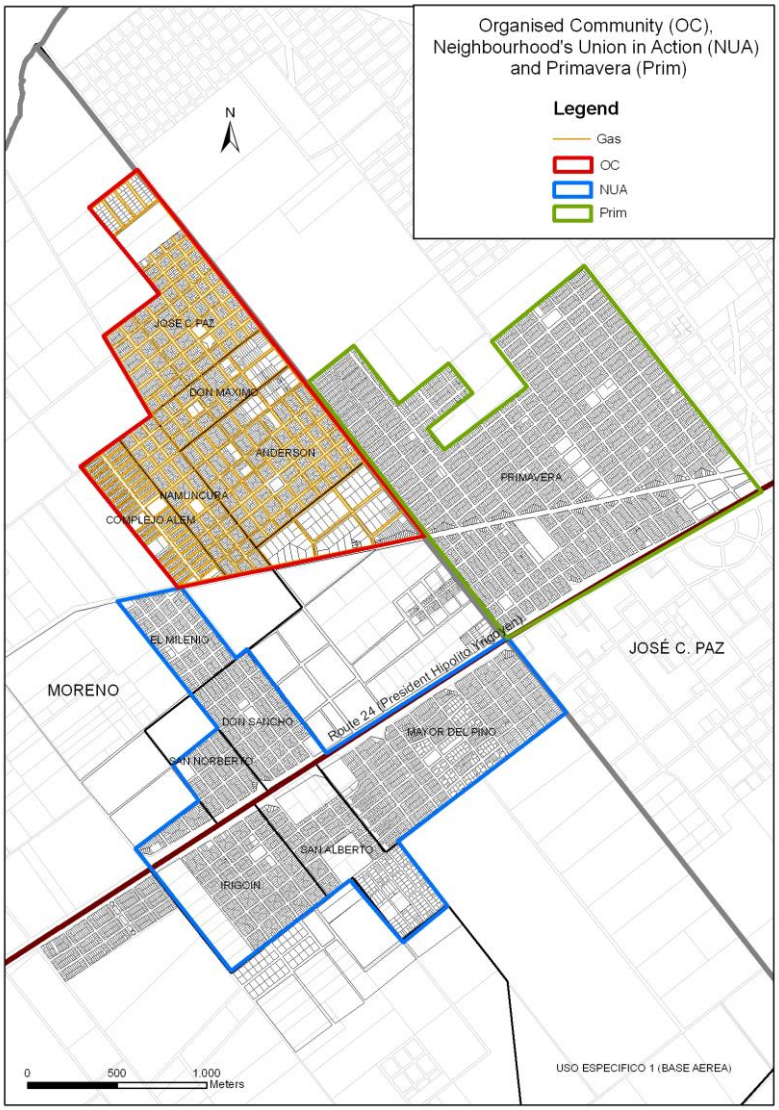
Figure 3.3 shows the location of the three groups of neighbourhoods (Google Earth, 2013). They all belong to the same urban area, despite being located in two different municipal jurisdictions. The two neighbourhoods in the Municipality of Moreno - Organised Community (OC) and Neighbourhoods United in Action (NUA) - are separated by the Argentine National Route 24, President Hipólito Yrigoyen Avenue, which gave rise to the different programme implementation stages. The Derqui Cross-Road, the main transportation hub for public and private motor vehicles in the region is highlighted by a circle.

FIGURE 3.3. INFORMAL NEIGHBOURHOODS: AERIAL VIEW



Source: Google Earth, 2013

FIGURE 3.4. INFORMAL NEIGHBOURHOODS: LAYOUT



Source: Author's based on NDO (2000), and cadastral information from DPUPBA (2012)

The research organised the neighbourhoods into three groups. Group 1 is defined by the OC neighbourhoods, which include Alem, Anderson, Don Máximo, José C. Paz, and Namuncurá. Group 2 is defined by NUA neighbourhoods, which includes Mayor Del Pino, Don Sancho, Irigoin, Milenio, San Alberto and San Norberto. Finally, Group 3 is defined by the Primavera neighbourhoods. The total area covers 586 blocks and 16,100 households (INDEC, 2001).

In contrast to squatter settlements the initial land division in these informal neighbourhoods has produced a very regular layout. An orthogonal grid of blocks, a

hundred metres per side, is the most typical block unit, which contains 32 parcels of similar area. Figure 3.4 shows the definition of each group of neighbourhoods and the regular parcelling as the result of informal developer subdivisions. Figure 3.5 provides views of the unpaved streets in the neighbourhoods, the scale of housing units and gives some indication of block layout (Figure 3.5).

The most representative plot is ten metres wide and 30 long; there are some small variations in shape while keeping the area almost fixed (lote tipo). In this case, the uniformity of dividing areas among neighbourhoods has its origins in the commercial objective of informal developers, standardising the subdivision process in the different settlements developed in the area under study (Vinelli, 1978). Therefore, the average area of a plot in each of the neighbourhood groups is similar (274, 270, and 275 square metres and the mode is 274 in all groups, while the standard deviation is very low, 0.12).

Nevertheless, sharing the plot is a frequent housing alternative in these settlements, where 20 percent of the plots held two housing units (79 percent had only one) There are only two cases in which up to four houses are sharing the plot. Plots are informally subdivided by households under very diverse circumstances. In this area, there are three reasons that residents indicate as the most frequent. First, and most common, is the plot is shared with offspring or other family members. Second, residents sell part of the parcel to non-family members, but this option is less common. Finally, the construction of a spare unit to rent was found in some cases, and this issue will be further analysed in the following chapters in relation to programme effects on tenants.[56]

Housing is also shared. While 85 percent of the houses have only one household, there are two households in 13 percent and just under one percent house three households. Although the average number of members in the housing unit is four, the number ranges from 1 to 13, while just under 8.5 percent of the units are housing eight or more people.

[56] There are no extensions by annexation of another plot in any of the housing units where the survey was implemented.

6.2. THE ENERGY DEMANDS OF RESIDENTS IN INFORMAL URBAN AREAS

There is no comprehensive or defined policy aimed at mitigating the energy demands of residents in informal urban areas in Buenos Aires (Bravo et al., 2008). The main energy options of the residents living in informal neighbourhoods in BAMA include bottled gas and electricity, as the more relevant energy sources, although some households use lower quality substitute goods, like charcoal, kerosene or firewood. More importantly, residents in informal neighbourhoods have unmet basic energy needs, meaning a low level of satisfaction for water and space-heating needs.

Bottled gas is the most popular fuel used by residents in informal neighbourhoods, although availability and affordability is found to be a key issue limiting its use. High upfront cost drives households to replace gas with charcoal and kerosene, two dirtier and less efficient fuels, thus increasing energy consumption and possibly even fuel expenditure for cooking.[57] Finally, these fuels are complemented with firewood (and sometimes solid waste) used for space heating.

The energy needs of the poorest are partially addressed by means of a national programme that sets a maximum price for up to two (ten kilogramme) gas bottles for every household each month and an equivalent flat fee for up to 1,500 cubic metres of networked gas (ENARGAS, 2008). There are two important facts to underscore associated with this service delivery. First, the caloric power of piped gas is greater than bottled, which makes the piped service cheaper and more efficient for domestic activities (Bravo et al., 2008). Importantly, the final cost of two gas bottles purchased under the regulated price equals the basic total cost of networked gas service consumption in the house, which includes heating and hot water appliance use, plus the usual domestic cooking use of this type of energy.

[57] Charcoal is heavily used, but average prices, which have increased steadily, limit this energy option for the most poor (Bravo, 2008).

The second important issue to underscore is related to the market itself, since over recent years, demand has outweighed supply. At highly regulated prices, gas distributors are reluctant to provide the required quantities to the market. Therefore, the outcome is supply scarcity and also an illegal market at higher than the regulated prices. Thus, besides the costs for users, the unpredictability in gas supply constitutes an additional problem that distorts the usual patterns of consumption, since residents need to stock up on gas bottles, and also creates some periods of forced lower consumption when product supply is scarce.

In consequence, the connection to the gas energy grid provides benefits above those based on cost reduction alone. The use value, through improved comfort that the new service brings about, exceeds the benefits associated with costs and finance and extends to immediate payback in comfort that impact on health and nutrition, to mention two highly relevant welfare dimensions of improved housing and energy (Hardoy and Satterthwaite, 1987; WHO, 2005, 2011). There is today enough evidence that associates the complex effects of housing conditions on health, giving strong relevance to the characteristics of indoor air quality (WHO, 2002) and thermal comfort (Howden-Chapman, 2004; Krieger and Higgins, 2002; Ormandi and Ezratty, 2012). It also decreases the time spent on securing adequate provision of bottled gas; networked gas supply is constant, reliable and cheap and improves the options for daily nutrition. By making energy for cooking less expensive, households can choose a wider repertory of foods – and cooking styles – in daily meals, while reducing illnesses that are derived from not observing indicative times for cooking meat and other ingredients. Indeed, users do not have to stop consuming due to the lack of available resources as a type of loan allows them to consume at lower costs, and without inefficient interruptions that would lead to decreased effectiveness. Therefore, the lower cost and better environmental performance of the service may allow considerable improvements in the quality of life and well-being (WHO, 2002, 2011).[58]

[58] Energy improvement is also associated with further improvements in the productivity of entrepreneurial activities, an issue raised by Benjamin (2000), Tipple (2004, 2005a and 2005b), Werna (2001) and Strassmann (1986) for Latin America.

The second most utlised service for domestic activities is electricity, although it is characterised by its low quality and poor reliability, aggravated by its cost and also by the spread of illegal connections (Bravo et al., 2008). Importantly, lower-income households pay proportionally more per kWh of electricity than higher-income customers (Bravo et al., 2008).[59] Therefore, most of their energy expenditure is concentrated in cooking fuel and on electricity, when they are legally connected to the grid.

6.3. THE ENERGY TRANSITION PROCESS AND HOUSING IMPROVEMENTS

The progressiveness of infrastructure services improvement has been acknowledged by Choguill (1996, 1999), mainly associated with community services. Although piped gas reduces considerably the money spent on energy, it does not necessarily guarantee that such benefit is effectively put in place at once. In contrast, there is an energy transition process, in which substitution is done progressively over time, in the same way in which the housing construction process has developed overall. As a result, not all households will be able to move through the different stages of infrastructure upgrading at the same rate.

There are three issues associated with improvements due to the service connection that should be underscored. First, substitution is a process that starts immediately with the new networked service being used in cooking appliances which most of the time extends to the acquisition and connection of an oven. Cooking appliance replacement or its adjustment to natural piped gas constitutes the first immediate step in the energy upgrading process. A year after connection to the grid all the housing units that participated in the programme were using this source for food preparation.

Also, as previously explained, the new service make it possible to obtain hot water inside the house at a lower cost, bringing an incentive for the building of interior water connections supplying hot water to kitchen and toilets, in neighborhoods

[59] The unit electricity price is higher for a monthly consumption of a hundred kWh, while the price increase for very high electricity use – six hundred kWh a month – is only about twenty per cent above this (Resolution No. 356/2008 (August 2008), from the electricity regulatory agency (ENRE)).

where only a low proportion of the households have got running water installations inside their house. The substitution of bottled gas consumption with the new lower-cost network gas generates new resources that allow the financing of the internal water installations.

The second important fact to highlight is that the appliances connected to the grid, and monthly charges, can still fluctuate considerably within the transition process from energy substitute goods – such as bottled gas, charcoal, coal, kerosene or electricity – to the use of gas from the piped system for all domestic activities. Some households living in units that have already received the connection, do have to wait until resources are made available to undertake the required improvements, for example the acquisition or adaptation of appliances to make use of the gas service in water and space heating. Considering that most non-participant residents use costly water and space heating choices (electricity and bottled gas), there is a strong reduction in fuel expenses when the low-cost natural piped gas devices are in use.

Third, energy connection requires a high degree of safety-related measures regulated by the Gas National Entity of Regulation (ENARGAS, 1992, 1997), which establishes the requirements for connections inside units. It includes pipe dimensions and materials, location of the devices, requirements on building materials, minimum size for each room and appropriate subdivision between places for cooking and sleeping areas, and ventilation characteristics. Therefore in order to obtain gas company approval for the connection some improvements in the housing unit must often be undertaken. Importantly, the service connection will not be approved until the regulatory safety measures are completely followed. That is why many residents at the post connection stage, still have to complete this type of improvement to be allowed to use this fuel for other domestic activities, besides cooking.

The typical neighbourhood houses are shown in Figure 3.5. Nevertheless, those seem not to be important constraints for obtaining a gas connection once minimal habitability and safety measues are implemented within the initial improvemnets.

Ventilation devices and quality of construction materials are two of them, but also improvements in electric wire conections and plumbing or windows.

FIGURE 3.5. NEIGHBOURHOOD STREET VIEWS

FIG.3.5.1 A STREET VIEW: OC, CUARTEL V., MUNICIPALITY OF MORENO

FIG.3.5.2 TYPICAL NON-PAVED STREET. OC, CUARTEL V., MUNICIPALITY OF MORENO

FIG.3.5.3 NON-PAVED STREET. NUA, CUARTEL V., MUNICIPALITY OF MORENO

FIG.3.5.4 NON-PAVED STREETS. PRIMAVERA, MUNICIPALITY OF J.C.PAZ)

Source: all photographs from author's photo collection, 2008

7. CONCLUSION

This thesis addresses physical investment effects by concentrating on house transformations through services. Furthermore, it underscores a broader dimension of investments. First, underlining participatory involvement through activities and membership in organisations, enrolment in the programme, and trust, a conceptualisation of collective capacity is introduced to describe the willingness to advance in collaborative experiences for neighbourhood consolidation. Second, the association between trust and physical investment is introduced to validate the explanation of the relationship between the physical and social dimensions. Given the stages of programme implementation it is proposed that the research will be able to track whether the outcomes of the physical and social dimensions are present from the first stage through to their residual effects, ie. once the experience has been established and bonds and networks have been consolidated.

The opportunity for involvement is driven by internalisation of benefits that might be derived from it. The explanations of physical and social investments extend the definition of property rights from the association with security to a broader definition of homeownership incentives through internalisation of benefits, based on security, savings, permanence in the house and reverse causation for increasing security through investments, participation and enrolment. This means that participation in community-enhancing activities will increase as far as the investment costs required (e.g. in time and coordination with others) are less than the long-term benefits. Then, tenure or legal status of the house should provide differentiated investment payoffs for participation. Yet, this study argues that savings from substitution and services capitalisation should provide a powerful incentive to enrol in the scheme that may moderate the relevance of legality and tenure considerations.

CHAPTER 4: METHODOLOGY

1. INTRODUCTION

This chapter explains the methodology employed in the research. It is organised in four parts. The first section outlines what is termed the identification of effects strategy. The co-production model and the sequential advance in programme implementation across different groups of neighbourhoods are taken into consideration for the design of the identification strategy. The quasi-experimental methodology outlines three different stages in which effects are assessed: i) social interaction and information gathering, the "familiarity building" stage; ii) the "complete experience" – social interactions and connection to the networked service, and, iii) residual effect of the intervention after four years of connection.

The second section describes the survey and the data collection, and discusses the outcome variables. The physical capital dimension of investment effects is assessed by tracking the evolution of housing consolidation improvements. Neighbourhood-enhancing social capital is divided into the two different social dimensions, trust (generalised and particularised) and participation (enrolment, participatory efforts and collective capacity). The section concludes by presenting a description of the main characteristics of the residents and housing.

The third section assesses treatment and control group balance based on pre-treatment information (year 2001) and baseline survey data (year 2006). The causal effects are evaluated in the fourth section at two points in time, 2006 and 2009, by two alternative methodologies. For 2006, a cross-section comparison of treatment and control groups is made. For 2009, the changes in outcomes from 2006 to 2009 in the treatment and control groups are evaluated. These are explained where the determinants for enrolment through internalisation of savings, the legal and tenure security explanations and the association of house improvements and trust are framed.

2. IDENTIFICATION OF EFFECTS STRATEGY

The expected effects of the co-produced gas programme are related to: i) housing improvements, ii) participatory involvement and the building of collective capacity, iii) generalised and particularised dimensions of trust, and, iv) the causal association of trust and consolidation efforts. In order to isolate the causality effect of the programme, the evaluation posits a counter-factual scenario. This constructs a hypothetical situation consisting of what would have happened to the households had they not received the intervention. Consequently, the differences between what would have happened and what did happen is defined as the programme effect (Rubin, 1974; Shadish et al., 2002). Although it is impossible to observe such a situation in reality, it is possible to approximate it by establishing a comparison group (control group) made up of households which have not received the programme, and which are as similar as possible to the group that did (treatment group). The way in which the intervention was assigned to one group of neighbourhoods in its first stage and later to another, permits the definition of the treatment and control groups. The mechanism that selected neighbourhoods was exogenous and mimics a random assignment to the programme, and therefore overcomes possible self-selection biases.

There are two essential points that substantiate this identification of effects. First, a key piece of information that could help to determine whether the selection of the treatment group was exogenous with respect to neighbourhood characteristics (which could partially be associated with outcome variables) is to check whether the treatment and control groups/neighbourhoods had similar socioeconomic characteristics at the moment when the programme was launched. To do that, I will analyse information available from the National Population and Housing Census that corresponds to 2001 (INDEC, 2001), that it is available at the census-radius level. This is complemented by doing the same analysis using information from the 2006 survey.

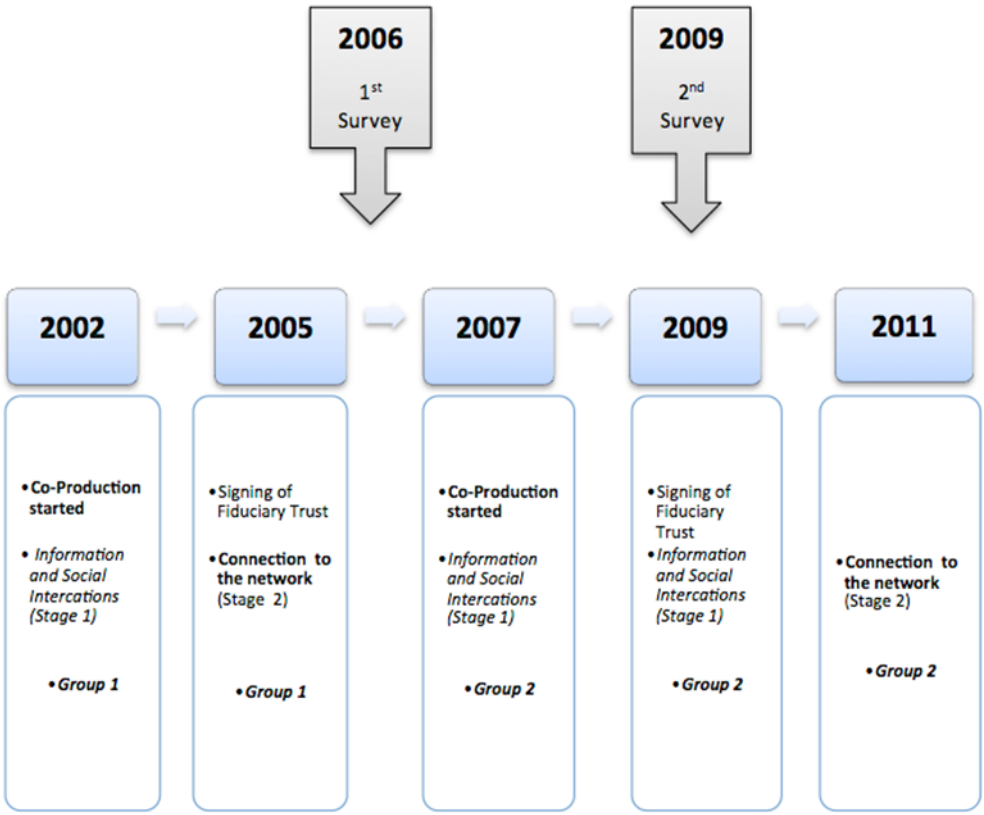
The second important issue for this methodology emerges because the programme has not reached all households assigned to the treatment group. Although the

programme was available to everyone living in the neighbourhoods targeted by the co-produced initiative, not all the families decided to enrol. In the literature this problem is known as “partial compliance” (see Duflo et al., 2008). As already explained, the co-produced model required that over 65 percent of the housing units in each block should express their interest in becoming clients in order for the whole block to be connected to the pipe network. If the analysis considered the treatment group as comprising only houses that were connected, the results would potentially suffer from self-selection bias, since the decision of each household to enrol could be considered as an endogenous component in which the most entrepreneurial or least risk-averse residents self-selected to participate. Therefore, the identification strategy deals with this potential endogeneity. Two alternative methods are applied: (i) the estimation of the intention to treat effect, and, (ii) the estimation of the Local Average Treatment Effect (LATE) (Angrist et al, 1996).

To apply the first estimation method I randomly selected households from the neighbourhoods where the programme was offered, no matter whether they had joined the programme or not. This group is called the Intention-to-Treat group. Thus, the estimation is based on the Intention-to-Treat sample (ITT) that gives the average effect of the co-production programme on the whole group of residents, regardless of their enrolment. In this way it is possible to obtain representative samples of everyone initially allocated to the group where the programme has been delivered. The second model, the impact of the programme per se, is measured by estimating the average effect on only those who have enrolled. This is defined as the Local Average Treatment Effect “on the treated” (LATE). By comparing the results from both model specifications it is possible to forecast the causal effects of the co-produced intervention.

Figure 4.1 shows the evolution of the programme stages (by year) for Groups 1 and 2 and the two periods (2006 and 2009) when the data were collected. Baseline information for the three groups that form the treatment and control samples was gathered in the 2006 survey and updated information completed by the 2009 follow-up survey. Table 4.1 describes each programme stage and the definition of treatment and control groups.

FIGURE 4.1. CO-PRODUCTION SEQUENTIAL IMPLEMENTATION AND DATA COLLECTION



Source: Author's elaboration based on chronological data from co-poduced programme implementation collected during fieldwork.

TABLE 4.1. CO-PRODUCTION STAGES: TREATMENT AND CONTROL GROUPS

Co-Production Stage	Treatment Group	Control Group	Year
Complete Experience (social interactions and connection)	Group 1	Groups 2 / 3	2006
Social interactions and information gathering	Group 2	Group 3	2006-2009
After connection	Group 1	Group 3	2006-2009

The group of neighbourhoods which were connected to the gas network on August 2005 is defined in this study as Treatment Group 1. The “complete experience” for this group marks residents’ participation as having “paid off”. Yet, in 2006, Group 1 had already gone through the two implementation stages. The first, from 2003 to 2005, was the social interaction phase (Co-production Stage 1) and the second, the connection phase in 2005 (Co-production Stage 2). From a total of 4,492 plots in Group 1, 1,951 had been connected to the gas network, and 945 had been connected for at least 12 months when the first survey was conducted in November 2006. The control group is formed by adjacent neighbourhoods, which at that time wanted to join the programme, but were unable to do so for technical reasons. Group 2 Stage 1 had not yet started at the time the baseline survey was implemented. Finally, Group 3 is not part of the programme and data on this neighbourhood has been collected in order to have a control group.

The implementation of the programme was extended to Group 2 in 2007. At that time, residents of these neighbourhoods started the process of social interactions involving information sharing and programme details. By 2009, Group 2 had gone through Stage 1 and participant families had been identified but they were still in the process of considering the signing of contractual agreements to formalise enrolment. By 2009, therefore, this group has already gone through the initial stage, where the links of generalised reciprocity are starting to turn into economic. The connection stage had not been implemented for Group 2 in 2009 and, as a consequence, access to the gas supply was not available (the “complete experience” had yet to materialise). In this group, from a total of 4,416 plots, 950 had already fulfilled the enrolment process at the time the follow-up survey was done in November 2009. Treatment Group 2, is therefore defined by the group of neighbourhoods in which only the social interactions and information stage has been implemented between 2007 and 2009. A control group, Group 3, formed of adjacent (non-treated) neighbourhoods had neither engagement with the programme nor any plans to do so.

By 2009, Group 1 had been connected to the gas service for four years and over 2,582 housing units had individual connections. For most of these households their

economic commitments to the programme should be complete; most should have finished the instalment payments. This is the third stage of the analysis, when the residual effect of programme implementation is evaluated years after the connection has been granted in order to trace the dynamics of the consolidation efforts over time.

3. DATA DESCRIPTION

The survey questionnaire was designed to capture detailed information on the socio-demographic and socioeconomic characteristics of the residents, their occupation and monthly income, the characteristics of housing and infrastructure and details related to progressive transformations made to the house with the passing of time.[60] Furthermore, a set of social capital questions associated with participatory involvement and trust were included, which fulfilled the standard survey measures that are considered to be "good practice". All variables measured contemporaneous values at the time of the survey, except for works carried out in which were measured retrospectively. In 2006, respondents were asked about all changes made since 1995, which is ten years before the survey.[61]

The survey was applied to randomly selected households. The sampling was prepared using the administrative records kept by the local NGO and additional information provided by the planning departments of the municipalities.[62] A number was used to identify each block, plot and each observation selected, using random numbers (lottery). Then, maps of blocks and plots were compiled and all the plots that had been randomly selected were shown. A number of replacements were indicated in each case. The protocol was set that after making three

[60] The questionnaire was not specifically prepared for this project. It was compiled from a series of surveys to collect information from residents as part of the activities of the NDO. I have participated actively in its creation, both in the devising of the questionnaire and in the fieldwork.

[61] A plan of the house was drawn during the interview and improvements were also checked at that point.

[62] FPVS is involved in activities that aim at supporting urban programmes in the neighbourhoods located in the municipalities of Moreno, San Miguel and José C. Paz that were covered by the sampled areas of this study.

unsuccessful attempts to conduct an interview with the sample household, a substitution of the next household on the list would be made. Where a plot had more than one housing unit, all of those present were included in the sample. Respondents were the heads of single households, identified as those people preparing and eating the same meal. The interviews were held over six weeks in 2006 and four in 2009; weekends were chosen to increase the chances of people being at home.[63]

Before the main surveys were held pilot sessions were conducted for the validation of the questionnaire, fieldwork planning and training of the team that helped with data collection.[64] Two pilot sessions identified difficult to understand questions (from percentage of missing answers) and the wording of original questions to be modified. The questionnaire was modified also to include some specific questions that emerged during the research. For example, the assessment of collective capacity based on a real proposal for an active collaboration was a new addition to the 2009 survey.

The survey team was formed of professional staff and university students.[65] Interviewing was done in pairs, each person dealing with a part of the questionnaire. Professional interviewers asked the bulk of the questions while students helped with observation questions related to the housing unit and the block, for which a specific knowledge of architecture was required.[66] The preparation for the survey included a letter of presentation that was delivered to each housing unit the day before the interview. The letter outlined the survey objectives, the estimated time that a visit would take place and the likely duration of each interview. At the start of each interview the purpose of the research project was repeated, and it was explained that participation was voluntary and people could refuse to participate or withdraw at any time without having to give any

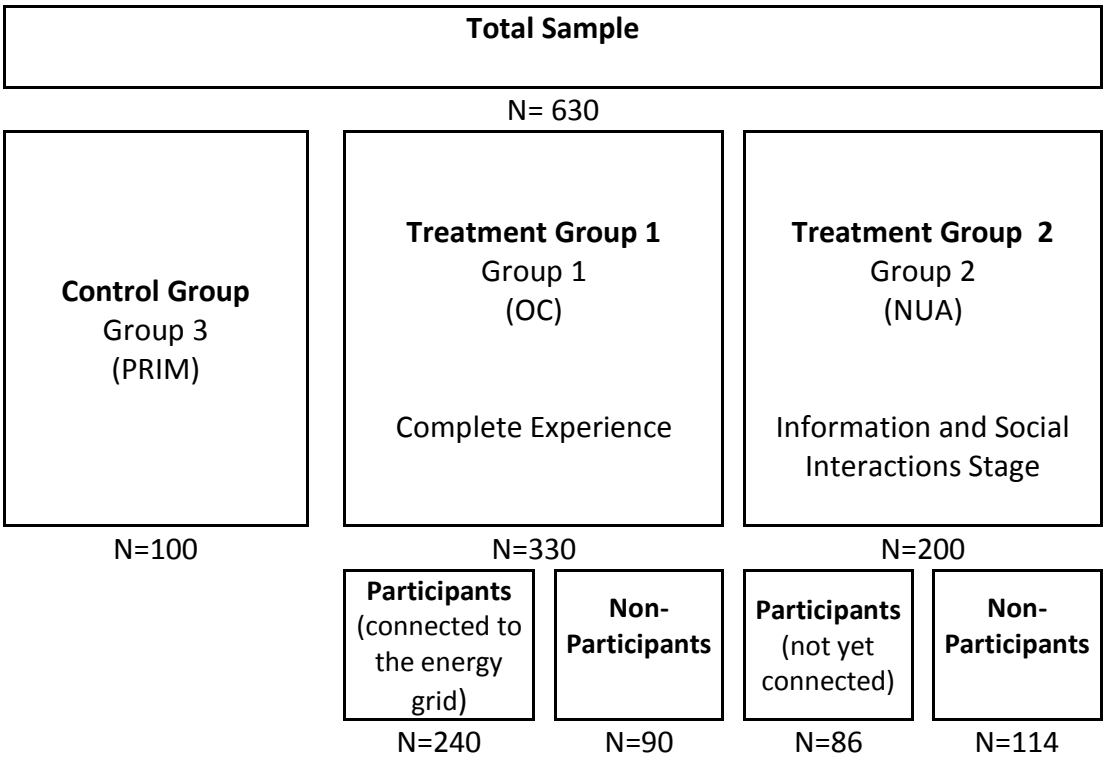
[63] When it rained, we cancelled the survey and it was postponed to the next weekend day. In 30 percent of cases, the same person was not found in the house during the follow-up survey.
[64] Training sessions on the questionnaire were undertaken two weeks before the survey was formally begun.
[65] The team were members of the NDO, see Chapter 1.
[66] They completed the task of drawing a plan for each housing unit, including the estimated size of the plot, the built space, its position in the plot and the block.

reason. Research ethics considerations attached to fieldwork and anonymity in the processing of results were observed, which means that all results have to be reported in aggregate mode and no personal information is specified. The qualitative insights collected from interviewees, some of which are included in the thesis as quotes, only use first names.

A group of local residents provided additional logistic support during the fieldwork. The residents focused exclusively on helping the team locate each of the housing units selected for the sample as the neighbourhoods, houses and plots do not have street signs or identifying numbers. The residents also assisted with introductions to the interviewees, which minimised people's suspicion of strangers. While a household was being interviewed the resident volunteers moved to the next sample participant to let them know that someone from the team would call in soon. Each interview took between 30 and 35 minutes, and each team would complete eight interviews over 6.5 hours.

The first survey, carried out in 2006, was delivered to a total of 630 households. More than half – 330 households – were randomly selected as Group 1. In order to construct a representative control group, 300 households in Group 2, neighbourhoods that had not yet benefited from the programme were surveyed. The survey was administered to a sample of 200 households located in the neighbourhoods where the programme was going to be implemented at a second stage and a random sample of 100 were located in the third group, the control neighbourhoods that would not be part of the intervention. Figure 4.2 shows the number of total observations, participants and non-participants in each group.

FIGURE 4.2. SAMPLE GROUPS DEFINITION AND NUMBER OF OBSERVATIONS BY GROUP (2006)



Note: Group 1 is defined by OC´s neighbourhoods; Group 2 is defined by UNA´s neighbourhoods and Group 3 is defined by Primavera´s neighbourhoods. N is the number of observations in each group. Respondents are household heads.

Panel data allows testing different hypotheses on the effects of the programme. Of the sample 630 households interviewed for the first time in 2006, roughly 70 percent were interviewed again in 2009 (433 families). The second survey was presented with the challenge of identifying and locating the original interviewees. This time a smaller subset was randomly selected from the 2006 sample, and the same procedures in terms of sampling, maps, letters of information and visits was followed. The response rate was high; 95 percent success in 2006 and 90 percent in 2009. However, it took much longer to find the sample household in 2009 compared with 2006.

In this case, power calculations were necessary to determine the sample size under consideration, and these calculations contributed to indicate the minimum sample size needed to answer the question of interest. According to Gertler et al. (2011), power calculations help verify if the available dataset is sufficiently large for the

purposes of an evaluation of the effects of a programme, in order to avoid the collection of excessive or of too little data. For my research, it was important to avoid a type II error (see Greene, 1987); that is, having sufficient data to avoid concluding that the programme had had no impact when, in fact, it had an impact. The power calculation was conducted through the identification of the outcome indicators, and by deciding what subgroups to compare.

The initial round of the survey was oriented at estimating the effects of the intervention on several outcomes. However, tenure and document categories were not included initially in order to estimate the mean and variance of the data and its minimum impact (by 80 percent). As stated by Gertler et al. (2011), sample requirements increase if the minimum detectable effect is small, if the outcome indicator is highly variable or there is a rare event, or if the evaluation is aimed at comparing impacts between different subgroups. The minimum number of households to be included in the sample covered all residents enrolled into the co-production programme (treated) and those that did not adhere to the scheme (controls). For the identification of an effects strategy, it was important to be sure that both subgroups (treatment and control) were balanced as to their observable characteristics. For my research, a confidence level of 0.95 and a statistical power of 0.8 were assumed. The consideration was focused on the following three indicators:[67] proportion of housing units that had formal rights to property, proportion of unemployed members of the household, and proportion of houses that had tiled floors. Within these parameters and a standard deviation of 0.2, a minimum sample of 413 households was calculated.

3.1. DEFINITION OF OUTCOME VARIABLES

3.1.1. HOUSING IMPROVEMENTS

[67] Source: National Population, Household and Housing Census, from year 2001 (INDEC, 2001) and Household Survey 2005 (fourth trimester) from National Statistics and Census Office (INDEC, 2006).

The provision of infrastructure is linked to housing investment, which is stimulated by infrastructure service improvements. According to Varley, “In terms of priorities, services should surely come first: the rest may even follow of its own accord” (1987: 478). Such housing improvements following the provision of water and sanitation infrastructure are described by Strassman (1984) who argues that progressive housing construction can be accelerated by an early provision of infrastructure. For the purposes of my research, housing improvements are described in this study as a dynamic process through which the house is progressively built and upgraded. Under the definition of housing improvements, all transformations and work on each of the housing elements, improved, replaced or added, are measured by means of a detailed checklist.

There are three broad transformation effects due to the gas service. First, for programme participants, housing formalisation follows safety regulatory measures enacted by ENARGAS, encourages replacement of precarious or temporary building materials for walls, roofs and floors with permanent ones. Second, and regardless of programme participation, improvements might be carried out such as using better construction materials or the addition of more rooms as residents adapt expectations to successive household transformations. Third, the energy transition from lower quality or expensive substitute goods to piped natural gas makes possible service upgrading inside the house, such as water basins in the kitchen or heating installation.

Three outcome variables related to progressive housing improvements are defined based on the information collected in the survey. One is the proportion of houses where changes were undertaken in the last year; second, an indicator capturing the number of transformations undertaken in the house during the same time frame; and third, the number of changes affecting the quality of construction materials (e.g., walls and plasterwork, ceramic tiles on floors and improved roof). The variables are defined from reported information about the works undertaken each year in the process of house consolidation. Due to budget constraints, the residents of these neighbourhoods did not undertake many improvements simultaneously, so any works could be identified individually and extend significantly over time. The

sequence of works for each housing unit was reconstructed and the year in which each work was initiated and finished was recorded, to facilitate the construction of the three different dependent variables.

The construction of the housing improvement variables proceeds in two steps. The first step is a measure for the occurrence of housing improvements is intended to assess whether residents located in the neighbourhoods that were targeted by the programme, in OC and NUA, behaved differently in their incentive to invest in improvements when they are compared with the control group. This is a dummy variable that equals one when the household has carried out an improvement during the last year and zero otherwise.

Figure 4.3 shows the proportion of residents that reported that they made home improvements. It displays the dynamic of this measure by comparing mean values of this variable for four different groups: three groups of housing units in OC - with and without piped gas connection, added to the whole intention to treat sample, to show the measures for participants and non-participants in the co-produced intervention, – and housing units in the control group. The horizontal axis shows the years and the vertical one the mean value of this variable.

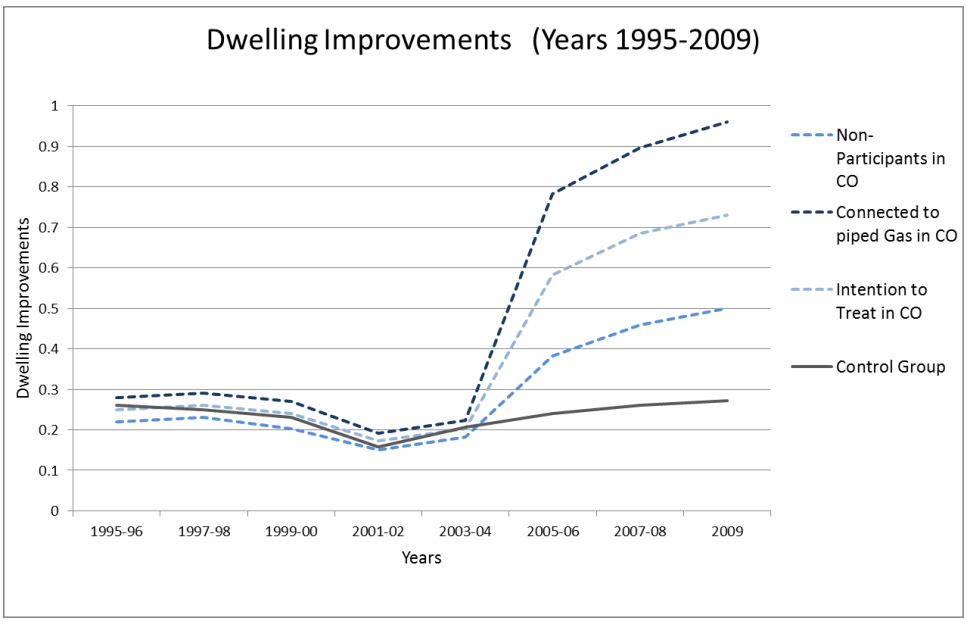
Between 2006 and 2009, the undertaking of improvements sharply increased for households located in the neighbourhoods of OC, where the co-produced programme was completely implemented, while remain fairly stable for residents in control groups. Indeed, both participants and non-participants have sharply increased the rate of housing improvements after the service was extended to the OC neighbourhoods. Programme participants display the higher proportion of housing units undertaking major improvements during this period. Indeed, the graph suggests the presence of spillovers induced by the gas network extension to the targeted area, providing investment incentives for the majority of residents, regardless of their enrolment in the programme.

Importantly, the parallel trend in all these groups before the programme was offered and implemented in the targeted neighbourhoods, emphasises the similar patterns of investment behaviour due to their common origin through “loteos

populares", although some differences in the levels of households undertaking improvements may be due to socioeconomic and socio-demographic differences among groups. This issue will be analysed in Section 4 of this chapter. The decline in the proportion of residents undertaking house improvements in all the groups from 1999-2000 to 2003-2004 is associated with the significant economic crisis and major downturn in economic activity (McKenzie, 2004) when the unemployment rate reached 45 percent of household heads in the neighbourhoods under study (INDEC, 2001). In such a context, it is feasible to consider that other expense priorities sharply limited – or interrupted – any housing investment.

FIGURE 4.3. HOUSING IMPROVEMENTS (YEAR 1995-2009)

RESPONDENTS UNDERTAKING IMPROVEMENTS (PERCENTAGE OF HOUSEHOLDS, BY YEAR).



Note: Based on survey data 1995-2009, for participants and non-participants within the intention to treat sample in Group 1 (OC) and control group

The second step is the progressive consolidation of the housing unit, captured by the number of improvements indicator that measures the extent in which major improvements or remodelings have been done. The improvements carried out are classified in three different element categories, based on quality of construction materials and new rooms or expansions, infrastructure, and finally, other additional improvements - related to interior and exterior spaces, including frames – doors, windows, fences, and exterior space, including sidewalks and carports)

In each case, a checklist of improvements was constructed during the interview based on the detailed description of yearly works carried out by households. For each component – remodel or new addition improvement - a value of one is assigned if the improvement was done and finished, one-half in the case it was still under construction or without appropriate constructive finishing (such as plaster in walls, tiles in floors or asphalt and isolation in concrete roofs) and zero when done n temporary building materials or not done at all. Households might differ in the scope of improvement efforts, from remodelings to new additions and extensions. Ideally, the sub indices will more appropiatly reflect that scope when weighted by the areas -in squared meters- that each improvement involves. Since obtaining such information goes well beyond this research data collection efforts, a simple weight was applied to correct for minor and major improvements (i.e., remodelling-or new additions). The indicator is the average sum of all the components and reflects the level of residents' investments in their house yearly. It allows capturing, in the econometric models, the dymanic of housing improvements and remodelings using comparable information from the different sample sub groups.

An alternative strategy, applied in De Souza (1999) and Van Gelder (2007), constructs a score based on the observed quality of construction materials from roof, floor and walls and compared them within time periods. The major drawback to apply that measure in this context is that measuring final quality rather that improvements, may underestimate the majority of new undertakings – which are still unfinished construction (i.e., without plaster) biasing the overall quality to lower than real boundaries. This issue of progressiveness will not be accurately captured when between period indicators based on the overall quality evaluation

of walls, roof and floor are compared. Thus, within such measurement strategy in this context, a new undertaking compared to the initial state can be taken as worsened up constructive quality conditions without taking into consideration that improvements are developing progressively intended to upgrade housing quality.

The first component, quality of construction materials includes all new improvements or remodellings built with permanent materials – as opposed to those built with temporary building ones. Permanent building materials are adobe, bricks and cement blocks for walls, tiles and cement for floors and concrete, tiles, metal or wood (with an additional ceiling and appropriate asphalt or membrane isolation, for roofs). Specifically, this category comprises floor, roof and walls new works (or following up), detailing the construction of concrete foundations, cement subfloor (*contrapiso*) and floor tiling or cement floor finishing, within the floor category; interior and exterior walls and their plasterwork for walls and roof built on durable materials and ceiling, shaping the construction quality of the roof component of the indicator.

These are the physical and tangible measures which can indicate whether households are consolidating their houses. Most of the times, households improve and replace transitory structures, in several occasions new rooms are added. It was very common to find that new rooms are built progressively, all -or few walls at once- the roof or the floor upcoming at a later stage. Therefore, by construction, this indicator is able to capture the dynamic of housing improvements related to new extensions. Therefore, in case a room has been added, the survey asked whether it was completed or partially built during that year, and then computes its constitutive elements separately. In those few cases in which a new toilet was built, their construction elements add plumbing or electricity works to that of construction materials –on floor, roof and walls.

This indicator for the number of housing improvements has a second component that reflects infrastructure improvements. Those include plumbing works related to -cold and hot water (in kitchen and toilets) and sanitary installation, electrical repairs and gas installation and appliances (as minor or major works).

Table 4.3 shows that there is energy transition process in fuel sources following the introduction of the natural gas connection to the houses. In the after connection stage, the complete shift to networked gas is reported only for cooking activities, while not for water or space heating. Note that 91 percent of the houses without access to natural gas consume bottled gas (in ten kilogramme cylinders), whereas the remaining nine percent use firewood, charcoal and electricity (Table 4.3.A). Once connected to the grid, natural gas is used for cooking in 100 percent of those units.

There is, however, a clear distinction between residents who are connected to the grid and those who are not, in the availability of hot water installation in the house. After obtaining the natural gas connection, the clearest effect for water and space heating is the progressive substitution of piped gas for bottled gas, electricity and less efficient sources (firewood, kerosene and charcoal). In non-serviced houses, water heating is commonly done by electricity (44 percent of houses) and the gas bottle (42 percent). After connection most houses progressively adopt piped gas for water heating. However, in both groups – with and without natural gas connection – there are still houses in which no system for water heating is in use. Additionally, some houses where natural gas connection has been made available, were still using electricity or had no water heating system in 2006, one year after gas was obtained.

The fuel most used for space heating, electricity, is significantly substituted by natural gas appliances, although there remained 20 percent of houses where kerosene, firewood, charcoal or no heating system were in used in 2006, despite the presence of the piped gas connection. Therefore, a surprisingly large proportion of households were still using electricity, carbon or coal, and even their cooking device, for inside heating when the weather was extreme.[68]

[68] In Buenos Aires, for at least three months a year the average temperature is below 11^{o} centigrade while extreme minimum temperatures can be around -5^{o} centigrade, on the Celsius scale.

TABLE 4.3. FUEL USE BY TYPE OF DOMESTIC ACTIVITY (YEAR 2006)

FUEL THAT IS USED FOR COOKING, WATER-HEATING AND SPACE-HEATING (IN PERCENTAGE OF HOUSEHOLDS). TOTAL SAMPLE IN 2006 SURVEY.

Table 4.3.A

Cooking System by fuel type	Without Gas Connection (%)	Connected to piped gas (%)
Piped Gas		100
Bottled Gas	91	
Electricity	3	
Charcoal	3	
No system	3	
Total	100	100

Table 4.3.B

Water-Heating System by fuel type	Without Gas Connection (%)	Connected to piped gas (%)
Piped Gas		72
Bottled Gas	42	
Electricity	44	24
No system	14	4
Total	100	100

Table 4.3.C

Space-Heating System by fuel type	Without Gas Connection (%)	Connected to piped gas (%)
Piped Gas		70
Bottled Gas	12	
Electricity	49	11
Firewood	12	5
Charcoal	4	3
Kerosene	8	6
No system	15	5
Total	100	100

Note: N=240 (units connected to gas network) and N=330 (without gas conection)

The third component of the number of housing improvements indicator includes other exterior or interior improvements – related to framing –windows and doors repairs, fences and sidewalks. Lastly, as an alternative to housing improvements estimation models, those exclusively related to quality of construction materials are

analysed separately from other improvement components in the econometric regressions.

3.1.2. PARTICIPATION

The first variable is enrolment, which measures financial contribution to the co-production scheme and the fiduciary trust. The other set of participation measures are participation in neighbourhood voluntary organisations and activities, in leisure associations, in formal organisations (active and passive), and the number of organisations in which the respondent participates. Participation variables are measured according to a set of standardised questions concerning participatory involvement of the respondents, collected for each adult member in the house, introduced in this way:

> *I would like to ask you about any organisations or associations in which either you or the rest of the household members may participate, whether in formally organised groups or just groups of people that gather regularly to do any activity or to talk about any specific matter.*

Participation is defined as taking part in activities, going to meetings or performing tasks. A card shows the nine types of activities/organisations. The categories are: i) religious (Church, Temple, Synagogue and all the Methodist and Evangelist groups); ii) sports club or recreational activity (soccer, volleyball, among others); iii) arts, music or educational activities (theatre group, musical group, school cooperative); iv) unions (trade union, unemployed movement); v) political parties; vi) environmental Groups (i.e., Ecologists); vii) professional institutions (i.e., professional society or chamber of commerce); vi) local social associations (local sanitary unit, local communal kitchens, mutual societies, among others); viii) consumers associations, and, ix) CBO and neighbours' meetings, and any activities for the improvement of the neighbourhood (i.e., *Comunidad Organizada* – Organised Community (OC) – for the gas service programme, meetings with neighbours within the same block, or any other local neighbourhood gathering).

Table 4.4 shows the sample characteristics of the participation variables in 2006. The participation rate is 28 percent, which indicates that less than one third of the respondents are members – or participate – in at least one group. The standard deviation of the membership variable is 0.45, which indicates a considerable variation in participation rates across individuals. The fraction of participants in the various groups ranges from none for professional associations to 25 percent for religious groups.[69] Sport groups are the second most popular category, with a participation rate of 15 percent of respondents, followed by neighbourhood associations (8 percent). Respondents who reported participation in other community service groups and artistic or hobby club activities is six percent. The low enrolment in political associations is remarkable: less than one percent of respondents are members of political groups or labour unions which suggest that the neighbourhood organisations are not explicitly politically oriented and clientelistic.

TABLE 4.4. PARTICIPATION IN ORGANISATIONS (YEAR 2006)

RESPONDENTS' PARTICIPATION BY TYPE OF ORGANISATION OR ACTIVITIES.
TOTAL SAMPLE IN 2006 AND 2009 SURVEYS.

Organisation Type (year 2006)	Obs.	Mean	Standard Deviation.	Min.	Max.
Religious	633	0.245	0.430	0	1
Sports	633	0.150	0.357	0	1
Artistic	633	0.060	0.238	0	1
Union	633	0.005	0.069	0	1
Political	633	0.011	0.105	0	1
Professional	633	0.000	0.000	0	0
Humanitarian	633	0.063	0.243	0	1
Consumers	633	0.002	0.040	0	1
Neighbourhood	633	0.079	0.270	0	1
Participation (total)	633	0.280	0.450	0	1

[69] The survey shows extensive participation in religious organisations (i.e., such as Parroquia Nuestra Señora de Itatí – Virgin of Itati Parish – or Iglesia Pentecostal – Pentecostal Church). Such organisations have acquired a fundamental role in channelling direct assistance through provision of food, clothes and medicine, or in matters related to personal rights, such as domestic violence (Di Virgilio et al., 2009).

Note: Based on categories used in the survey questionnaires. Participation (total) indicates the proportion of respondents that participate in at least one organisation type.

Participation in community activities in Argentina is limited. According to the data obtained by the Latin American Public Opinion Project (LAPOP) in 2010, participation for the solution of neighbourhood issues - both in BAMA and nationally- is below the average level for the region. On a 1 to 100 scale, Buenos Aires averages 16 percent, which is 2.5 points below the regional average and ten points below the participation level reported in countries such as Paraguay. The study underscores that seven percent of the respondents participate in neighbourhood associations, a measure similar to that reported in the study settlements, while people report a higher level of involvement in religious organisations (22 percent).[70] Importantly, the frequency of participation across categories remained constant from 2008 to 2010. In contrast, in the neighbourhoods the figures slightly increased, but involvement in community enhancing activities remained low.

The empirical analysis focuses on four different participation variables.[71] The interest of this study lies on the respondent's involvement in voluntary neighbourhood organisations and activities. Measures of individual social capital investment are constructed considering the type of participatory involvement, whether it is voluntary or within formal, structured organisations. Voluntary participation is particularly useful to measure and two categories are distinguished: i) participation in voluntary neighbourhood activities and organisations and ii) participation in voluntary non-social activities and organisations, which includes all voluntary, leisure activities and organisations in which the respondents are actively

[70] Average religious participation is 20 points below the average for Latin America and the lowest on the continent. Political participation is similar to other Latin America averages (6.9 percent) LAPOP, 2010.

[71] Empirical studies that assess participatory involvement in community enhancing social capital, such as Hilber (2010) or Di Pasquale and Glaeser (1999), use estimation measures of membership of neighbourhood associations and organisations. Estimations focus on evaluating the levels of participation that only provide individual returns, a variable indicating individual membership in non-neighbourhood associations, such as those with co-workers, is generally used as the outcome in falsification tests that assess for the robustness of the models and estimates.

involved. Finally, among the formal organisations defined in the study, the main distinction is i) active formal organisations or ii) passive formal organisations. The former includes participation in religious, political and labour union activities and organisations, while the latter includes professional, consumer or environmental organisations.

Religious organisations are included in the study as ways of formal, active participatory involvement but because of their structured and hierarchical configuration they are not considered neighbourhood-enhancing voluntary activities. Obviously, the motivations for getting involved in these organisations include religious considerations and spiritual guidance. But, when respondents were invited to explain involvement, they also mentioned "help in wellbeing", "making them feel good", and "giving education to children and teaching them good values". In 2006, 14.2 percent of respondents participated in voluntary social activities and organisations while 21 percent in voluntary leisure activities and less than two percent in formal passive organisations. Notably, 26 percent participated in formal active organisations which are mostly religious in nature (Table 4.4).

In order to complete the participatory assessment, an additional question to evaluate the presence of "collective capacity" was included. This measure constitutes a proxy for active participatory involvement and assesses capacity by means of a concrete proposal. Two questions were asked. First, the relevance of having street signs with names and numbers. Respondents were unanimous: almost 98.7 percent of the responses considered street signs to be of high importance. Without numbers the residents are not able to receive regular mail, an issue that strongly affects their employability. Second, the people were asked: *"Do you think we can succeed in obtaining street signs if all neighbours get organised for such purpose?"* and *"Are you willing to participate, even with money to finance this?".* A dummy variable for the affirmative answers to both questions is constructed and called '*collective participation*'.[72]

[72] The survey also included some open questions with the idea of gathering qualitative insights as regards the motivations invoked by those that had not been willing to participate when the programme was presented for their consideration.

TABLE 4.4. PARTICIPATION IN ORGANISATIONS (YEARS 2006 AND 2009)

DESCRIPTIVE STATISTICS: RESPONDENT´S PARTICIPATION BY ORGANISATION OR ACTIVITIES CATEGORIES DEFINED FOR THIS STUDY.
TOTAL SAMPLE IN 2006 AND 2009 SURVEYS.

ORGANISATION TYPE (YEAR 2006)	Obs.	Mean	Standard Deviation.	Min.	Max.
voluntary_social_org	633	0.142	0.243	0	1
voluntary_leisure_org	633	0.210	0.338	0	1
formal_organisations_active	633	0.016	0.089	0	1
formal_organisations_active (includes religious org)	633	0.261	0.370	0	1
formal_organisations_passive	633	0.002	0.040	0	1
ORGANISATION TYPE (YEAR 2009)	**Obs.**	**Mean**	**Standard Deviation.**	**Min.**	**Max.**
voluntary_social_org	433	0.155	0.251	0	1
voluntary_leisure_org	433	0.085	0.212	0	1
formal_organisations_active	433	0.029	0.090	0	1
formal_organisations_active (includes religious org)	433	0.245	0.333	0	1
formal_organisations_passive	433	0.030	0.097	0	1

Note: Based on answers from survey questionnaires on types of organisations and activities.

3.1.3. PARTICULARISED AND GENERALISED TRUST

The standard survey question, framed in Rosenberg (1956), estimates generalised trust according to the statement: “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?”. Individuals who answer that ‘‘most people can be trusted’’ are defined as trusting, and the non-trusting category includes those who say that ‘‘you can’t be too

careful''.[73] Despite the popularity of Rosenberg´s question to measure trust, a number of authors have raised important criticisms (Glaeser et al., 2000; Uslaner, 2002; Beugelsdijk, 2006).

First, the question is not clear on how far trust may extend. The *wording* is problematic because the meaning given by each respondent to "most people" may be different. It may refer to people whom they know personally or to the population in general (Stolle 1998; Glaeser et al., 2000; Hardin, 2002; Rotenberg et al., 2005) or as a sign to indicate trust in strangers (Uslaner, 2002). Empirical evidence indicates that when respondents think about people they already know, the generalised trust measure is correlated with particularised trust. Second, instead of measuring trust and distrust, the question refers to trust and caution, which are not opposites (Miller and Mitamura, 2003). The answer as formulated may include cautiousness but not distrust. Moreover, answers may be biased depending on whether a person lives in a safe environment, associated with low levels of caution, or in places where caution is deemed essential (Miller and Mitamura, 2003). These critiques point to the difficulties of how attitudes can be measured (Hertzberg, 1988), under conditions where question interpretation is likely to be highly varied (Sturgis and Smith, 2010).

Indeed, the issue of language and meaning of terms is relevant to my research. In Spanish a single word defines both trust and confidence (*confianza*) while in English, these are two different words. Therefore, a definition of particularised measures of trust as used in this study may be better interpreted as a measure of resident 'confidence'. Although the conventional Anglo-Saxon definition and terminology has been followed in the literature review and my analysis, there is some slippage between interpretations of terms in Spanish from the field.

Qualitative insights gathered during fieldwork provided an indication of trust among residents. During the survey application, nobody was willing to open their door to strangers and the team had to present references and make several prior

[73] A dummy variable takes the value 1 if the respondent answer is within the "trusting" category, and 0 otherwise.

visits before people agreed to be interviewed in their home. When the idea of trust was inquired about, people referred to unknown others and to strangers, leaving aside day-to-day experiences, in connection with crime, insecurity or cheating. Generalised trust was neither connected to insecurity measures such as number of assaults to which the respondent or inner circle of family members and neighbours was exposed, nor whether the family usually leaves someone at home as security from crime. On average, 20 percent of the respondents in the Group 1 neighbourhoods said that ‘‘most people can be trusted’’ in 2006. To put such a measure in the Argentinian context, it should be noticed that the average proportion of household heads that declare they trust most people in Argentina from 1990 to 2001 was 15 percent (Bjornskov, 2006). Therefore, after the gas connection was granted in the neighbourhoods, the level of trust reported by residents was 32 percent higher than average values.

A set of questions interrogate other dimensions of trust. These focused on respondents’ trust in certain institutions; namely, the municipal public sector, neighbours, the NGO and CBO, banks and the utility company where relevant. The answers for these variables related to different trust domains, are coded from one (low or none at all) to five (high). Descriptive statistics using the average score indicates the highest level of trust - 4.63 - is in the family. The average score for trust in neighbours is 2.99, trust in neighbourhood associations is 2.33 and trust in the municipality is 2.09. Based on this scale, the variables defined for each particularised trust domain take both higher categories together – high and quite high, respectively – to construct an indicator that approximates a trusting attitude towards each specific domain.

Table 4.5 presents descriptive statistics for the complete sample in 2006 and 2009, respectively. The first column displays sample averages, which represent the fraction of respondents in 2006 who say that they trust other people or institutions (as listed in each row). On average, 16 percent of respondents in 2006 say that ‘‘most people can be trusted’’, and the figure increases to 30 percent to 2009. Moving from trust in others to trust in institutions, mean values display a wide variation across types of institution. Over 91 percent of respondents report very

high and high trust in the family, which remains stable over the two periods. Forty-eight percent and 58 percent respectively have trust in the NGO and CBO in 2006. The former remains stable and the latter is reduced in 2009 to 48 percent. Trust in neighbours falls slightly from 38 to 35 percent, comparing 2006 to 2009. The lowest trust measure reported is in the municipality at 15.7 percent, which is almost halved to nine percent in 2009. Forty two percent of respondents report high and quite high trust in the utility firm.

TABLE 4.5. TRUST VARIABLES (2006 AND 2009)

DESCRIPTIVE STATISTICS. TRUST OUTCOMES. ALL SAMPLES.
SOURCE: BASELINE AND FOLLOW-UP SURVEYS (2006-2009)

VARIABLE TRUST (HIGH AND QUITE HIGH) YEAR 2006	Obs.	Mean	Std. Dev.	Min	Max
Generalised Trust	633	0.16	0.37	0	1
Trust in Family	633	0.91	0.29	0	1
Trust in Neighbours	633	0.38	0.49	0	1
Trust in NGO	633	0.48	0.50	0	1
Trust in CBO	633	0.58	0.49	0	1
Trust in Municipality	630	0.16	0.36	0	1
Trust in Utility	633	0.42	0.49	0	1

VARIABLE TRUST (HIGH AND QUITE HIGH) YEAR 2009	Obs.	Mean	Std. Dev.	Min	Max
Generalised Trust	413	0.30	0.46	0	1
Trust in Family	413	0.91	0.29	0	1
Trust in Neighbours	413	0.35	0.48	0	1
Trust in NGO	413	0.48	0.50	0	1
Trust in CBO	413	0.48	0.50	0	1
Trust in Municipality	412	0.09	0.29	0	1

Table 4.6 describes the same variables for Group 1, 2 and 3. Group 1, is the treated group of residents that are located in the neighbourhoods where the co-produced programme was implemented and the connection to the energy grid already granted. Generalised trust is higher (20 percent) while we observe ample variation across different types of institutions. The family earns the highest level of confidence, 88 percent, and trust in the CBO is 43 percent. Once again, the lowest degree of confidence is in the municipality, 11.6 percent followed by the level of

confidence in the utility firm at 16.4 percent. Interestingly the neighbours on the block and the NGO all enjoy high levels of trust, 38 and 54 percent, respectively.

TABLE 4.6. DESCRIPTIVE STATISTICS TRUST VARIABLES – BY SAMPLES. SOURCE: BASELINE SURVEY. YEAR 2006.

VARIABLE TRUST (VERY HIGH AND HIGH)	GROUP 1 (OC) Mean (SD)	GROUP 2 (NUA) Mean (SD)	GROUP 3 (PRIMAVERA) Mean (SD)
Trust in Others	0.20	0.12	0.12
	(0.4)	(0.33)	(0.32)
Trust in Family	0.88	0.96	0.91
	(0.32)	(0.2)	(0.29)
Trust in Neighbours	0.38	0.40	0.36
	(0.49)	(0.49)	(0.48)
Trust in NGO	0.54	0.52	0.39
	(0.50)	(0.50)	(0.52)
Trust in CBO	0.43	0.33	0.13
	(0.5)	(0.47)	(0.5)
Trust in Municipality	0.12	0.22	0.18
	(0.48)	(0.50)	(0.51)
Trust in Utility Firm	0.16	0.15	0.08
VARIABLE TRUST (VERY HIGH)	GROUP 1 (OC) Mean (SD)	GROUP 2 (NUA) Mean (SD)	GROUP 3 (PRIMAVERA) Mean (SD)
Trust in Family	0.76	0.79	0.79
	(0.43)	(0.41)	(0.41)
Trust in Neighbours	0.16	0.15	0.13
	(0.37)	(0.36)	(0.4)
Trust in NGO	0.26	0.20	0.17
	(0.36)	(0.4)	(0.38)
Trust in CBO	0.16	0.14	0.08
	(0.37)	(0.35)	(0.44)
Trust in Municipality	0.09	0.22	0.14
	(0.43)	(0.41)	(0.36)

Generalised trust is lower in the other two neighbourhood groups while trust in the family and the municipality are higher in Group 2 and Group 3. The description of

these measures indicates that there are differences among groups that, as I will analyse later in Chapters 5, may be attributed to the programme implementation.

3.1.4. TENURE VARIABLES: THE LEGAL AND THE TENURE SECURITY APPROACH

Based on the academic controversy on tenure security and legality already discussed, two alternative criteria are applied to define conceptualisations of informality. Two different types of questions are used. One is related to self-declared security by tenure status. The other asks about the documents the residents have as proof of their tenure status, and what is the relation of the head of household with the person named in the documents. The self-declared tenure status is the standard way to measure informality in national statistics in Argentina. It is based on respondent's answers to the question "Would you inform me of your status, as regards the house and plot of land?". The categories are: i) own both the house and the plot of land, ii) own the house only, iii) rent the house, iv) occupant type categories (paying taxes and with permission), v) squatter (occupant without permission) and vi) another answer or don't know. In this approach, each self-declared set of tenure conditions is used as a dummy variable which is indicative of self-declared tenure status. The formal group comprises owners of the land and the house (formal owners) and owners that have obtained formalised rights through regularisation programmes. The informal owners group comprise owners of the house but not of the land (informal owners). Finally non-owners are all those that are occupants – paying property taxes or with permission to stay such as preliminary tenure – and another category for occupants without approval (squatters)[74] and renters. This category has (full or partial) rights of use.

Nevertheless, there are plenty of reasons to believe that the form in which National Statistics measure tenure status under-reports informality (see Goytia and Lanfranchi, 2009 in Lall et al., 2009). As this is a self-declared measure, the categorisation of formal owners does not provide information on whether the

[74] This approach can be seen as the standard approach found in the literature (see Cruz and Morais, 2008).

rights over the asset are legal or informal ones. In particular, in settlements which originated as informal commercial subdivisions and where households have already paid for the land, households consider themselves to be homeowners (of both the plot and the house) even though no formal title has been granted.

In order to conceptualise informality in legal terms, a second set of questions was introduced. The second question checks the documents that respondents possess as proof of ownership and who is entitled as the holder of legal rights. The categories include i) title deeds, ii) preliminary purchase agreement (conveyance), receipt of purchase, iii) regularisation programme (known as Pierri´s or Precarious Ownership Law (Law 24.374)) and iv) no document at all. These documents can be endorsed with the name of the household head and/or his wife/husband, but also under the name of a close relative (fathers, mothers) or other relatives (uncles or aunts, cousins, etc.) or are shared among several neighbours (as is the case of undivided rural land) or none of these options.

The two differentiated sets of dummy variables corresponding to the declared tenure and the legal status of the plot and the house are constructed and included in the analysis.

3.2. CHARACTERISTICS OF THE GROUPS AT THE INITIAL SURVEY (2006)

This description is an overview of the main characteristics of both residents and housing in the area where the co-production intervention is being carried out. Table A.1 (in the Appendix 1) provides a description of all the variables in the database, while Table 4.7 presents summary statistics for the whole sample (treatment and control groups). The 36 variables for which the data was obtained in the 2006 survey are grouped in seven categories: i) socioeconomic characteristics; ii) employment; iii) income and wealth; iv) housing characteristics; v) length of residence; vi) tenure and legal status, and, vii) distance measures. A mean, standard deviation, and minimum and maximum values are presented for each.

A brief overview of group characteristics is useful. The data for declared head of the household provide an average age of 48 years, 63 percent of respondents were male and 68 percent have primary educational level as the highest educational level achieved, whereas 12 percent have completed high school and 20 percent have not completed primary school. Two-thirds of the respondents were either married or cohabited while 15 percent were divorced or widowed and the rest were single. Importantly, ten percent are immigrants, 59 percent were local domestic migrants while 30 per cent were BAMA-born residents.

Employment and income variables help to characterise the labour market features of the residents in these neighbourhoods. The proportion of informal workers – 62 percent – is considerably higher than the 48 percent average for Great Buenos Aires (GBA) provided by EPH-INDEC (2006), denoting the precariousness of the labour market for these residents. The proportion of temporary and self-employed (freelancer) workers ranges from 12 to 19 percent of the total share of working household heads. Nevertheless, the unemployment rate of seven percent is similar to that of GBA for that date (EPH-INDEC, 2006). The highest proportion of workers was employees – 42 percent – while only one percent are employers and eight percent are retired. Moreover, the proportion of social plan beneficiaries represents four percent of the respondents. The mean value for the monthly per capita income in 2006 was ARG $308.30, and incomes ranged from ARG $40 to ARG $2,000. The total average monthly income, including all adult members in the household was ARG $1,233.91 and ranged from ARG $450 to ARG $3,800. National statistics by INDEC, indicates that the indigence line per adult in December 2006, which was based on the basic food basket was ARG $134.14 while the poverty line for an adult was ARG $291.08. Both figures indicate that the average income in the area was just above the poverty line.

TABLE 4.7. SUMMARY STATISTICS TABLE. VARIABLE LIST AND MEANS.

(YEAR 2006)

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
Household´s Head Socio-Demographic Characteristics					
Age	633	48.69	13.08	1	90
Sex_Male	633	0.63	0.44	0	1
Highest Level of Education (Completed)					
no education	633	0.20	0.46	0	1
Primary School	633	0.68	0.46	0	1
Secondary School	633	0.12	0.33	0	1
Marital status					
Single	632	0.10	0.28	0	1
Divorced, Separate or Widow	632	0.15	0.35	0	1
Married or Co-habitant	632	0.75	0.48	0	1
Economic dependency ratio	633	0.23	0.22	0	0.82
Number of occupants in the house	633	4.56	2.12	1	11
International immigrant	629	0.10	0.31	0	1
National migrant	629	0.59	0.49	0	1
Bs. As local migrant	629	0.30	0.46	0	1
Household´s Head Socioeconomic Characteristics					
Employment and Income					
Unemployed	631	0.07	0.25	0	1
Employee	631	0.42	0.49	0	1
Retired	631	0.08	0.28	0	1
Employer	631	0.01	0.12	0	1
Temporary Worker	631	0.12	0.33	0	1
Social Plan Beneficiary	633	0.04	0.21	0	1
Freelance Worker	631	0.19	0.40	0	1
Housewife	631	0.05	0.23	0	1
Type of occupation					
Formal Worker	617	0.48	0.50	0	1
Informal Worker	617	0.52	0.50	0	1
Income and wealth					
Total household Income	606	1233.91	697.26	450	3800
Income per capita	606	308.30	200.22	40.91	2000
Goods index	633	0.42	0.14	0	0.50
Service Index	633	0.15	0.09	0	0.30
Housing Characteristics					
Number of Houses by plot	633	1.25	0.54	1	6
Number of rooms	616	1.99	0.82	1	8
U. B. N. overcrowding	616	0.29	0.46	0	1
Type - standard	627	0.87	0.31	0	1
Type - very precarious	627	0.02	0.14	0	1

Type - shack	627	0.08	0.28	0	1
Houseage up to 5 years	611	0.08	0.27	0	1
House age between 6 and 15 years	611	0.28	0.45	0	1
House age between 16 and 22 years	611	0.21	0.41	0	1
House age between 23 and 29 years	611	0.19	0.39	0	1
House age more than 30 years	611	0.24	0.43	0	1
Length of Residence					
Up to 5 years	625	0.15	0.36	0	1
Between 6 to 15 years	625	0.32	0.47	0	1
Between 16 to 22 years	625	0.18	0.39	0	1
Between 23 to 29 years	625	0.18	0.39	0	1
More than 30 years	625	0.17	0.38	0	1
Housing Tenure Status					
Formal Owner	633	0.77	0.41	0	1
Formal Renter	633	0.02	0.12	0	1
Informal owner	633	0.17	0.11	0	1
Occupant (with permission)	633	0.07	0.25	0	1
Squatter	633	0.04	0.22	0	1
Other types of ownership	633	0.00	0.07	0	1
Legal Status By Ownership Documentation					
Title	633	0.34	0.47	0	1
Preliminary purchase agreement (*boleto*)	633	0.40	0.49	0	1
Preliminary legal documents (regularisation of land rights)	633	0.06	0.23	0	1
No Document	633	0.17	0.38	0	1
Other type of documents	633	0.02	0.14	0	1
Neighbourhood Heterogeneity					
Tenure heterogeneity	488	0.50	0.05	0.43	0.66
Housing Type heterogeneity	488	0.64	0.02	0.58	0.68
Permanence heterogeneity	488	0.29	0.03	0.26	0.36
Migrant heterogeneity	488	0.11	0.05	0.06	0.26
Distance					
Dist. Network	611	726.44	517.01	39.91	2060.16

Two indices were created to capture respondents' access to goods and services.[75] The average index score is 0.42 (goods) and 0.15 (services), which indicates a higher proportion of goods than services in the house. The indices suggest that the consumption of some valuable goods depends exclusively on efforts within households while service acquisition needs coordinated activity since it cannot be acquired individually in the market. Finally, the survey calculated the average

[75] It takes into consideration five domestic services (water obtained with a motor pump or similar, sink with water in the kitchen, lavatory with water, toilet with a water discharge to a septic tank, cellular phone) and five goods (fridge with freezer, washing machine, VCR, computer, car).

distance to the energy network, producing a figure of 727 metres (standard deviation 517, ranging from 39 to 2,000 metres), a measure that was originally related to the random assignment of the neighbourhoods to the programme.

4. TREATMENT AND CONTROL GROUP BALANCE

4.1. PRE-TREATMENT CHARACTERISTICS OF THE GROUPS (2001)

Table 4.8 presents the pre-treatment information from the 2001 National Population and Housing Census (INDEC, 2001). The purpose of this comparison is to confirm that the main characteristics of the treatment and control groups are balanced and, if differences emerge, to define the comparison properly by including the corresponding control variables in the model. The Table presents two groups of results. The first three columns provide descriptive statistics – mean and standard deviation – for each variable that was obtained from the census data and computed at a census track-units level. Columns 4 to 6 include a summary of the results of differences from the tests of means calculated on each variable, as well as its significance and the standard deviation in parentheses. The list of variables is divided into several groups that represent the residents, housing, and the characteristics of the neighbourhoods.

The pre-treatment similarities in socio-demographic and housing characteristics can be taken as consistent with the exogenous allocation of the co-production intervention in the neighbourhoods, and this was described when the natural experiment was presented in Chapter 1. The socioeconomic, housing and infrastructure service variables are reasonably well balanced for the three groups in 2001. The variable for educational level does not display significant differences; the difference is relatively small for primary educational level attained, which is only 2 percent lower for Treatment Group 2. When considering the maximum educational level attained by the head of the household, we cannot reject the hypothesis of equality as regards the highest educational level reached. The strong similarity in secondary and university level education compensates for the small difference in

the variable for completing primary education (means: 44.5, 41.3 and 44.6 percent in each of the treatment and control groups, respectively) which is hardly significant at 0.10 significance level. Nevertheless, this fact might have a direct incidence on several outcome variables, since there is a claimed-for link between education and social capital (Glaeser, 2001). A low education level might even suggest greater employment precariousness in Group 2, which might constrain housing investment. Then, as a function of this difference, the incorporation of the primary education variables in the estimations can be justified.

The proportion of immigrants and domestic migrants is lower in the control groups, where the proportion of locally born residents is slightly higher. The difference in the mean values for the proportion of residents that were not born in Argentina is marginally significant (at 5 percent). The means are 4.19 and 5.25 percent in each of Groups 1 and 2 respectively, and 3.15 percent in the control group. The same goes for the proportion of domestic migrants that are born outside the BAMA. Among the socio-demographic characteristics that might influence participatory involvement and trust, these indicators are usually considered relevant (Portes and Zhou, 1992). Hence, these indicators need to be included as controls in the estimations.

Household welfare conditions, which are measured by the Unsatisfied Basic Needs (UBN) indicators,[76] including characteristics such as housing, sanitation, education, overcrowding and subsistence, suggest a strong similarity between groups in 2001.

The hypothesis of equality in the proportion of unrecoverable deficient houses (shacks), shown in the housing term from the UBN indicator can not be rejected. The groups are well balanced in terms of maintenance capacity of the household, measured by dependency ratio, which indicates the existence of four or more

[76] The households that have Unsatisfied Basic Needs (UBN) are the ones that show at least one of the following deprivation indicators i) Housing: houses of an undesirable type, such as a room in an *inquilinato*, or precarious housing or others, including *ranchos*; ii) Living capacity: 4 or more people per employed member and also, whose head has not completed the third grade of primary school; iii) Sanitary conditions: homes having no toilets; iv) School attendance: household where children at school age (6 to 12 years) do not go to school, and v) Overcrowding: houses with more than 3 people per room (INDEC, 1984).

people dependent per employed family member in the household, when this member has not completed the third grade of primary school. The latter is a commonly used indicator from census data that provides a proxy of subsistence conditions among family members. Given the differences in primary school attendance, and considering that the national census does not provide information on the household's income, this measure provides evidence of similarities within the households of the different groups.

The difference between the treatment and control groups in the variable of the overall unmet basic needs is significant at ten percent: the mean values are 30.94, 28.16 and 26.96 percent of households, for Groups 1, 2 (treatment groups) and 3 (control group), respectively. Importantly, the mean values of the different sub-elements that are part of the UBN indicator suggest that overcrowding for 2001 (associated with the number of people that sleep in a room) is slightly higher for Group 1 (12.2 percent) when compared with Group 2 (9.1 percent) and control Group 3 (8.82 percent). This indicator explains in great part the differences in the UBN indicator among the groups. Nevertheless, the difference is relatively small and significant at a ten percent level. Since this indicator can be affected by the programme, a variable indicating the number of members in the house will be included in the control vector of the estimations.

The indicators related to services and housing suggest similar conditions among groups. The hypothesis of equality of means in the variables of tenure cannot be rejected. No significant differences appear in the tenure variable of formal ownership (that is the formal, declared ownership of the house and the land), which is slightly lower for Group 2 (UNA). This characteristic may influence directly some of the result variables that we want to analyse in our study, since tenure may affect housing and community-enhancing investment.

TABLE 4.8. MEANS AND DIFFERENCE OF MEANS TESTS FOR CENSUS VARIABLES. BY GROUPS (YEAR 2001)

VARIABLE	GROUP 1 Treatment 1 (OC)	GROUP 2 Treatment 2 (NUA)	GROUP 3 Control	OC vs. NUA	OC vs PRIM	NUA vs PRIM
		Mean			*Difference of means*	
Household Head Socio-Demographic Characteristics						
Highest Level of Education (Completed)						
no primary education	20.94	20.6	20.99	0.16	0.12	-0.29
	(0.31)	(0.45)	(0.36)	(0.31)	(0.27)	(0.25)
primary education	44.54	41.38	44.67	1.56**	0.45	-1.10*
	(0.22)	(0.2)	(0.14)	(0.56)	(0.48)	(0.59)
secondary school	14.91	14.85	14.94	0.06	-0.025	-0.09
	(0.28)	(0.29)	(0.29)	(0.42)	(0.42)	(0.42)
university degree	0.07	0.11	0.10	-0.03	-0.02	0.01
	(0.03)	(0.05)	(0.03)	(0.05)	(0.04)	(0.05)
Migrant Status						
international immigrant	4.19	5.25	3.15	-1.05**	1.03**	2.09**
	(0.34)	(1.2)	(0.27)	(1.29)	(0.45)	(1.26)
national migrant	31.91	31.81	21.37	0.09	0.54**	0.44**
	(0.27)	(0.15)	(0.2)	(0.31)	(0.34)	(0.25)
Bs. As. local migrant	0.11	0.13	0.10	-0.01	0.01	0.02
	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)
Unsatisfied Basic Needs						
UBN (any category)	30.94	28.16	26.96	0.778*	0.97*	0.20*
	(1.00)	(1.63)	(1.14)	(1.9)	(1.56)	(2.05)
UBN housing	9.38	9.42	9.63	0.95	0.75	0.79
	(0.81)	(1.24)	(0.71)	(1.53)	(1.10)	(1.47)
UBN dependency	1.28	1.73	1.43	-0.45	-0.15	0.30
	(0.22)	(0.26)	(0.18)	(0.35)	(0.29)	(0.32)
UBN overcrowding	12.2	9.21	8.82	1.38**	1.87**	0.38*
	(0.87)	(1.05)	(0.69)	(1.41	(1.14)	(1.29)
Housing Tenure status						
formal owner	68.64	65.14	68.94	0.50	-0.29	-0.80
	(1.15)	(2.29)	(0.7)	(2.65)	(1.38)	(2.46)
formal renter	2.64	2.98	3.29	-0.34	-0.65	-0.30
	(0.24)	(0.61)	(0.28)	(0.68)	(0.38)	(0.69)
Neighbourhood heterogeneity						
tenure	0.49	0.55	0.48	-0.06*	0.01	0.06**
	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)
housing	0.64	0.65	0.62	-0.01	0.01	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
education	0.28	0.30	0.29	-0.01	-0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Infrastructure						
no running water	53.94	52.14	53.32	0.79	0.62	0.82
	(1.32)	(1.72)	(2.15)	(1.24)	(1.59)	(1.83)
no household sewage disposal	55.53	54.98	55.91	0.55	0.62	0.07
	(2.36)	(2.39)	(2.01)	(3.48)	(3.19)	(3.22)
unpaved streets	18.83	11.32	33.97	7.50	-15.14	-22.65**
	(5.63)	(4.57)	(6.88)	(7.530)	(9.16)	(8.51)

Source: Based on NHPC,INDEC (,2001)
*** p<0.01, ** p<0.05, * p<0.1

Furthermore, the hypotheses of equality in infrastructure and services among the treatment and control groups can not be rejected. This means that the groups are well balanced in the proportion of houses having substitute goods of appropriate quality instead of a substitute for networked services in those neighbourhoods. No significant differences are seen in the infrastructure services available in the house, which involves a toilet with an appropriate disposal arrangement (i.e., connected to a septic tank), and availability of water obtained from a reliable source in terms of bacteriological quality (i.e., a deep enough underground well activated by a motor pump).

One of the main services provided by the municipal public sector in areas with informal urbanisation is adequate paving of streets. The difference in the proportion of non-paved roads is statistically significant (at a 0.01 significance level). The number of paved roads is higher in treatment than in control groups. While 34 percent of the houses in the control group are located in areas with no paved roads; 19 percent and 11 percent of the dwellings belonging to Groups 1 and 2 (OC and NUA), respectively, do not have access to such an amenity. This fact can be indicative of the municipal public sector being less attentive to basic demands. Nevertheless, this is compensated for by the fact that those units are much closer to the main avenues of the area, as it is explained later when the descriptive statistics of our survey measures are summarised. If this is associated with the level of trust in the municipality, the bias might be detrimental to control neighbourhoods, since treatment groups are better serviced. To overcome such an issue, the distance to the main avenue is included as a control in those estimations.

We cannot reject the null hypothesis of equality of means related to the indicators of heterogeneity, except for tenure heterogeneity which is slightly higher in Group 2, but the difference is marginally significant at a 0.10 significance level when Groups 1 and 2 are compared. Most of the indicators of neighbourhood heterogeneity (on housing, education and migrant status) are generally well balanced among groups, suggesting a strong similarity in the composition of the census tracks in these groups.

I can therefore conclude that the groups are well balanced in terms of pre-treatment, socio-demographic, housing and neighbourhood characteristics, which are consistent with the exogenous allocation of the co-production intervention. Nevertheless, some additional measures are taken in order to substantiate the empirical strategy. First, the differences in the pre-treatment characteristics will be controlled, including those features in the estimations. Second, the resident's and housing characteristics from the 2006 baseline survey are described in the next section. If significant differences between treatment and control groups were found in some of the observed features, it is necessary to control such differences in the estimation of the effects of the programme.

4.2. TEMPORAL (SOCIAL CAPITAL) TRENDS

Despite the fact that the groups are well balanced in their observable characteristics, it is useful to corroborate that the trends in these characteristics over time have also been similar. Differences might have an impact on some of the analysis. The exogeneity of the programme allocation and the similarity of the observable characteristics, when referring to the residents, housing, the origin of informal neighbourhoods, plus the fact that the Groups had been a single administrative locality for many years, suggest similar processes and timings of change. Residents in the neighbourhoods share a similar contextual environment since the locality had originated and developed as a single jurisdiction, and then was split into two different municipalities in 1993. At that time, neighbourhoods in Groups 1 and 2 were allocated to Moreno, while Group 3 to José C. Paz.

Three different participation measures from a 2002 survey (Forni and Coniglio, 2003, based on IDICSO-COSNET, 2002) present very similar trends during the period prior to the programme implementation in the two municipal jurisdictions, José C. Paz and Moreno. Importantly, 75 percent of the respondents from José C. Paz and 85 percent from Moreno reported that they have never been involved in neighbourhood organisations. In both, among those that have participated at least

once in their life, one-third have done so in neighbourhood organisations. Indeed, respondents in both groups have a relatively similar knowledge of their peers in the block since two-thirds of the respondents know their neighbours. Besides, 29 percent in José C. Paz and 41 percent in Moreno have a negative perception about residents' disposition to allocate time to organisations; this was slightly greater in the treatment group. These figures are consistent with what has been reported by other studies assessing participatory efforts in Latin America (Gilbert and Ward, 1984b). However, the difference among groups may be indicative of a lower involvement of the respondents in treatment groups, but the perception of other neighbours' involvement is similar between both groups.

Although we do not have data about trust among neighbours in order to trace behaviours, there are certain qualitative insights that help substantiate an overall view of the level of social interactions among peers before the intervention in those neighbourhoods. Scholars that have focused on issues connected to social capital in these neighbourhoods describe a very low level of interaction among neighbours before the announcement and implementation of the programme (Fidanza, 2005). They also point to the "more inward" focus and fewer opportunities to develop solidarity bonds during the economic crisis of 2001, when unemployment affected 47 percent of household heads (Fidanza, 2001: 8; INDEC, 2001). Commonly heard expressions included, "I don't even know my neighbour's name", "I wouldn't risk my neck for any of them", "I'm not in touch with them ... I manage on my own", and "I did everything on my own". Such expressions summarise the context before the intervention, and show that the residents' involvement in reciprocal relations with others was very limited (Fidanza, 2001). Under such initial conditions new social interactions elicited by the intervention may affect the level of trust among peers as a result of new interactions and commitments.

4.3. CHARACTERISTICS OF THE GROUPS IN 2006

Individual-level data from the sample gathered in 2006 include neighbourhood comparisons of socioeconomic variables. These included, age, sex, level of

education and employment of the head of the household, marital status, total family income and dependency ratio, tenure and housing legal status (both as reported by respondents and backed with documentation), length of permanence in the neighbourhood and characteristics of the dwellings (number of houses per plot, number of rooms, age and type of the house and overcrowding). The above-mentioned indicators from the baseline survey of 2006 are described In Table 4.9, where they are compared for the treatment and control groups.

Summary statistics for each treatment and control group and the t-tests for the difference in the mean value of key variables between the control and treatment groups are reported, grouped in seven different categories: i) socio-economic characteristics, ii) employment, iii) income and wealth, iv) housing characteristics, v) length of residence, vi) tenure and legal status, and, vii) distances measures.

Most socioeconomic variables are well balanced among groups and do not show significant statistical differences, a result which is consistent with our hypothesis that the selection for the programme was not based on socioeconomic characteristics of the residents. We cannot reject the hypothesis of equality of means for the sex of the household head, the level of education (no education and complete secondary education), number of members in the house and most of the employment and income variables, even the proportion of formal workers and social plan beneficiaries. Moreover, the differences in the variable of completed primary education, which were reported as being statistically significant in the pre-treatment data analysis for 2001, is hardly significant (at 5 percent) with more respondents having primary school as the higher level of scholarship attained in Group 1. While this might suggest greater employment precariousness, the similarity in employment status and type of occupations does not support such a belief.

When the difference in the mean values for the proportion of residents that were not born in Argentina is considered, once again, it is marginally significant (at 5 percent). This result is aligned with the evidence provided by pre-treatment data analysis. It indicates a lower proportion of international and domestic immigrants in

the control group, where the proportion of locally born residents is slightly higher and statistically significant (at 1 and 5 percent, respectively). In order to account properly for these observable marginal differences in the group composition, the two variables will be included as control in the estimations.

Results for age, marital status (separated, widow or widower) and retirement status (as an occupational activity) show values that are marginally higher in the control group. Moreover, the dependence ratio is marginally lower in that group. While we cannot reject the hypothesis about the number of members in the house neither the variables related to income per capita and total income, nor do the above-mentioned differences contribute to suggest the existence of a slightly higher proportion of older residents in the control group. These variables are added as controls to account for such differences among groups. Furthermore, to illustrate the balance in the economic characteristics, income and employment were considered. The household per capita income is close to ARG $300 in all groups (ARG $298.26, $309.98 and $319.5 for Groups 1, 2 and 3, respectively) and the average total household income per month is ARG $1,224.13, $1,190.92 and $1,231.87, respectively. The mean differences for the average monthly income per capita are marginally and statistically significant at a ten percent significance level. Moreover, one cannot reject the null hypothesis of equality of means in the proportion of all occupational categories (employee, unemployed, and employer, temporary and freelance workers) and of housewives and social plan beneficiaries. We cannot reject the hypothesis for the proportion of formal and informal workers either.

TABLE 4.9 MEANS AND DIFFERENCE OF MEANS TESTS: BY GROUPS. (YEAR 2006)

VARIABLE	GROUP 1 (CO)	GROUP 2 (NUA)	GROUP 3 (PRIM)	OC vs. NUA	OC vs. PRIM.	NUA vs. PRIM.
		MEAN		DIFFERENCE IN MEANS		
Household Head Socio-Demographic Characteristics						
Age	48,19	47,08	53,78	1,11	-5.5***	-6.6***
	(13,23)	(13,09)	(11,34)	(1,17)	(1,49)	(1,56)
Sex_Male	0,65	0,62	0,61	0,05	0,04	-0,008
	(0,43)	(0,46)	(0,46)	(0,03)	(0,05)	(0,05)
Highest Level Of Education (Completed)						
No education	0,22	0,23	0,24	-0,08	-0,08	0,001
	(0,44)	(0,48)	(0,48)	(0,04)	(0,05)	(0,05)
Primary School	0,7	0,66	0,66	0.08**	0,08	0.01*
	(0,44)	(0,48)	(0,48)	(0,04)	(0,05)	(0,05)
Secondary School	0,09	0,11	0,1	0,04	0,01	-0,03
	(0,35)	(0,29)	(0,33)	(0,02)	(0,03)	(0,03)
Marital status						
Single	0,17	0,16	0,15	-0,02	0,002	0,03
	(0,26)	(0,31)	(0,26)	(0,02)	(0,03)	(0,03)
Divorced, Separate or Wi	0,25	0,23	0,32	0,007	-0.1***	-0.1***
	(0,33)	(0,32)	(0,45)	(0,02)	(0,04)	(0,04)
Married or living with couple	0,52	0,49	0,44	-0,04	0.1***	0.1***
	(0,48)	(0,49)	(0,41)	(0,04)	(0,05)	(0,05)
Economic dependency	0,22	0,27	0,16	-0.1***	0.1***	0.1***
	(0,21)	(0,24)	(0,19)	(0,01)	(0,02)	(0,03)
Number of members in t	4,63	4,53	4,39	0,1	0,24	0,14
	(2,13)	(2,12)	(2,11)	(0,18)	(0,24)	(0,26)
International Immigrant	0,11	0,11	0,09	0,01	0,04	0,01
	(0,31)	(0,31)	(0,29)	(0,03)	(0,02)	(0,03)
National Migrant	0,58	0,56	0,51	1.13**	3.0***	2.1***
	(0,49)	(0,50)	(0,46)	(0,05)	(0,04)	(0,06)
Local Migrant GBA	0,32	0,33	0,38	-0.12*	-1.01**	-1.13**
	(0,47)	(0,47)	(0,40)	(0,02)	(0,03)	(0,03)

(Continue)

VARIABLE	GROUP 1 (CO)	GROUP 2 (NUA)	GROUP 3 (PRIM)	OC vs. NUA	OC vs. PRIM.	NUA vs. PRIM.
		MEAN		DIFFERENCE IN MEANS		
Household´s Head Socio-Economic Characteristics						
Employment						
Unemployed	0,08	0,06	0,09	0,03	-0,01	-0,04
	(0,26)	(0,21)	(0,29)	(0,02)	(0,03)	(0,02)
Employee	0,4	0,46	0,38	-0,05	0,02	0,08
	(0,49)	(0,50)	(0,49)	(0,04)	(0,05)	(0,06)
Retired	0,08	0,07	0,15	0,01	-0.1**	-0.07**
	(0,26)	(0,25)	(0,35)	(0,02)	(0,03)	(0,03)
Employer	0,01	0,01	0,03	-0,01	-0,02	-0,01
	(0,09)	(0,12)	(0,17)	(0,01)	(0,01)	(0,01)
Temporary Worker	0,14	0,12	0,08	0,01	0,05	0,03
	(0,35)	(0,32)	(0,28)	(0,03)	(0,03)	(0,03)
Social Plan Beneficiary	0,04	0,05	0,05	0,01	0,01	0,01
	(0,19)	(0,23)	(0,22)	0,00	0,00	0,00
Freelance Worker	0,19	0,21	0,19	-0,01	0,01	0,02
	(0,39)	(0,41)	(0,39)	(0,03)	(0,04)	(0,04)
Housewife	0,06	0,04	0,05	0,02	0,01	-0,01
	(0,24)	(0,20)	(0,22)	(0,02)	(0,02)	(0,02)
Social Security						
Formal Worker	0,49	0,51	0,53	-0,05	-0,07	-0,01
	(0,50)	(0,50)	(0,50)	(0,04)	(0,05)	(0,06)
Informal Worker	0,51	0,48	0,46	0,05	0,07	0,01
	(0,50)	(0,50)	(0,50)	(0,04)	(0,05)	(0,06)
Income and Wealth Indicators						
Total Household Income	1224,1	1190,9	1231,9	33,22	-77,7	-71
	(685)	(672)	(781)	(62)	(84)	(90)
Income per capita	298	309	319	-11,72	-11.2*	-29,53
	(188)	(219)	(195)	(18,2)	(22,6)	(26,9)
Goods Index	0,42	0,43	0,43	-0,01	-0,01	0
	(0,16)	(0,15)	(0,14)	(0,01)	(0,02)	(0,02)
Service Index	0,19	0,16	0,18	0.02*	0.06*	-0,04
	(0,17)	(0,17)	(0,19)	(0,01)	(0,02)	(0,02)
Distances						
Distance to nearest avenue	855	1281	325	-426**	529***	956***
	(146)	(105)	(59)	(187)	(162)	(124)
Average distance to network	340	809	1285	-945***	-469***	-476***
	(60)	(124)	(104)	(125)	(142)	(167)

(Continue)

VARIABLE	GROUP 1 (CO)	GROUP 2 (NUA)	GROUP 3 (PRIM)	OC vs. NUA	OC vs. PRIM.	NUA vs. PRIM.
		MEAN		DIFFERENCE IN MEANS		
Housing characteristics						
Houses by plot	1,18	1,34	1,28	-0.16***	-0.10**	0,06
	(0,42)	(0,69)	(0,50)	(0,05)	(0,05)	(0,08)
Number of rooms	1,98	1,8	2,09	0.10*	-0.20*	-0.28*
	(0,85)	(0,76)	(0,69)	(0,07)	(0,09)	(0,09)
U. B. N. overcrowding	0,33	0,33	0,3	-0,04	0.19*	0.203*
	(0,46)	(0,48)	(0,35)	(0,04)	(0,05)	(0,06)
Type _standard	0,88	0,87	0,9	0,01	-0.18*	-0.12*
	(0,32)	(0,34)	(0,18)	(0,03)	(0,03)	(0,04)
Type_precarious	0,03	0,02	0,01	0,01	0.03*	0.01*
	(0,16)	(0,12)	(0,10)	(0,01)	(0,02)	(0,01)
Type _shack	0,08	0,11	0,03	-0,03	0.05*	0.08**
	(0,27)	(0,32)	(0,18)	(0,03)	(0,03)	(0,04)
House age up to 5 years	0,07	0,12	0,01	-0.05**	0.05**	0.1***
	(0,25)	(0,33)	(0,10)	(0,03)	(0,03)	(0,03)
House age between 6 and 15 years	0,27	0,31	0,22	-0,03	0,05	0,08
	(0,45)	(0,46)	(0,42)	(0,04)	(0,05)	(0,06)
House age between 16 and 22 years	0,26	0,19	0,12	0.07*	0.1***	0,07
	(0,44)	(0,39)	(0,32)	(0,04)	(0,05)	(0,05)
House age between 23 and 29 years	0,23	0,14	0,17	0.09**	0,06	-0,03
	(0,42)	(0,34)	(0,38)	(0,04)	(0,05)	(0,04)
House age more than 30 years	0,17	0,24	0,48	-0.07**	-0.3***	-0.2***
	(0,38)	(0,43)	(0,50)	(0,04)	(0,05)	(0,06)
Housing Tenure and Legal Status						
Self declared tenure status						
Formal Owner	0,76	0,72	0,91	0,03	-0.1***	-0.18***
	(0,43)	(0,45)	(0,29)	(0,04)	(0,05)	(0,05)
Informal Owner	0,08	0,11	0,04	-0,03	0,03	0.06*
	(0,27)	(0,31)	(0,20)	(0,03)	(0,03)	(0,03)
Formal Renter	0,02	0,01	0,01	0.01*	0,01	-0,01
	(0,15)	(0,07)	(0,10)	(0,01)	(0,01)	(0,01)
Occupant with permissic	0,06	0,1	0,01	-0,03	0.05**	0.01***
	(0,24)	(0,30)	(0,10)	(0,02)	(0,03)	(0,03)
Squatter	0,05	0,05	0,05	0	0,04	0,04
	(0,21)	(0,23)	(0,10)	(0,02)	(0,02)	(0,02)
Other types of ownershi	0,01	0	0	0	0,01	0
	(0,08)	(0,07)	0,00	(0,01)	(0,01)	(0,01)

(Continue)

VARIABLE	GROUP 1 (CO)	GROUP 2 (NUA)	GROUP 3 (PRIM)	OC vs. NUA	OC vs. PRIM.	NUA vs. PRIM.
		MEAN		DIFFERENCE IN MEANS		
Legal Status By Ownership Documentation						
With Title	0,31	0,35	0,45	-0,04	-0.1***	-0.10**
	(0,46)	(0,48)	(0,50)	(0,04)	(0,05)	(0,06)
Boleto -coveyance	0,4	0,37	0,48	0,03	-0,08	-0.11*
	(0,49)	(0,48)	(0,50)	(0,04)	(0,06)	(0,06)
Precary tenure -regulariz	0,1	0,01	0,01	0.01***	0.07**	-0,01
	(0,30)	(0,10)	(0,14)	(0,02)	(0,03)	(0,01)
No Document	0,16	0,25	0,04	-0.08**	0.1***	0.2***
	(0,37)	(0,43)	(0,20)	(0,04)	(0,04)	(0,05)
Other type of documents	0,02	0,02	0	0	0,02	0,02
	(0,15)	(0,16)	0,00	(0,01)	(0,02)	(0,02)
Length of Residence in the neighbourhood						
Up to 5 years	0,17	0,18	0,01	-0,011	0.1***	0.1***
	(0,38)	(0,39)	(0,10)	(0,03)	(0,04)	(0,04)
Between 6 to 15 years	0,31	0,33	0,31	-0,01	0,01	0,02
	(0,46)	(0,47)	(0,46)	(0,04)	(0,05)	(0,06)
Between 16 to 22 years	0,2	0,18	0,13	0,01	0,06	0,05
	(0,40)	(0,39)	(0,33)	(0,04)	(0,04)	(0,05)
Between 23 to 29 years	0,2	0,14	0,19	0.06*	0,01	-0,05
	(0,40)	(0,35)	(0,39)	(0,03)	(0,05)	(0,05)
More than 30 years	0,12	0,17	0,37	-0.05*	-0.2***	-0.2***
	(0,32)	(0,37)	(0,48)	(0,03)	(0,04)	(0,05)

(Continue)

VARIABLE	GROUP 1 (CO)	GROUP 2 (NUA)	GROUP 3 (PRIM)	GROUP 1 vs. GROUP 2	GROUP 1 vs. GROUP 3	GROUP 2 vs. GROUP 3
	MEAN			DIFFERENCE IN MEANS		
Legal Status By Ownership Documentation						
With Title	0.31	0.35	0.45	-0.04	-0.1***	-0.10**
	(0.46)	(0.48)	(0.50)	(0.04)	(0.05)	(0.06)
Boleto -coveyance	0.4	0.37	0.48	0.03	-0.08	-0.11*
	(0.49)	(0.48)	(0.50)	(0.04)	(0.06)	(0.06)
Precary tenure -regularizati	0.1	0.01	0.01	0.01***	0.07**	-0.01
	(0.30)	(0.10)	(0.14)	(0.02)	(0.03)	(0.01)
No Document	0.16	0.25	0.04	-0.08**	0.1***	0.2***
	(0.37)	(0.43)	(0.20)	(0.04)	(0.04)	(0.05)
Other type of documents	0.02	0.02	0	0	0.02	0.02
	(0.15)	(0.16)	0.00	(0.01)	(0.02)	(0.02)
Length of Residence in the neighbourhood						
Up to 5 years	0.17	0.18	0.01	-0.011	0.1***	0.1***
	(0.38)	(0.39)	(0.10)	(0.03)	(0.04)	(0.04)
Between 6 to 15 years	0.31	0.33	0.31	-0.01	0.01	0.02
	(0.46)	(0.47)	(0.46)	(0.04)	(0.05)	(0.06)
Between 16 to 22 years	0.2	0.18	0.13	0.01	0.06	0.05
	(0.40)	(0.39)	(0.33)	(0.04)	(0.04)	(0.05)
Between 23 to 29 years	0.2	0.14	0.19	0.06*	0.01	-0.05
	(0.40)	(0.35)	(0.39)	(0.03)	(0.05)	(0.05)
More than 30 years	0.12	0.17	0.37	-0.05*	-0.2***	-0.2***
	(0.32)	(0.37)	(0.48)	(0.03)	(0.04)	(0.05)

Notes: Table computed at the household level using survey information (2006). Standard errors shown in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Other characteristics, such as the means for the goods index, are very similar across groups. One exception in the service index, marginally superior in Group 1, is related to the expected outcome of the effects of having gas connection, in connection to housing improvements in the treatment group that has already been connected to the service. This issue is indicative of the effects of the intervention. In most other respects, housing characteristics are well balanced and the marginal differences shown between the groups are statistically significant at a 10 and 5 percent significance level. There are more housing units per plot in Group 2 (1.34 units compared to 1.18, and 1.28 units per plot in Groups 1 and 3) and the number of rooms is slightly higher in the control group (the difference is statistically

significant at a 10 percent significance level). As we have already indicated when describing the pre-treatment information, the overcrowding indicator associated with the number of people per room in the house shows a slightly higher difference in the treatment groups when compared to the control group (means 0.33 and 0.30, respectively). This variable can have a direct incidence on some of the improvement outcomes because families may have more incentives to build a new room. Consequently, the number of members in the house should be included as control in the model regressions.

As can be seen, the tenure and document variables are reasonably balanced for the three groups, displaying no significant differences in most of them. For example, we cannot reject the null hypothesis of equality for the proportion of formal renters, occupants and squatters. The proportion of households that declare having a formal tenure status of the house and the plot is higher in the control group (91 percent), when compared to the neighbourhoods in the treatment groups (76 and 72 percent, respectively), and the difference is significant at a one percent significance level. This feature may influence directly some of the outcome variables of interest. The tenure formality/informality status can affect people's incentives to improve the house and thereby have an impact on the estimated participation and on trust. In all models this variable is included as a control to check differences among groups.

The length of residence ranges from six to 22 years (from 1984 to 2000) and is well balanced among groups. The fact that there are more newcomers and a greater proportion of newer built houses during the last five years in the treatment groups might be considered a side effect of the intervention.[77] These differences are statistically significant at a one percent level. Moreover, the higher proportion of older housing units and the statistically significant difference in the proportion of residents who settled there more than 30 years ago reinforces the notion of an older established population within the control group. These facts can bias the estimation of social capital investment because the newly arrived can have a

[77] Restricted to residents living there for less than four years before the baseline survey.

"diluting" effect (see Hilber, 2010) and affect other changes. On the one hand, long-standing houses may have been progressively improved over a longer time frame and thus require fewer improvements. On the other hand, older units may be in need of a greater number of repairs, as was shown by Ward et al. (2011a) for Mexican *colonias*. What is relevant is that those differences among groups have to be controlled. Therefore, dummy variables corresponding to length of residence and tenure status are included in the models.

A tenure status variable is included because of the higher correlation between the length of residence and the type of document that residents hold as a proof of their tenure status. The probability of a dweller having formal or informal status is correlated with the time in which s/he has settled in the area. Indeed, the residents that settled after the 1977 enactment of the provincial government of Buenos Aires (8912) are considered illegal according to the law. This land-use legislation was enacted in order to limit informal development in the region (Goytia and Lanfranchi, 2009). The law required a minimum plot size of 300 square metres and forced developers to finance infrastructure as a prerequisite for the subdivision of land. At the same time, any land development not following regulations was deemed illegal. The land regularisation programme developed in 1994 for settlements inhabited until 1984 was aimed at people who could prove continuous occupation of the plot. The residents that arrived after 1994 are deemed illegal by the provincial law.

That is an important explanation for the differences in the proportion of residents holding legal status of their units, since the time of arrival and the age of the housing unit are correlated with the possession of this type of documentation. We cannot reject the null hypothesis of equality in means for the proportion of residents that have a conveyance, which is the preliminary sales agreement. Moreover, there are statistically significant differences in the proportion of household heads that reported having legal titles, a preliminary tenure regularisation certificate or no document at all. The proportion of titled units is 45 percent for neighbourhoods included in the control group, while it is 31 and 35 percent for the units included in Treatment Groups 1 and 2. This suggests that the

higher proportion of older population that has been established for a longer period of time within the control group has had access to a legal status. The undocumented status of the housing units is higher within Group 2 (UNA), which has a slightly higher proportion of newcomers, while the proportion of units that have certificates of preliminary tenure regularisation is higher in Group 1 (OC). These facts should justify the incorporation of the dummy variables for the documents and of the tenure categories in the regressions. Finally, the average distance to the energy network is 726.44 metres, with a standard deviation of 517.01, ranging from 39 to 2,000 metres.

To sum up, many of the observable characteristics of the households in the treatment and control groups appear similar at this stage. When this is not the case for variables that are more closely related to the expected outcomes of the co-produced intervention, they are included as covariates in the models.

The observable characteristics that are statistically different among groups and that may not be directly affected by the programme are included in the models.[78] Those include all resident and housing-level characteristics already described which account for differences in observable characteristics. This set of covariates include: i) socio-demographic characteristics of the head of household, the family and the housing unit: age (and age square), sex, marital status (binary variable taking value 1 for married or cohabitation and 0 otherwise), primary education, migratory status (two dummy variables taking value 1 if respondent is immigrant or domestic migrant from another province of the country, and 0 if otherwise) and number of houses in the plot; ii) socioeconomic characteristics of household head: employment and income characteristics (a binary variable for retired), logarithm of average family income per capita, dependency level (i.e. the ratio of the number of residents under 14 and the number of income earning family members), the total number of members in the house; iii) dummy variables identifying the length of residence of the family in the neighbourhood, divided into five categories: less than

[78] There is a usual trade-off involved in the choice of covariates in order to avoid post-treatment bias, which is caused by adjusting for variables that are themselves affected by treatment (Rosenbaum 1984).

five years in the neighbourhood, 6 to 12 years, 12 to 22 years, 23 to 30 years and more than 30 years and, finally; iv) tenure and documents dummies.

Measures that account for contextual effects related to heterogeneity are also included as controls. The calculation of statistics of the surrounding blocks is considered since the degree of homogeneity or heterogeneity between neighbours may affect participation costs. The very low number of neighbourhoods in our sample (15 in total) constrains the inference over heterogeneity measures at the neighbourhood level. The models include the average values and heterogeneity indices of a selected set of characteristics related to nearby neighbours. The definition of nearby houses includes those that are within 200 metres or less from each other. This distance accounts for what could be a reasonable spatial expansion of daily social interactions.

The heterogeneity characteristics in such neighbouring clusters are: i) income index (computed using household income from the different surveys) to measure levels of income inequality, ii) the (migrant) origin heterogeneity index (that takes into consideration nationality and province of origin), iii) the education heterogeneity index, iv) the tenure heterogeneity index; v) housing heterogeneity index and, finally, vi) the length of residence heterogeneity index. The construction of the indices is described in Appendix 3.

The income index is based on the quintiles of the income distribution within the group; the migrant heterogeneity index considers the share of local-born residents, of national migrants and of cross-border ones. The education heterogeneity index divides people into four educational level categories: primary education not completed, and primary, secondary and university level studies completed.

The tenure heterogeneity index divides people into five categories: formal owner, informal owner, renter and occupant, and the last category considers those that are squatters. The housing heterogeneity index takes into account the share of units that are regular ones, and those that are shacks and dilapidated ones (*casillas* and *ranchos*, in Spanish) Finally the length of permanence index categorises people into the 5 categories already described as controls: less than five years in the

neighbourhood, 6 to 12 years, 12 to 22 years, 23 to 30 years and more than 30 years.

5. ESTIMATION MODELS FOR YEARS 2006 AND 2009.

Two different estimation methods are used to present the impact of the intervention at the two different points in time, 2006 and 2009. One, based on OLS – 2SLS, when using data from 2006, and "differences-in-differences" estimators, when households are observed at two points in time by the surveys from 2006 and 2009. Basically, difference-in-differences methodology compares variations in the results over time between treatment and control groups. The outcome variables are used as dependent variables in the econometric models, which have the offering of the programme (intention to treat) and the effective enrolment (local average treatment effect) as main explanatory variables. The main significant differences on individual and contextual variables are included as covariates, based on the results obtained in this chapter assessing treatment and control groups balance. The econometric models that are estimated to obtain measures of the effects are included in the Appendix 2.

5.1. SAVINGS AND ENROLMENT

The first set of models contributes to understand how different characteristics of the households affect their probability of joining the programme. Enrolment in the co-produced programme is explained based on observable characteristics of the household head, the family and the house, using 2006 information of residents located in Group 1. First, the model includes two sets of socio-economic characteristics from the householder – age, sex, marital status, maximum level of education attained and migrant condition (international, provincial or local metropolitan area native) – and from the members that cohabit in the house (the

number of residents, number of children under 14 years old), dependency ratio,[79] number of houses per plot and total family income by quintiles of the income distribution. In Model 2 labour status and occupation variables are added. Those include: (i) household head labour occupation, (ii) whether the household head works in formal employment conditions – which means regularity on income and stability through pension system coverage, and (iii) the length of permanence in the job. All these measures may affect (current and permanent) income. Since long term residence may reduce information problems and may determine security, Model 3 includes (iv) the stability effect -by length of residence in the neighbourhood. Models 4 and 5, take into account the self-declared tenure status of the respondent, using the following characteristics[80]: (i) owner of the house and the plot (defined as formal owner); (ii) tenant (defined as formal renter); (iii) Owner of the house only (defined as informal owner); (iv) occupant having permission to dwell in (defined as occupant) and (v) occupant without permission to live in the house (defined as squatter). Documentation of ownership rights is included, instead of including the tenure situation. Model 5 adds legal type of documentation for ownership rights.[81] The legal ownership rights include the following categories: (i) legal title, either nominated at his/her name or a close relative (Title), (ii) Conveyance, or receipt , either nominated at his/her name or a close relative (Conveyance), (iii) land regularisation beneficiary (precarious tenancy, known as "*titularidad precaria*" or "*Ley Pierri*"[82] (Regularised), (iv) None and (v) Unknown, in case the respondent does not know what type of document the family holds. [83]

This thesis underscores that the potential savings that energy substitution represents for families are a key determinant in providing incentives to participate. In order to assess the validity of this assumption, a variable captures the cost of gas

[79] Number of adult working members per number of children in the household.

[80] It distinguishes the use rights from those to transfer and modify the unit. It has no legal connotation since legality is not assessed by INDEC.

[81] Due to the fact that the documentation and tenure self-reported are highly correlated, these set of variables cannot be included altogether.

[82] The Governor of Buenos Aires Province, which enacted in 1994 the Land Regularisation Law No 24.374.

[83] The set of explanatory variables are included sequentially in five Probit models.

substitutes spent by both participants and non-participant households. For non-participant families this amount represents their current expenditure in any network gas substitute, while for participant families, the expenditure in gas substitutes is computed by a retrospective question of how much they were spending before their connection to the grid. There is an obvious disadvantage to this method of coding gas substitution expenditure: programme adherence would be underestimated if inflation has affected the price of energy substitutes, since adherent households will systematically have lower values as compared to what they would be nowadays reporting. But, the inflationary context – 12.3 percent rate from 2005-2006 (BCRA, 2012) – is offset by regulated maximum prices for gas tanks. So, a conservative estimate of the savings in energy expenditure that guide households in their participation decision is provided here.

The importance of savings is captured in the models that include the full set of individual and household variables detailed above. In addition, three different measures of gas substitute's expenditure are added. Savings are coded as a dichotomous variable taking value 1 if the family spends (or was spending if they belong to the (now) connected group) above a certain percentile of the distribution of expenditure in the neighbourhood and 0 otherwise.

5.2. THE MEASUREMENT OF EFFECTS

As we explained above, in many policy circumstances, understanding if the neighbourhood where the intervention is offered, as a whole, exhibits some average difference as compared to the control group is of high relevance. On the one hand, this sort of intervention where residents have to contribute to finance the connection, can never expect full compliance and, on the other hand, we might expect spillovers to affect the residents that were not enrolled in the co-produced programme (the "non-treated" group in the "intention to treat" sample group). For these reasons, the first set of models involves comparing the intention to treat group (all residents in the neighbourhoods where the programme is offered, both treated and non-treated) against the control group (Group 3, formed by Primavera

neighbourhoods).

We have two differentiated "intention to treat" groups. Comparing neighbourhoods from Group 2 (NUA) and Control (Primavera), will shed light on the effect of introducing an exogenous source of social interactions (Stage 1 of the co-production intervention) while comparing Group 1 (OC) and Control Group[84] will inform on the "complete experience" effects, if any, that arise from the outcomes under analysis. The same is estimated again, as result of the whole co-production experience and gas network connection after some years of its implementation in year 2009.

Finally, there is also an interest in understanding the effects of the programme on other, more specific groups. In particular we are interested in analysing programme effects – or incremental effects – for the actual "treated" residents, which means those that enrol in the programme and obtain the connection to the energy grid. First, it compares enrolment families in Group 1 against the non-treated families (non-participants in Group 2 and every household in Group 3). The same is done to compare outcomes for enrolment families with non-adherent ones within neighbourhoods where the programme was not implemented.

5.3. TENURE, HOUSING IMPROVEMENTS AND TRUST

Given the heterogeneity of formal rights to property that prevailed in these settlements – from titled property rights to informal ones, such as those associated with informal occupation or the possession of informal documents – there might be different incentives for the residents to invest in social capital, thanks to the energy programme. Therefore, the sample is split into four different categories, which are: titled ownership rights, non-legal rights ownership, secure ownership (declared formal owners) and non-owners (squatters and occupants or renters holding use rights).

[84] In 2006 the programme was only delivered to Group 1, so at that time, the control group includes Group 2 and 3.

The last group of estimations are intended to shed light to the hypothesised effect of trust development on housing reforms. The effect on improvements will be the estimated effect of the gas programme on the selected outcome (i.e., housing improvements or number of improvements), which is the result of the direct effect of the programme on improvements plus the indirect effect of the programme on the generation of trust.

Therefore, the next stage of this analysis assesses the association between trust measures and private investments on changes to the house. The trust variable is incorporated as an independent variable in the model where the dependent is the variable indicating the improvements in the house.

The third goal of this work is to examine whether the co-production intervention effect on investment in the house might be affected by the generation of trust. The main hypothesis that is considered here is that both formal and informal institutions – such as tenure rights as well as trust, may have effects on private investment in the house due to co-production programme implementation. As result of such considerations, in this section the trust elicited by the new networks supported by the programme and their influence on the likelihood to invest for housing improvements are jointly assessed. The models provide empirical evidence about the association between several dimensions of trust and private investments when it comes to improvements in the houses.

6. CONCLUSIONS

The implementation of the co-produced programme was carried out in a way that facilitates the evaluation of effects by means of the "natural experiment". The chapter has described the data and the central methodological issues that help to quantify these social and physical effects. First, it defines three different programme stages that are the base for the identification of the causal effects of co-production taking into consideration the sequential implementation into the neighbourhoods.

Second, this methodology compares variations in the results between the groups of

neighbourhoods that were beneficiaries and non-beneficiaries of the intervention at two points in time (2006 and 2009). Residents that are located in the neighbourhoods that were programme beneficiaries are compared against those residents located in non-beneficiary neighbourhoods. Thus, the counterfactual for the beneficiary group is estimated from the change in outcome of the non-beneficiary group (comparison or control group). In the completed experience stage in 2006, Group 1 is compared to Groups 2 and 3, since the last two were not beneficiaries of the co-produced programme at that date. In 2009, either the effects from the social interactions and information gathering stage (in Group 2) and the effects from the after connection stage (in Group 1) have the neighbourhoods where the programme is not implemented as a control group (Group 3). In each beneficiary group, the method distinguishes the average effect from the specific effect on the programme participants that decided to enrol in the co-produced scheme.

Third, the chapter provided evidence on the well-balanced characteristics of the groups (treatment and control) that validates the exogeneity of programme allocation. This information helps to determine any differences among groups previous to the intervention that are controlled- and ruled out- once included as controls in the models. Besides, the limitations on checking social trends before programme implementation are overcome by presenting available qualitative information that helps to substantiate the balance among groups. Still, the relevance of utilising differenced data between 2006 and 2009 takes away any difference in unobservable characteristics that cannot be appropriately control when including observables differences among groups as covariates.

Finally, the methods used to measure programme effects, enrolment and savings internalisation, the tenure and legal explanations and the association between trust measures and housing improvements are outlined. This way, the legal and tenure security explanations for internalisation of benefits from investment are empirically framed, when the causal effects on the outcomes of interest are contrasted between residents that where beneficiaries of the co-produced service programme and those located in the control group.

CHAPTER 5: THE SOCIAL DIMENSIONS: PARICIPATION AND TRUST

1. INTRODUCTION

This chapter presents the effects of service co-production on participation and trust. The presentation of these results is organised in four sections. Section 5.2 considers enrolment to the network extension programme and outlines the effects of savings which is a key factor for the internalisation of benefits. Section 5.3 considers voluntary participation in neighbourhood activities and organisations driven by implementation of the co-produced programme, and the building of collective capacity. Section 5.4 concentrates on the co-produced programme's effect on generalised and particularised trust and bases the analysis in the three co-production stages. Finally, Section 5.5 presents the conclusions on the social dimension of co-producing services.

2. MEMBERSHIP, GAS EXPENDITURES AND SAVINGS

Chapter 3 outlined the internalisation of benefits from household membership in the co-produced programme. Membership is defined as the contribution in time and financial resources to the programme via enrolment and becomes effective with the signing of the fiduciary trust agreement. By 2006, Group 1 households were connected to the new pipeline, and had been since 2005. In the group, non-participating residents had either not given their consent or were unable to reach agreement with a sufficient proportion of neighbours within their block. The survey of this group captured data for 240 households enrolled on the programme (over 70 percent) and 90 that were not.

The decision to enrol on the programme depends on a calculation of savings generated by substituting bottled gas (*garrafa social*) or other poor quality goods such as wood logs, kerosene, or expensive electricity services, for the networked gas, against the costs of the new system. Obtaining energy from the gas company is cheaper and safer, and increases comfort in all domestic activities, from nutrition to

hygiene.[85] Yet, participation involves individual and household commitments to finance the grid extension. Residents are encouraged to pay regular monthly expenses over a time frame that extends beyond most of the financial commitments they are used to. Indeed, by signing the fiduciary trust agreement, each adult member in a participant household has to guarantee that financial commitments will be paid and, moreover, each becomes liable for their neighbours' accountability or payment default.

In order to understand the substitution effect the 2006 survey included two questions. One retrospective dealing with energy consumption habits, while the second disaggregates actual consumption through piped provision into two items: gas expenses (charged for consumption) and average installation costs. Participants report average monthly energy spending on gas around AR$ 62 before connection, while on average they paid almost the same (AR$ 60) for their new piped gas consumption. Net consumption spending is half of that sum, with the rest used to pay for the extension and connection works. After paying the fixed costs of the installation, there is a projected reduction in energy expenses and a boost in disposable monthly income of almost AR$ 35. Since families are spending around five percent of their incomes on either buying gas or gas substitutes, in the short run it seems that households might be indifferent to the decision to participate in economic terms, since the only benefit at this stage would seem to have been the use value of the new service. Nevertheless, the internalisation of net savings through connection is apparent when all the installation costs have been paid, reducing energy expenditure to AR$ 28.5, that is 2.3 percent of the average monthly income of AR$ 1,200. Importantly, taking into account the variable and fixed costs, at the connection stage in 2006, 41 percent of households experienced some sort of savings, a percentage that will increase to 77.5 percent after the installation cost is paid. Finally, the rest of the participants spend the same but are

[85] A fixed maximum price and a fund to finance subsidies for bottled gas were established by the National Government, that aimed to target the population that lack access to piped gas service. Nevertheless, the subsidised gas bottle is much more expensive than network-distributed natural gas (ENARGAS, Resolutions Nos. 1070 -1071 and 1080/2008), while supply is insufficient due to lack of adequate monitoring and control by the regulatory authority (Bravo et al, 2008).

consuming much more energy, since the new service allows for heating devices and hot water, besides cooking use (Table 5.1).[86]

TABLE 5.1. AVERAGE MONTHLY ENERGY EXPENDITURES ON PIPELINED GAS AND SUBSTITUTES.

In AR$ (November – December 2006)

	Obs	Mean	Std. Dev.	Min	Max
Gas substitutes (consumption)	330	62.4	74.9	10	850
Pipelined gas (consumption)	240	28.5	28.2	4	200
Pipelined gas (consumption & connection)	240	59.9	42.5	5	200
Savings (substitution)	240	-34.6	77.2	14	-750
Savings (substitution & connection)	240	-2.7	64.4	10	-565

Savings from substitution may constitute a powerful incentive to explain enrolment. To understand what are the characteristics associated with membership, participation is explained by socioeconomic and socio-demographic conditions of the household head and the family, tenure, legality and residence stability. After that, the savings hypothesis is assessed adding gas expenditures before connection as an explanatory variable in the models. Lastly, the analysis is complemented by the inclusion of contextual (spatial) effects, in terms of heterogeneity and neighbours' enrolment. Model results are reported in Table 5.2. We can see that age is positively associated with participation (an additional year correlates with a 1-percentage point increase in the probability of connecting to the gas network), implying that the more mature the household head the greater the chance they will engage in this costly improvement. On average, those who did participate are 5.2 years older. However, age is no longer statistically significant once legal documents are included, which indicates that youth is not a constraint to participation when legal rights are taken into consideration.

[86] Information estimates from Gas BAN indicate that gas consumption of these customers was increasing progressively from 500 cubic metres a year to an average consumption over 750 cubic metres a year (Gas Natural BAN, 2006).

TABLE 5.2. MEMBERSHIP IN CO-PRODUCED PROGRAMME

Dependent Variable: Membership in Co-Produced Programme	(1)	(2)	(3)	(4)	(5)
Socioeconomic characteristics					
Head of household characteristics					
Age	0.010***	0.007**	0.006**	0.005*	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Male	0.001	-0.038	-0.055	-0.055	-0.077
	(0.072)	(0.085)	(0.082)	(0.086)	(0.077)
Marital status. Baseline Category: : single					
Divorced, separated or widow	-0.211	-0.201	-0.178	-0.193	-0.195
	(0.149)	(0.173)	(0.170)	(0.181)	(0.176)
Married or cohabitant	0.003	0.042	0.075	0.075	0.092
	(0.113)	(0.141)	(0.141)	(0.148)	(0.139)
Education. Baseline Category: : no education					
Completed Primary	0.092	0.021	0.053	0.064	0.051
	(0.068)	(0.072)	(0.073)	(0.075)	(0.075)
Completed Secondary	0.095	0.035	0.068	0.070	0.051
	(0.075)	(0.089)	(0.085)	(0.086)	(0.087)
Place of birth. Baseline Category: : Buenos Aires					
International immigrant	0.093	0.108	0.115*	0.138**	0.151***
	(0.077)	(0.069)	(0.069)	(0.061)	(0.055)
National migrant	0.133**	0.171**	0.167**	0.167**	0.177**
	(0.060)	(0.069)	(0.069)	(0.070)	(0.070)
Household characteristics					
Houses per plot	-0.050	-0.044	-0.039	-0.044	-0.029
	(0.071)	(0.073)	(0.071)	(0.070)	(0.067)
Number of members	0.047**	0.033	0.028	0.025	0.027
	(0.023)	(0.023)	(0.023)	(0.023)	(0.022)
Number of children under 14	-0.140**	-0.071	-0.076	-0.051	-0.080
	(0.065)	(0.067)	(0.064)	(0.064)	(0.063)
Dependency ratio	0.008**	0.006*	0.007**	0.006*	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Income					
Quintiles of total family income	0.025	0.007	0.011	0.018	0.025
	(0.020)	(0.021)	(0.021)	(0.022)	(0.021)
Permanent income and labour characteristics					
Labour situation. Baseline Category: : formal worker					
Informal worker		-0.139**	-0.137**	-0.133*	-0.147**
		(0.070)	(0.070)	(0.071)	(0.071)
Type of job. Baseline Category: : employee					
Unemployed		0.003	-0.017	0.008	-0.025
		(0.114)	(0.120)	(0.124)	(0.138)
Temporary job		0.008	0.033	0.048	0.059
		(0.087)	(0.083)	(0.081)	(0.075)
Social plan beneficiary		-0.417	-0.460*	-0.474	-0.324
		(0.277)	(0.271)	(0.301)	(0.273)
Freelancer		0.207**	0.196***	0.175***	0.193***
		(0.059)	(0.060)	(0.064)	(0.054)
Retired		0.092	0.100	0.094	0.097
		(0.091)	(0.088)	(0.090)	(0.088)
Employer		-0.199	-0.275	-0.260	-0.157
		(0.235)	(0.247)	(0.248)	(0.210)
Time in current job. Baseline Category: : Less than 2 months					
between 2 and 3 months		-0.044	-0.062	-0.076	0.008
		(0.103)	(0.110)	(0.113)	(0.098)
Between 4 and 6 months		0.079	0.067	0.035	0.063
		(0.078)	(0.081)	(0.086)	(0.076)
Between 7 and 12 months		0.169**	0.162**	0.144**	0.176***
		(0.062)	(0.066)	(0.071)	(0.061)
Between 1 and 2 years		0.079	0.063	0.020	0.048
		(0.077)	(0.080)	(0.086)	(0.080)
More than 2 years		0.012	0.011	-0.028	-0.033
		(0.104)	(0.102)	(0.113)	(0.110)

Table 5.2 [Continued]

Length of residence in neighbourhood. Baseline category: Less than 5 years					
Between 6 and 15 years			0.162***	0.164**	0.164**
			(0.06)	(0.07)	(0.07)
Between 16 and 22 years			0.229***	0.199***	0.197***
			(0.05)	(0.06)	(0.06)
Between 23 and 29 years			0.166**	0.133	0.119
			(0.07)	(0.08)	(0.08)
More than 30 years			0.139*	0.12	0.097
			(0.07)	(0.08)	(0.09)
Tenure situation. Baseline category : Formal owner					
Renter				-0.35	
				(0.21)	
Informal owner				-0.129	
				(0.12)	
Occupant				-0.475***	
				(0.15)	
Squatter				-0.1	
				(0.17)	
Title of property. Baseline category: Title					
Conveyance					-0.242***
					(0.078)
Regularized					-0.12
					(0.136)
Other documents					0.002
					(0.152)
No title					-0.586***
					(0.103)
Unknown					-0.521
					(0.331)
Log-likelihood	-176.3	-140	-133.7	-126.4	-118.2
Pseudo-r2	0.10	0.19	0.22	0.26	0.31
Fraction of participants observed in data	0.71	0.72	0.72	0.72	0.72
Average probit score	0.62	0.72	0.75	0.75	0.82

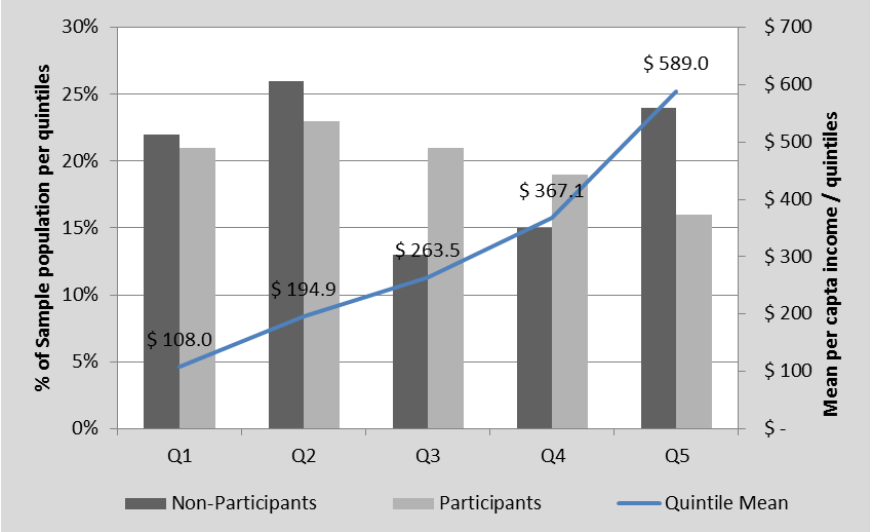
Notes: N=330 Probit Model. Marginal probabilities calculated at the mean.
All models include socioeconomic controls, head of household labour characteristics and length of permanence of residence in the neighbourhood. Robust standard errors in parentheses.
p<0.01 *** p<0.05 ** p<0.1*.

The migrant condition of the head of household is a predictor of enrolment. Compared with household heads born in Buenos Aires, those coming from other provinces of Argentina and immigrants are more likely to enrol in the programme. The latter display greater probability of participation (13 percentage points), but only when their permanence of residence, tenure and legal status is considered, implying that those born in neighbouring countries have a higher probability of enrolment, holding all other determinants at their mean level.

In a context of occupational instability, household decisions to enrol and how the service (and further installation works) would be financed become relevant. The main reason is that income is unstable and households face risks of affordability during some months. At such times, people usually manage to cope by reducing consumption, including deferring buying a gas bottle, especially at the end of the month. Importantly, income per se is not a significant constraint for accessing services. The distribution of participating households is almost perfectly even along quintiles of income (see Graph 5.1). Both participants and non-participants are similarly represented among the different quintiles of the income distribution in the neighbourhood. These data indicate a positive distributive effect of the programme.

Evidence of earnings is complemented by the household head's relationship with the labour market. There is a strong negative relationship between enrolment and heads of household who report employment in the informal sector. These findings are in line with the explanation that income instability might deter families from engaging in monthly expenditure obligations. Notably, residents who are freelancers or self-employed (*cuentapropistas*) are more likely to enrol than employees. Since membership is not bound to formal employment, self-employed (generally informal workers) benefit most from co-production. Those heads of household who started working between seven and 12 months before the 2006 survey was conducted have higher probabilities of programme participation as compared with other reported timeframes of job initiation. The suggestion is that households decided to enrol influenced by very recent employment experience.

FIGURE 5.1 MEMBERSHIP DISTRIBUTION BY INCOME QUINTILES (MEANS IN AR$) YEAR 2006



As already explained in Chapter 3, it could possibly be the case that those who decided to participate had started to look for jobs in order to cover the expected monetary commitments of participation. In effect, they planned for the prospective investment by increasing their participation in the labour force. Membership into the programme may imply more hours at work or other family members taking on new occupations. The qualitative insights provide some support for this notion. According to Marcos T., a resident who lived in the Barrio Alem, whose family decided not to enrol in the programme, *"… I think natural gas would be good, it would be good if I have a job, because until now, thanks God, I'm working, but … I don't know, maybe, who knows, [if] I'm out of work, and I would be in a bit of trouble … wouldn't I? So … it would be complicated to get stuck in it"*.

These figures underscore the relevance of residential stability to participation. Length of residence in the neighbourhood is a good predictor of the internalisation of benefits through participation. It increases the probability of enrolment, as

compared with those households that have been living in the neighbourhood for less than five years.[87] Breaking down the sample, those who first arrived 16 to 22 years ago had the greatest likelihood of membership (22 percentage points more likely as compared to families living in Organised Community for less than five years and holding all other determinants at their mean level). All other groups are also positively associated with membership as compared to the newcomers and this relationship is statistically significant.

Importantly, once tenure and documents are included as controls, six to 22 years residence predicts participation. Notably, this group had arrived to the area after the enactment of Buenos Aires Province Decree, law 8912/77, which declared this settlement subdivision type "illegal".[88] The group was always informal while households with greater permanence of residence were able to claim the benefits from Land Regularisation National Law 24.374, after 1992 (Clichevsky, 1996). The findings support the explanation that titling and tenure are strong predictors of the decision to engage in housing improvements but stability is still a significant predictor for residents who arrived in the neighbourhoods during the period when the area developed under informal treatment under the law. Therefore, while tenure and documents are significant for long-term residents' enrolment, residential permanence is central for participation of those residents who are categorised as informal within the scope of the Land Use Regulation Law.

Tenure is associated with enrolment: formal owners do lead enrolment as compared with occupiers, though reported formal owners are not more likely to participate than those who report being informal owners (owners of the house but not of the plot). At the same time, renting or squatting is not a deterrent to participation and there is no statistical difference between those reporting being formal owners and squatters. Although the number of squatters is very low (16 in the entire sample) over 70 percent of them have enrolled in the programme, especially those that enjoy stability of residence. Occupants have fewer incentives

[87] Eleven percent of people enrolled arrived within less than five years, while among those not enrolled the figure is 30 percent.

[88] Below a minimum lot size of 300 square metres and without complete provision of infrastructure (Clichevsky, 1996).

to engage in costly infrastructure improvements given their uncertain expectations of future residency. Of 21 occupants, less than one-third are enrolled and these have been living in the house for between 6 and 22 years. It is somewhat similar with legal documents, since not having any documentation as proof of ownership or having a conveyance is associated with diminished enrolment. From a total of 133 residents holding a conveyancing document, 36 do not participate. However, titleholders are not the only ones who participate. Those who are regularised, have other documents or are unclear about the documentation are not statistically associated with lower enrolment in the programme. From a total of 54 residents that have no documentation as proof of tenure, one-third (18) have already enrolled in the programme.

It is particularly relevant to analyse the importance that savings in gas represent for households that decide whether or not to invest in connecting to the gas grid. In Table 5.3 (Columns 1 to 6) the gas expenditure variable separates the sample into those that spend (or spent) the least and those that were above this threshold. Different measures are used to code expenditures. First, it separates the sample into those that spend the least (25 percent of the sample) and those that were above this threshold (75 percent of the sample) (columns 1 and 4). Then, it separates spending below and above the mean expenditure (columns 2 and 5) and finally, expenditure was coded as 1 for those spending above the 75^{th} percentile (the quarter that spent the most) and 0 for those below this threshold (Columns 3 and 6). Importantly, the threshold which has the greater predictability is the one identifying households that consume the least in gas substitutes (the quarter of the sample which reported the lowest values for this variable): the group spending above this low threshold are almost 40 percentage points more likely to enrol than their counterparts who spent below the 25^{th} percentile (holding all other variables at their mean level). Together with tenure (being a formal owner as compared to an occupant) and title (having property title versus not having any documents or having conveyance), expenditures in gas substitutes is the most powerful predictor of programme participation. It is interesting to note that both the threshold identifying consumers of gas substitutes above the median and that which

identifies the top consumers (above the 75th percentile) are less predictive than the first one, since in any of the models their predictability is higher than 24 percentage points.

TABLE 5.3. MEMBERSHIP IN CO-PRODUCED PROGRAMME (SAVINGS MODEL) (YEAR 2006)

Dependent Variable: Membership in Co-Produced Programme						
	TENURE STATUS			OWNERSHIP DOCUMENTS		
	(1)	(2)	(3)	(4)	(5)	(6)
Income						
Quintiles of total family income	0.01	0.01	0.01	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Tenure Condition. Baseline Category: : Formal owner						
Formal renter	-0.27	-0.30	-0.29			
	(0.21)	(0.23)	(0.21)			
Informal owner	-0.13	-0.17	-0.20			
	(0.11)	(0.12)	(0.12)			
Occupant	-0.44***	-0.43***	-0.49***			
	(0.14)	(0.15)	(0.16)			
Squatter	0.010	-0.031	-0.06			
	(0.14)	(0.15)	(0.15)			
Ownership Documents. Baseline Category: : Title						
Conveyance				-0.23***	-0.23***	-0.20***
				(0.07)	(0.07)	(0.07)
Regularised				-0.10	-0.16	-0.14
				(0.13)	(0.14)	(0.13)
Other documents				0.06	0.01	-0.01
				(0.11)	(0.14)	(0.15)
No documents				-0.56***	-0.57***	-0.53***
				(0.10)	(0.107)	(0.11)
Unknown				-0.45	-0.50	-0.57
				(0.42)	(0.369)	(0.35)
Expenditure in Gas (before substitution)						
Above 25th percentile	0.39***			0.38***		
	(0.07)			(0.07)		
Above median		0.20***			0.18***	
		(0.05)			(0.05)	
Above 75th percentile			0.23***			0.18***
			(0.04)			(0.04)
Log-likelihood	-112	-120	-119	-104	-113	-114
Pseudo-r2	0.342	0.293	0.303	0.38	0.33	0.33
Average probit score	0.789	0.78	0.79	0.80	0.80	0.81

Notes: N=330 Probit Model. Marginal probabilities calculated at the mean.
All models include socioeconomic controls, head of household labour characteristics and length of permanence of residence in the neighbourhood. Robust standard errors in parentheses.
p<0.01 *** p<0.05 ** p<0.1*.

In all, identifying the group of families that spend the least on gas substitutes, together with tenure conditions that identify occupants and legal documents which identify conveyance holders and undocumented holders, seems the most reasonable strategy for identifying the lower probability of membership. Importantly, the results from incorporating the consumption variables greatly increase the models' predictability.[89] Socio-demographic and socio-economic characteristics of the household head and the family explain only ten percent of the variance in membership. The new models identify approximately 34 to 38 percent of the variability observed in participation. This finding compares with Di Pasquale and Glaeser's (1999) "better citizenship" analysis of membership that explained only 8 to 13 percent of the variability on "working to solve local problems" when using a much larger sample from the US General Social Survey (GSS).

In Table 5.4 the heterogeneity indices are included. For each there is a positive relationship between enrolment and greater homogeneity. This finding is in line with the work of Alesina and La Ferrara (2000) that shows that in heterogeneous communities, both in terms of income inequality and racial or ethnical fragmentation, participation in groups that require direct contact among members is low. All three heterogeneity indices are statistically significant in explaining membership, meaning that the greater the homogeneity of group members the easier they find it to come to an agreement to sign the trust fund agreement. This is true for income, migration and length of permanent residence. However, income heterogeneity seems to represent the weakest relationship with membership (both in terms of magnitude of the effect and level of significance). This might be because as explained previously, income does not constrain participation.

[89] R squared more than doubles as compared to models in the previous section.

TABLE 5.4 MEMBERSHIP IN CO-PRODUCED PROGRAMME (HETEROGENEITY)

Dependent Variable: Membership In Co-Produced Programme	HETEROGENEITY INDEX		
	MIGRANT	INCOME	PERMANENCE
	(1)	(2)	(3)
Migrant heterogeneity index	0.033***		
	(0.01)		
Income heterogeneity index		0.014*	
		(0.01)	
Permanence heterogeneity index			0.028***
			(0.01)
Observations	330	330	330
Log-likelihood	-58.35	-65.53	-61.55

Notes: Probit Model. Group 1. Clustered standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. All models include socio-economic controls, head of household labour characteristics, length of residence in the neighbourhood and tenure controls

3. PARTICIPATION

In addition to membership, involvement in neighbourhood activities might be boosted by the specific "participatory" aspects of the co-production institutional scheme. The following sections present the co-produced programme effects on participation at the three different stages of implementation. I consider the complete experience effects of Group 1; the information gathering stage (in Group 2) and finally, the post connection stage.

3.1. CONNECTION STAGE: THE COMPLETE EXPERIENCE

Table 5.5 reports a summary of the econometric results for the evaluation of participatory outcomes at the connection stage in Group 1. The outcomes examined are listed together with the effect that can be attributed to the co-produced gas programme and the range of effects estimated according to the different specifications of the econometric models. For each variable there are two tables: one summarises the results obtained from the standard estimation of the model, the average impacts in the whole group of residents, besides their effective

enrolment (which is reported by the intention to treat variable, ITT), in Columns 1 to 3. The second reports the average effect on those that enrol in the co-produced programme to obtain the piped gas connection (reported by the local average treatment variable, LATE) in Columns 4 to 6. All the differences between groups are added as controls in Column 2 (see Chapter 4) and in Column 3, contextual heterogeneity measures (of income, nationality, and length of residence). Columns 4 to 6 display the same regressions showing the average effects on those that enrol only (local average treatment effect on the treated, LATE).

TABLE 5.5. PARTICIPATION: CONNECTION STAGE (2006)

	GROUP 1 (OC) Intention- to -Treat Estimates (ITT)			GROUP 1 (OC) Average Treatment Effect on the Treated (LATE)		
Dep. Variable	(1)	(2)	(3)	(4)	(5)	(6)
Voluntary social org	-0.014	-0.008	-0.028	-0.019	-0.011	-0.038
	(0.029)	(0.032)	(0.034)	(0.041)	(0.042)	(0.045)
Voluntary leisure org	-0.032	-0.051	-0.048	-0.044	-0.069	-0.066
	(0.033)	(0.035)	(0.037)	(0.046)	(0.048)	(0.049)
Formal org_active	-0.014	-0.013	-0.012	-0.019	-0.017	-0.016
	(0.011)	(0.010)	(0.010)	(0.015)	(0.013)	(0.013)
Formal_org_passive	-0.010	-0.007	-0.006	-0.013	-0.010	-0.008
	(0.010)	(0.009)	(0.009)	(0.014)	(0.012)	(0.012)
Q orgs	0.036	0.020	-0.023	0.050	0.027	-0.031
	(0.073)	(0.079)	(0.079)	(0.101)	(0.106)	(0.104)
Formal org active_rel	0.098	0.096	0.090	0.136	0.131	0.123
	(0.038)	(0.038)	(0.042)	(0.052)	(0.050)	(0.054)
Collective_capacity	0.211**	0.225**	0.244**	0.290**	0.303**	0.324**
	(0.088)	(0.102)	(0.110)	(0.120)	(0.136)	(0.142)

Notes: N=630. Models 1 to 3 are OLS, Models 4 to 6 are (IV) 2SLS. Models 1 and 4, no control variables; Models 2 and 5, full set of socio-demographic, socioeconomic controls, length of residence, tenure and legality; Models 3 and 6, socio-demographic and socioeconomic controls length of residence, tenure and legality; and adds heterogeneity indices for migrant condition, income and length of residence. Columns (1), (4) and (7): Standard errors in parentheses. Columns (2), (3), (5) and (6): Robust Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
^includes religious organisations.

If we consider the effects of the programme at this stage on the different participatory variables, results show that one year after the connection, there is no induced increase in resident participatory involvement attributable to the programme. Participation - the proportion of respondents who report participation - is no higher for residents connected to the grid than is reported by residents in the control group. Both the intention to treat estimator and the estimation of the treatment effect on the treated suggest similar conclusions in that differences among groups are not statistically significant (Table 5.5). The analysis confirms the expected pattern from the literature; namely, once services are obtained, mutual contributions tend to weaken. In short, participation is a response to "pragmatic policy interests" (Mansuri and Rao, 2004), such as a cost-effective service delivery.

Despite the low level of involvement, the results suggest that the co-produced gas programme did raise collective capacity at this stage. Regarding the effects on the readiness to work together for the collective provision of public goods, the results show that the programme induced an increase in this willingness. The "intention to treat" estimator suggests an increase of 21.1 to 24.4 percent in the proportion of respondents that report such a disposition attributable to the co-produced programme, whereas the average effect on the "treated" estimator reports stronger effects, with an increase of 29 to 32.4 percent .

Table 5.6 reports the results for this collective-capacity dependent variable based on "practical collaboration" when the sample is divided into the tenure categories. The intention to treat estimator suggests an increase of 21 to 24 percent in the willingness to collaborate. The LATE estimator reports a stronger effect of 29 to 32 percent. These results suggest that the programme implementation increases the willingness to collaborate displayed by residents, despite the tenure and legal status that they hold. Regarding the effects of the programme on formal owners, the intention to treat estimator suggests an increase of 19 to 25.6 percent and the LATE estimator reports a stronger effect of 25.2 to 31.7 percent attributable to the programme. In the case of non-titled residents, the intention to treat estimator suggests an increase of 21.5 to 27 percent and the LATE estimator reports a stronger effect of 31.2 to 38.3 percent.

These effects seem less robust for titled owners and non-formal owners, whose willingness to collaborate are determined by contextual effects of heterogeneity/homogeneity of the group. In the case of residents holding legal rights to property, there is no robust effect attributable to the programme. Regarding the effects of the programme on this group, the results indicate that the co-produced programme induced an increase in their willingness to participate in collective activities only when the model specification controls for the contextual effects. In such a case, the intention to treat estimator suggests an increase of 25 percent whereas the LATE estimator reports a stronger effect of 30 percent. Then, in the absence of selective incentives provided by group composition, titled residents do not increase their participation compared with legal owners in the control groups. As these results indicate, the composition of the group (its heterogeneity or homogeneity) is a key determinant for the individual incentives to participate. Collaboration is easy among similar peers, but group inequalities provide incentives that can either increase the willingness to participate – for example, to make one's voice heard – or can weaken such a willingness due to difficulties to share a "common language" among the parties.

A similar effect on the willingness to collaborate is found for non-formal owners.[90] The significant effect in this group disappears when individual characteristics and group heterogeneity are accounted for in the models. The intention to treat estimator suggests an increase from 31 to 56.5 percent. In other words, the positive effect on the group of residents associated with the connection stage of the programme disappears due to the inclusion of the contextual effect of neighbour characteristics. Some interesting features arise from the information on this group. The local average treatment estimator (LATE) suggest an increase of 60 to 98 percent, which suggests that almost all of the households that participated in the programme and were connected to the new gas service, would be willing to participate in a new collective intervention in their neighbourhood (were such an opportunity to present itself). This analysis is complemented in Chapter 6 when

[90] Non-formal owners are informal owners, occupants, squatters and renters.

housing improvements for this group and the association with the specific institutional co-produced programme institutional framework are analysed.

TABLE 5.6. COLLECTIVE PARTICIPATION: THE COMPLETE EXPERIENCE. BY LEGALITY AND TENURE (2006)

Dep. Variable: Collective participation	Intention to Treat Estimates (ITT) for Complete Experience in OC					
	(1)		(2)		(3)	
Full Sample	0.211**	(0.088)	0.244**	(0.110)	0.225**	(0.102)
Titled (Legal Rights)	0.221	(0.144)	0.227	(0.157)	0.254*	(0.144)
Formal Owner (Secure Ownership)	0.199**	(0.100)	0.256**	(0.119)	0.235**	(0.117)
Non-Titled (No Legal Rights)	0.215*	(0.111)	0.270**	(0.136)	0.224*	(0.122)
Informal Owner or Use rights (Non- Secure Ownership)	0.315*	(0.183)	0.565**	(0.234)	0.252	(0.226)
	Local Average Treatment Effect (LATE) for Complete Experience in OC					
	(4)		(5)		(6)	
Full Sample	0.290**	(0.120)	0.324**	(0.142)	0.303**	(0.136)
Titled (Legal Rights)	0.268	(0.174)	0.262	(0.168)	0.299*	(0.166)
Formal Owner (Secure Ownership)	0.252**	(0.127)	0.317**	(0.141)	0.292**	(0.142)
Non-Titled (No Legal Rights)	0.312*	(0.161)	0.383**	(0.179)	0.319*	(0.169)
Informal Owner or Use rights (Non- Secure Ownership)	0.591*	(0.355)	0.979***	(0.369)	0.437	(0.377)

Notes: N=630 (full sample); Title=214; Formal Owner= 485; Non-Titled=415 and Informal/Use rights =145. Models are OLS for the ITT and (IV) 2SLS for LATE. Comparison is Group 1 and Groups 2 and 3. Model 1 and 4, no control variables; Model 2 and 5, full set of socio-demographic, socioeconomic controls, length of residence, tenure and legality; Models 3 and 6, socio-demographic and socioeconomic controls length of residence, tenure and legality; and adds heterogeneity indices for migrant condition, income, length of residence. Columns (1), (4)): Standard errors in parentheses. Columns (2), (3), (5) and (6): Robust Standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

3.2. THE INFORMATION GATHERING STAGE (2006-2009)

As explained in Chapter 4, the sequential implementation of the programme meant that in 2009, Group 2 had gone through the social interaction phase, started in 2007. Group 1 had been connected to the gas network for four years, while Group 3 remained as a pure control group with no implementation of the co-produced

intervention. Households were observed at two points in time (years 2006 and 2009). The results reported in this section are then based on the difference-in-differences methodology. This compares variations in the results over time between treatment and control groups. Table 5.7 reports the results on participatory outcomes at the two different stages of implementation: the information and social interaction stage (in Group 2) and the residual effect of the programme several years after implementation (in Group 1).

The co-production programme caused an increase in participatory involvement in voluntary neighbourhood activities and organisations, and in the average number of activities in which residents in Group 2 were involved. This is the expected result of the information and social interactions stage, when residents are encouraged to gather the required information and to build links among neighbours (i.e., to reach the level of enrolment that is required for the connection of the block). The intention to treat estimation shows an incremental effect in the residents' level of participatory involvement that ranges from 13.9 to 17.4 percentage points is attributable to the programme (Columns 4 to 6). The incremental effect due to the co-produced programme represents a 100 percent increase in the proportion of residents that reported having participated in voluntary neighbourhood activities compared to 14.6 percent of the residents that reported that they had participated in voluntary social activities in the control group during the same time frame. In order to have a comprehensive measure of the scope of overall participation (Row 5) reports the effect on the number of organisations in which respondents participate. The intention to treat estimator suggests a positive incremental effect of the programme in the number of activities reported by respondents in Group 2 that is attributable to the programme, and this effect is negative for Group 1 at the post connection stage. Both are statistically significant at conventional significance levels. The information stage supports an increase of 17.2 to 22.7 percent on residents' membership in activities departing from an average of 0.6 in the control group. Participatory involvement has increased when it is required by the co-produced model, but less than one third of respondents report doing so.

TABLE 5.7. INFORMATION AND POST-CONNECTION STAGE (YEARS 2006-2009). INTENTION TO TREAT ESTIMATES

DEP. VARIABLE	POST-CONNECTION STAGE GROUP 1 (OC)			INFORMATION STAGE GROUP 2 (NUA)		
	(1)	(2)	(3)	(4)	(5)	(6)
part_voluntary_soc_org	-0.062	-0.026	-0.017	0.139***	0.166***	0.174***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
part_voluntary_leis.	-0.024**	-0.025**	-0.012	0.014	0.016	-0.02
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
part_formal_passive	-0.024**	-0.025**	-0.012	-0.014	-0.016	-0.02
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
part_formal_active	-0.041*	-0.036	-0.021	0.014	0.028	0.017
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
q_ogs	-0.277***	-0.228***	-0.179***	0.172***	0.227***	0.211***
	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)

Notes: N=387 (Group 1) and N=270 (Group 2). Models are Differences in Differences. Intention- to-Treat Estimates. Comparison is Group 1 and Groups 2 compared to Group 3. Model 1 and 4, no control variables; Model 2 and 5, full set of socio-demographic, socioeconomic controls, length of residence, tenure and legality; Models 3 and 6, socio-demographic and socioeconomic controls length of residence, tenure and legality; and adds heterogeneity indices for migrant condition, income, length of residence. Robust Standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

3.2.1. PARTICIPATION AND LEGAL/TENURE STATUS

The empirical results provide evidence that participatory involvement is tightly associated with the internalisation of benefits. Residents increase their participation when it is required, and when benefits are internalised, and reduce it when motivation ceases. This is the cyclical trend for residents' involvement. In Table 5.8, the differences-in-differences estimation is presented for each of the categories defined according to the tenure status and legality of rights that residents have over their housing units (legal and non-legal rights, and formal and non-formal ownership categories). These indicate the legal and tenure security explanations from investments associated with the internalisation of benefits from services. Non-legal and informal owners may feel encouraged to participate

because the improvements in neighbourhood infrastructure can provide individual benefits, reinforcing security. This fact constitutes a key element in cooperation.

The results of offering the intervention at the information stage (the intention-to-treat effect in Group 2) indicate a positive effect on participatory involvement. Despite the differences in tenure status, residents in three of the four categories from Group 2 display positive incremental effects in the likelihood of participatory involvement in voluntary neighbourhood activities as an effect of the information stage of the intervention. The positive coefficient on the intention to treat estimator 1 for Titled (legal owners), declared formal owners and informal (non-titled) owners, indicates that these are more likely to report participatory involvement compared with the control group. Except for the residents that did not declare having any ownership rights (occupants with or without permission and renters), the coefficients for all tenure categories are positive and significant at the information stage. This effect is largely consistent with the urban literature reviewed in Chapter 3, since these residents are less able to reap the direct benefits of an improved neighbourhood through capitalisation. The result must be treated with care, however, as the sample is small and may not allow for statistical significance (N=145).

That said, stability through length of residence in the house is correlated with participatory voluntary involvement for this group. In the case of non-formal owners, the coefficient for 23 to 29 years of permanent residence in the house is highly correlated to participatory involvement, and larger and more significant than the other variables. The results indicate that residential stability has a powerful significant impact on increasing participatory involvement in voluntary neighbourhood activities despite the tenure condition of this group.

TABLE 5.8. INFORMATION AND POST-CONNECTION STAGE. PARTICIPATION BY LEGALITY AND TENURE

DIFFERENCES IN DIFFERENCES INTENTION TO TREAT ESTIMATES - PARTICIPATION IN VOLUNTARY SOCIAL ORGANISATION (FOR NEIGHBOURHOOD IMPROVEMENT) - REDUCED AMPLE

Dep. Var; PARTICIPATION IN VOLUNTARYSOCIAL ORGANISATION	LEGAL OWNERSHIP		FORMAL OWNERSHIP		NON-TITLED (NO LEGAL RIGHTS)		USE RIGHTS/ NO-OWNERSHIP	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intention_to_treat_OC	-0.21***	-0.09***	-0.07***	-0.03	0.01	-0.01	-0.04	-0.21**
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.08)	(0.09)
intention_to_treat_NUA	0.10***	0.17***	0.17***	0.20***	0.21***	0.20***	0.05	-0.13
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.08)	(0.09)
howlong1_5				0.31***		0.16***		-0.07
				(0.03)		(0.04)		(0.06)
howlong6_15		0.03		0.021		0.011		0.07*
		(0.04)		(0.02)		(0.02)		(0.04)
howlong23_29		-0.05		0.01		0.14***		0.44***
		(0.03)		(0.02)		(0.02)		(0.05)
howlong30_more		0.23***		0.13***		0.04		0.12*
		(0.03)		(0.02)		(0.02)		(0.07)
Socio-demographic and income controls	yes	yes	yes	yes	yes	yes	yes	yes
Constant	0.86***	0.82***	0.225*	0.076	-0.82***	-0.88***	-0.94***	-0.94***
	(0.16)	(0.16)	(0.13)	(0.13)	(0.12)	(0.13)	(0.26)	(0.28)
R-squared	0.217	0.26	0.087	0.10	0.09	0.10	0.16	0.25
F-test		19.72		24.30		12.39		25.50
Prob > F		0		0		5.39e-10		0

Notes: N=630 (full sample); Title=214; Formal Owner= 485; Non-Titled=415 and Informal/Use rights =145. Differences in Differences Estimates. Baseline category: Group 3. Model 1,3,5 and 7, full set of socio-demographic, socioeconomic and income controls, Models 2,4,6 and 8 socio-demographic and socioeconomic , income controls and length of residence. Robust Standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

The evidence offers insights on the incentives to get involved in neighbourhood activities for both formal and informal owners during the social interaction stage. The results for the intention to treat estimator for legal and formal owners are stronger when controlling for individual and contextual characteristics.

While the first result supports the property rights view of investment in neighbourhood-enhancing activities, such as public goods provision, the other two results are consistent with tenure security and services incentives on neighbourhood participatory efforts. All three results contribute to support the internalisation of benefits effects explanation because these groups benefit most from neighbourhood improvements. The results, moreover, support the direction of internalisation effects extending to residents whose housing rights are not legally documented.

Once services are obtained, the post connection effect several years after the completion of the co-produced intervention indicates a reduction in participatory involvement for both titled residents and formal and non-formal owners, even if the effects for these last categories are not robust to all specifications of the models. The models reflect the plausibility of the explanation about voluntary participation as a mean. All models show no statically significant impact, or at least no impact that is robust, except for model (1 and 2) that shows a statistically significant impact on legal residents reducing their level of participation. As in previous models for this group of legal owners, the contextual effects influence their level of participation. In this case, the reduction is lower when they are included in the model as controls. Finally, the length of residence for residents declaring formal and non-legal ownership is positive and statistically significant in several cases. Notably, having one to 5 years of residence suggests a positive incremental effect on explaining participatory involvement for residents in these groups.

3.3. THE AFTER CONNECTION STAGE (2006-2009)

In contrast to the boost in participatory involvement reported at the information stage for Group 2, the results do not show any significant effect on voluntary participation attributable to the post connection stage four years after the connection has been obtained in the Group 1 neighbourhoods. The result gives more support to the internalisation of benefits motivation for participation, and evidence from the literature underscoring the cyclical nature of participation and the halt of efforts once services are obtained (Gilbert and Ward, 1984b; Mangin, 1970; Portes and Walton, 1976). Not only does voluntary social participation not change significantly but also the overall membership in organisations decreases at this stage. Among the possible explanations, in the literature is the idea that it is not costless to participate (Banerjee and Duflo, 2011) since participatory involvement may affect the time allocation of low-income residents. It can distort familial and working duties. Then, when services have already been obtained either

the new economic commitments or the new possibilities of allocation of extra time for the improvement of their own houses may substitute for external commitments, given the fixed amount of 'free' time that residents have. The negative sign of all the coefficients for leisure, formal active and formal passive organisations, might be indicative of such a constraint. The results are not robust to the inclusion of contextual effects. Then contextual determinants in terms of neighbours' income, migrant origin and length of residence heterogeneity affect the likelihood of participation in that type of organised activity in the post-connection stage for Group 1 (Table 5.7).

4. TRUST

This section reports the co-produced programme effects on trust at the three different stages of implementation. It considers the complete experience effects for Group 1 (Section 4.1); then, the information gathering stage in Group 2 (Section 4.2), and finally, the after connection stage for Group 1 (Section 4.3).

4.1. THE COMPLETE EXPERIENCE

The effects of the co-production intervention complete experience involve the two implementation stages together: the gathering of information and the networked gas service connection stage in which participants' houses are provided with piped gas. The average effects in 2006 of this "complete experience" stage are presented for the two different groups already defined: the first estimates the average impacts in the whole group of residents, in addition to their effective enrolment (intention to treat variable, ITT) and second, the average effect on those that enrol in the co-produced programme to obtain the piped gas connection (local average treatment variable, LATE). The results are reported in Table 5.9.

TABLE 5.9. THE COMPLETE EXPERIENCE (YEAR 2006)

Dep. Variable: Trust	Intention-to-Treat (ITT) For Complete Experience in OC			Local Average Treatment Effect (LATE) For Complete Experience in OC		
	(1)	(2)	(3)	(4)	(5)	(6)
Generalised Trust	0.0851***	0.0773**	0.0751**	0.118***	0.105**	0.102**
	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.04)
Trust in CBO	0.200***	0.208***	0.207***	0.277***	0.283***	0.281***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
Trust in the Family	-0.0603**	-0.074***	-0.073***	-0.083**	-0.101***	-0.099***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Trust in Neighbours	0.018	-0.012	0.003	0.025	-0.017	0.005
	(0.04)	(0.06)	(0.05)	(0.06)	(0.07)	(0.06)
Trust in NGO	-0.027	-0.035	-0.041	-0.037	-0.048	-0.055
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Trust in Municipality	-0.079***	-0.079**	-0.078**	-0.110***	-0.109**	-0.106**
	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.04)
Trust in Utility	0.0799*	0.0908*	0.111***	0.111*	0.124**	0.151***
	(0.04)	(0.05)	(0.04)	(0.06)	(0.06)	(0.06)

Notes: N=630. Models are OLS for the ITT and (IV) 2SLS for LATE. Model 1 and 4, no control variables; Model 2 and 5, full set of socio-demographic, socioeconomic controls, length of residence, tenure and legality; Models 3 and 6, socio-demographic and socioeconomic controls length of residence, tenure and legality; and heterogeneity indices for migrant condition, income, length of residence. Columns (1), (4): Standard errors in parentheses. Columns (2), (3), (5) and (6): Robust Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.1.1. GENERALISED TRUST

The survey allowed for an interrogation of residents' perception of generalised trust. When people were asked if the statement "most people can be trusted" is true, roughly 20 percent answered "yes" in Group 1, while affirmative answers were 12 percent in the control group. The intention to treat estimator suggest an increase of eight percent in the positive attitude towards trusting others that is attributed to the programme at this stage. The results are robust to the inclusion of the socio-demographic and socio-economic characteristics, tenure, legal and length of residence, and heterogeneity indices that account for contextual effects from the nearest neighbours (Columns 2 and 3 for the ITT estimates).

The complete experience effect on trust becomes larger when it measures the impact on residents that participate in the co-production programme and are connected to the grid. For example, whereas the intention to treat estimator

suggest an increase of 7.5 to 8.5 percent on the proportion of respondents that report trust in others (Columns 1 to 3) whereas it becomes 10.2 to 11.8 percent in LATE estimates (reported in Columns 4 to 6). The positive effect is maintained, while the coefficients are slightly reduced, when all the socio-demographic and socioeconomic controls, length of residence, legality and tenure and, and heterogeneity indices, are included in the estimation.

It is important to underline that the effect of the "complete experience" inducing an increase in the reported levels of generalised trust may be tied to the co-produced programme's effects on other dimensions of particularised trust, through the "bridging" effect through weak ties.[91] As it will be shown, that association holds true in this case. The results for the intention to treat estimates indicate that the programme induce an increase in the likelihood of reporting higher levels of trust in the CBO and the utility firm at this stage while the average effect on the treated estimator reports even stronger effects (Table 5.8).

The second outcome of interest considers the effects elicited by the different stages of the intervention on trust in CBO and NGO (in this case, FPVS). In these circumstances, it is the track record and the credibility of both intermediate organisations that are relevant for promoting residents' trust in them. The former is in charge of locally managing the links among residents and with external actors. The latter (FPVS) is territorially based and works across the whole groups of neighbourhoods that are considered in the sample. Importantly, the NGO's role is central to strengthen commitments among parties, especially the asymmetric information within groups. Financial markets are not framed to include medium- and long-term finance instruments tailored to this population. Hence, the asymmetric information for external actors is minimised through the support that these two organisations provide to ensure that repayment will take place (McLeod and Mullard, 2006). It requires overcoming residents' fears of contractual obligations and designing repayment modes to which participants can commit realistically and that the utility can enforce. Moreover, they introduce clear

[91] The "bridging effect" of social capital, forging connections with other groups (Schuller et al, 2000).

guidelines and sanctions, seeking to lower transaction costs among parties, deter opportunistic behaviours, and resolve the problem of free riding among residents (for example, to strictly control for illegal connections to pipes).

The intention to treat estimator suggest an increase of 20 percent in the proportion of respondents that report a high level of trust in the CBO attributable to the programme, and it becomes stronger, to up to 28.3 percent, under the average treatment effect estimator. The results are robust to the inclusion of the full set of covariates (Row 2, Columns 1 to 6). In addition, there are no significant effects on trust in the NGO (FPVS). None of the coefficients – neither ITT nor LATE – is statistically significant at conventional significance levels. The control group includes Group 2 which at this stage already knew they would receive the programme in the near future, and might be inclined to a response bias induced by the expectation toward the in-coming programme. The mean for each group helps to explain such a fact. In 2006, trust in the NGO reached 46 percent of residents in Group 1, while 39 percent in Group 3, and 47 percent in Group 2.

Regarding trust in the utility firm and the municipality, the results show that the co-produced service programme induces high levels of trust in the utility firm (Gas BAN). The intention to treat estimator is associated with an increase of between 7.9 and 11 percent in the proportion of residents that report trust in the utility firms (Column 1 to 3). These results are stronger for those that participate in the co-produced scheme. The average effect on the treated estimator suggests an increase of 11 to 15.1 percent (Column 4 to 6). All these results are robust to the inclusion of controls. Importantly, the inclusions of contextual effects of heterogeneity in the model estimations induce an increase in the level of trust in the utility firm that is attributed to the programme (Columns 3 and 6). Although in principle in the neighbourhoods where the programme was offered the LATE estimator suggest an increase of 11.1 percent for the proportion of participants reporting high levels of trust in the municipality, it increases to 15.1 percent when all controls are included in the model. These results might arise because the level of homogeneity of neighbours in the block may facilitate reaching agreement and carrying out all administrative processes that eases -and accelerates- obtaining the grid connection

for the whole group. In other words, it means that contextual effects are considered when respondents report trust to the utility firm, since service access cannot be resolved individually in this case.

However, there are some puzzling results in relation to the effects on residents' trust in the municipality. On the one hand, one might have expected a positive effect on the level of trust in the municipality attributable to the complete implementation of the co-produced intervention. In order to illustrate trust towards the municipality, the mean is 0.12 – for the proportion of respondents reporting high and quite high levels of trust in the local government in Group 1, and 0.22 and 0.18 in the control groups (Groups 2 and 3). The results for the intention to treat estimator suggests a decrease of eight percent. That represents almost a 40 percent decrease in the reported level of trust that can be attributed to the complete programme implementation. The effect seems robust across specifications, and remained practically unchanged when differences among groups are controlled (Columns 2 and 3). Indeed, the average treatment effect on the treated estimator suggest a decrease of eleven percent in the proportion of respondents reporting trust in the municipality attributable to the programme, once the effect on the participants is exclusively estimated (LATE) and 10.6 percent when all variables that control for individual and contextual effects are applied (Table 5.8, Columns 4 and 6). Then, the results indicate that the programme decreases the level of trust in the municipality reported by the residents that participate in the programme.

These results suggest that after programme implementation – information and connection stage – the issue of balanced reciprocity at stake in the interaction space between residents and the municipality does not generate incremental effects on the levels of trust in that institution. In fact, the results are indicative of exactly the opposite; that the co-produced model caused a decrease in trust of the local government. This is an interesting result since it might have been expected that the presence of public sector bodies involved in co-production might have motivated incremental levels of increased confidence in the institution. Some qualitative insights from residents contribute to understanding that the

implementation side of policies, that considers both the expectation based on policy decision-making and the actual capacity to deliver, affect the level of trust in the municipal public sector.

There may be some motivation for raising resident expectations prior to programme delivery. The offering of the programme to the whole area constitutes a first attempt to reverse the absence of municipal attention to this locality and its informal settlements. The area was incorporated into municipal jurisdiction in 1993, and since that time, very few programmes have been targeted to satisfy the most basic demands of residents in these neighbourhoods. As expressed by one a resident who has lived in the barrio of Namuncura for over 20 years, “It was a big surprise, we were not expecting it. Because of the situation that we are a bit like abandoned here. And to say that they will come to the neighbourhood and put in gas is an impact”.

In contrast, respondents expressed greater confidence in the CBO than in the municipality, once the connection was granted. As a resident in Alem explained in 2006: “I think it would be better if the Organised Community moves now to do more things here, because the municipality doesn’t do anything, not even street repairs ... ”. Therefore, one plausible explanation for the low level of trust in the municipality reported during and after programme implementation is related to how the municipality performs its duties at these stages. Views expressed refer to the capaciy of municipal authorities and officials to be committed and responsible to the programme and neighbourhood demands. For example, maintenance of public space has been a long-standing municipal duty but has not been carried out. This might be indicative that commitments and balanced contributions among parties including residents and municipal bodies might have not been enforced as expected in order to elicit resident’s trust.[92]

The second puzzling result is concerned with trust in the family. This socioeconomic institution is one of the most important in almost all societies and has a recognised

[92] Similar qualitative insights were provided by Almansi et al., (2010) in their analysis of another co-production programme related to water services carried out at that time by the same municipality in nearby neighbourhoods.

role in economic decisions (Becker, 1974). The results regarding the effects of the complete programme experience indicates a decrease in the level of trust in the family attributable to this programme stage. The intention to treat estimator suggest a decrease of six percent in respondents' displaying high or quite high levels of trust in the family. The result is robust to the inclusion of covariates (Columns 2 and 3 in Table 5.9) and gets even stronger for the average treatment effect estimator, with a reduction of ten percent in the reported level of trust in the family at this stage (Columns 4 to 6). While 88 percent of the respondents in Group 1 report high or quite high levels of trust in the family, 91 percent and 96 percent in Groups 2 and 3 respectively, do so.

There are two different types of (plausible) explanations related to this result. The first involves the impact of long-term decisions inside the family. Involvement in long-term financial commitments where they have to share responsibility with other neighbours may present families with complex decisions that can affect the level of trust among members. This is an issue that is not without internal domestic effects in these contexts, when a change in the diffused reciprocity among members is introduced by the co-production programme. The second, as will be explained later in this chapter, points to the complementarities between the level of generalised trust and trust in the family.

One of the expected effects of the intervention is associated with trust among neighbours. From one side, the exogenous boost in social interactions (among block and neighbourhood peers) is expected to facilitate building links that lead to increased familiarity and reciprocity, which seem valuable for the generation of trusting behaviours among residents. Indeed, the provision of the service is obtained through the engagement in reciprocal obligations that change moral obligations between peers into economic ones. At this stage, the programme has been delivered but still financial commitments to repay are at an early stage of enforcement. However, neither the intention to treat coefficient nor the average treatment effect on the treated are statistically significant.

At the connection stage, the transition in neighbours' relations does not facilitate the generation of trusting attitudes. The results indicate that the co-produced programme has not raised the level of trust among residents at this stage. One plausible explanation for that is that the balanced reciprocity among neighbours, which now involves transactions and mutual obligations, is not sufficient to generate trust. Indeed, it might take more time to develop, since the development of interpersonal links involves a production phase as part of the process that leads to developing trusting behaviours among peers (Hilber, 2010).

Some complementary measures can help to illustrate these observations. Only 12 percent of residents in Group 1 in 2006 consider that their links with neighbours have improved, six percent that they have worsened while 82 percent state that there has been no change among neighbourhood relations due to the intervention.

4.2. THE INFORMATION GATHERING STAGE

The next summary of results, considers the effects at the initial stage of the co-produced programme implementation (Table 5.10). The information gathering stage is characterised by the exogenous change in the "invited spaces" for social interactions among residents, public and private sectors, NGO and CBO.[93]

After the two-year span in which the information gathering stage took place (in Group 2), familiarity through the new opportunities for building links and the diffusion of information do not appear to affect the level of generalised trust. The change in the level and type of interactions among residents and other actors developed at this stage – the new invited spaces- are not associated with incremental effects on generalised trust. The results are reported in (Table 5.10, Columns 4 to 6). None of the intention to treat coefficients is statistically significant at conventional significant values. The results provide support for the explanation

[93] The results explained here are based on the differences-in-differences estimation for Group 2 (NUA) compared to control (Group 3, Primavera), during this stage. The differences-in-differences estimator allows to remove any unobservable pre-treatment characteristic that would have influenced the results.

that the social interactions and information gathering activities do not encourage further impact on the likelihood of residents reporting trust in others.

Importantly, in the neighbourhoods of Group 2, the information gathering and social interactions stage has a positive effect on the average level of residents' trust in the NGO (intention to treat estimate). The proportion of respondents reporting a higher level of trust in the NGO increased compared to what is reported by residents in the control group.[94] At this stage, 57 percent of residents in Group 2 and 25 percent in Group 3 report trust in the NGO. This incremental effect can be causally attributed to the interactions supported by the co-production institutional scheme through this stage. In contrast, the positive and significant incremental effect on trust in the CBO for Group 2 at this stage is not robust to the inclusion of all controls. It suggests that socio-demographic, socioeconomic, and contextual effects matter for eliciting trust in the CBO at this stage.

At the information gathering stage in Group 2 the intention to treat coefficient suggest a decrease in the levels of trust in the municipality. Only four percent of residents report high or quite high levels of trust in Group 2– a decrease from 22 percent reported in 2006. Thus the decrease measures a 19.3 percentage point negative difference in trust levels compared to the control group reported by the ITT model. Interestingly, in 2006 this same group reported a higher level of trust in the municipality before implementation started in their neighbourhoods. A feasible explanation for this observation is based on expectations generated by the forthcoming implementation of the programme in the near future.

The expectation generated by municipal public policy, based on the perception of a renewed interest in informal neighbourhood development, through municipal participation in the co-production programme, might boost trust at this preliminary stage before the programme is effectively implemented. As this involved the groups of residents located in the neighbourhoods targeted in the second phase of co-production delivery, higher levels of trust at this stage can be indicative of expectations of benefits as result of interactions with the public sector.

[94] The coefficients are statistically significant and rather stable in all the specifications, although marginally decreasing when the full set of covariates is included.

Nevertheless, such higher trust levels at a preliminary stage, reduced once the programme was effectively implemented and commitment among parties needed to be demonstrated. In contrast, in the control group, Group 3, residents´ trust in the municipality remained unchanged as there is no effect of the programme, nor expectations, since the programme is not targeted to these neighbourhoods.

The differences-in-differences intention to treat estimators for the measure of trust in the family, the results are not robust across specifications since it only appears (negative and statistically significant) when the set of individual and contextual controls are included in the models. It would have been expected that, given the decrease in the level of trust in the family showed at the complete experience stage, the information stage would have followed the same trend. This stage is when decisions on enrolment have to be made. In fact, during field work, it was possible to obtain some qualitative evidence which point to internal disappointments among family members, or women convincing their husbands, or taking the decision to enrol in the programme on their own responsibility. However, the results do not contradict the explanation since it might be feasible to consider that all these socio-economic, socio-demographic, tenure, legal and length of residence characteristics, and the contextual effects, may affect the level of trust that respondents have which respect their family during this stage.

Finally, a look at the effects of the co-produced programme on trust in neighbours, the results show that the coefficients on the differences between the residents in both groups are not statistically significant at conventional levels. Individuals in the group of neighbourhoods where the co-produced stage is implemented are not more likely to report trust in their neighbours, a statement which might have been consistent with the “familiarity” explanation of social capital accumulation building reciprocity at this stage.

TABLE 5.10. TRUST: INFORMATION GATHERING AND AFTER CONNECTION STAGE (2006-2009)

Dep. Variables: Trust	AFTER CONNECTION STAGE (ITT) in OC (GROUP 1)			INFORMATION GATHERING STAGE (ITT) in NUA (GROUP 2)		
	(1)	(2)	(3)	(4)	(5)	(6)
Generalised Trust	-0.064	0.1	0.088	-0.078	-0.055	-0.057
	(0.07)	(0.07)	(0.09)	(0.07)	(0.06)	(0.09)
Trust in CBO	0.229***	0.263***	0.308***	0.151**	0.132	0.156
	(0.06)	(0.06)	(0.06)	(0.07)	(0.09)	(0.11)
Trust in Family	0.151***	0.115**	0.096**	0.019	-0.039*	-0.075*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
Trust in Neighbours	0.121**	0.217**	0.244**	0.036	0.094	0.128
	(0.08)	(0.11)	(0.10)	(0.09)	(0.10)	(0.12)
Trust in NGO	0.155***	0.212***	0.250***	0.189***	0.161**	0.143*
	(0.05)	(0.05)	(0.05)	(0.06)	(0.07)	(0.08)
Trust in Municipality	-0.027	-0.035	-0.019	-0.17***	-0.19**	-0.19**
	(0.05)	(0.07)	(0.07)	(0.06)	(0.08)	(0.09)

Notes: Differences in Differences Estimates (DD) for the Intention-to- Treat. The first comparison is Group 1 and Group 3 neighbourhoods (N= 387), the second Group 2 and Group 3 (N=298). Model 1 and 4, no control variables; Model 2 and 5, full set of socio-demographic, socioeconomic controls, length of residence, tenure and legality; Models 3 and 6, socio-demographic and socioeconomic controls length of residence, tenure and legality; and adds heterogeneity indices for migrant condition, income, length of residence and tenure. Columns (1), (4) and (7): Standard errors in parentheses. Columns (2), (3), (5) and (6): Robust Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.3. THE POST-CONNECTION STAGE

The results for the post-connection stage are reported in Table 5.10, (Columns 1 to 3) and Table 5.11. As for the case of generalised trust, the results for the post-connection stage contribute to the suggestion that there is no incremental effect on residents' reported level of generalised trust attributed to this stage. Aside from the higher level of trust displayed by the households which had received the complete experience in 2006, all coefficients on the intention to treat estimator are

not statistically significant at conventional levels. Importantly, the differences in differences estimator indicates an incremental effect of 20 percentage points on generalised trust as a result of this stage on non- participants, when compared with the control group. There is a positive incremental effect on the level of generalised trust displayed by non-participants whereas no significant changes are attributed to programme participants at this stage (reported in Table 5.11).

The results of the differences in differences estimator suggest positive incremental effect on the level of trust in neighbours, in associations and in NGO for non-participants that is attributed to this stage of the intervention in the neighbourhoods. Notably, non-participant families in OC measured against their counterparts in control Group 3 display an incremental effect of trust and in most cases this increase is higher than the effects attributed to participant families in OC when compared with the same control group (Table 5.11, Column 2). This finding is extremely relevant from a policy perspective since it seems to indicate the presence of strong spillover effects upon non-participant families. It also seems to imply that the pace of this spillover is quite slow as compared to the effect on those actually treated, given that we observe this increased level almost four years after actual implementation of the programme.

The evidence for the post connection stage indicates a positive incremental effect on the level of trust in the NGO and CBO. Comparing the residual effect for the intention to treat group (Group 1) against control (Group 3) (Table 5.10, Columns 1 through 3) these coefficients show positive and statistically significant coefficients. Regarding trust in the CBO, the intention to treat differences in differences estimator displays a positive increment of 22.9 to 30.8 percentage points over the control group mean, whereas trust in the NGO is positively incremented by 12.1 to 24.4 percentage points. The figures underscore that after a few years of programme implementation the balanced reciprocity elicited among residents and the organisations has been sustained. This observation may be a relevant matter for driving collective capacity and the willingness to undertake other initiatives.

By contrast, however, the differences in differences intention to treat estimator is not statistically significant at conventional significant levels when measuring trust in the municipality. It suggests that there is no change to the level of trust in the municipality attributed to this stage when compared to the control group. The potential for sustained collective capacity and willingness to undertake future initiatives, indicated by the data in the previous paragraph, would appear more likely without involvement of the municipality. Future co-production might be envisaged as a matter of neighbourhood-NGO and utility company arrangements.

Trust in the family is associated with positive incremental effects in Group 1 at the after connection stage (Table 5.10, Row 3, columns 1 to 3). The differences in differences intention to treat estimator suggests a positive incremental effect attributed to the programme. The results are robust to the inclusion of the full set of covariates. At this stage, the average proportion of respondents that have high or quite high levels of trust in the family is 96 percent and 83 percent in the control group. The 15 percentage point difference (in the ITT model specification with no covariates) is indicative of the positive incremental effect over the control mean. The result reverses the lower initial levels of trust in the family that were reported at previous stages. Part of this effect can be attributed to non-participants displaying a positive incremental effect on trust in the family at this stage. The results might be suggesting that trust in the family takes longer to develop. For residents with access to the gas network, it may be associated with commitments already enforced (financial efforts jointly assumed) and all the benefits that are gradually enjoyed by members of the house related to the new facility that contributes to comfort in everyday activities, that progressively turn into new domestic habits over the passing of time. It is plausible to assume that an improved comfort and use value, savings and capitalisation through services might have been conducive to increased reciprocity among family members associated with a common goal to which they have jointly contributed.[95]

[95] An additional plausible explanation for the incremental effects on the levels of trust in the family reaching non-adherent residents is provided by recent research on the causal inverse association between civic engagement and participation and the closeness of family ties (Alesina and Giuliano,

The positive incremental effects of the intervention on the level of trust in the family can be considered as a substitute for generalised trust. Evidence indicates that there is a causal association between residents' strength of family ties and the level of generalised trust (Ermisch and Gambetta, 2010; Alesina and Giuliano, 2011). Individuals with weak family ties are more likely to display higher levels of trust in strangers (Ermisch and Gambetta, 2010). Indeed, higher levels of happiness indicators and life satisfaction are all positively associated with greater strength of family ties (Alesina and Giuliano, 2010), which makes this effect of the programme on trust in the family highly relevant.

The evidence based on survey and experimental data from developed countries indicates that this effect on the family is associated with the degree of "outward exposure" (Ermisch and Gambetta, 2010). Then, the limited strength of contact and interaction with "others" would decrease individuals' motivation to be in relation to strangers at the same time that it increased their reliance on the family. It is plausible to assume that increased levels of reliance on the family due to the programme intervention can operate not only through lower effective levels of interactions with "others" – for example through lower participation in other voluntary leisure activities – but also due to increased comfort in terms of protection from extreme temperatures due to a better overall domestic environment, which might affect the incentives to stay at home rather than go out. Hence the inward exposure may be increased due to a bundle of economic, social and physical factors combined.

While the social interaction and information stage suggests no significant impact of the co-produced gas programme on changes in the level of trust among neighbours in Group 2, a strong and significant impact on the likelihood of reporting high levels of trust among neighbours is in evidence four years after connection. Average levels of trust in neighbours rises between 12 to 24 percent in the neighbourhoods were the programme was offered (Table 5.10). Notably, both participants and non-participants report increased levels of trust in their neighbours (18.5 percent when

2011). Nevertheless, the fact that their level of generalised trust is increased as a residual effect of the intervention contradicts the notion of substituting effects among both.

programme participants in Group 1 are compared with residents of the control group) (Table 5.11, Column 1) and 29.6 percent when non-participants' level of trust in neighbours is contrasted with the average level in the control group (Column 2). This result suggests that the programme has been well balanced in affecting the level of trust among neighbours after implementation.

TABLE 5.11. TRUST: AFTER-CONNECTION STAGE (2006 -2009)

PARTICIPANTS AND NON-PARTICIPANTS in AFTER-CONNECTION STAGE IN OC (GROUP 1)

	AFTER-CONNECTION STAGE IN OC (GROUP 1)	
	(1)	(2)
Dep. Variables	PARTICIPANTS	NON-PARTICIPANTS
Generalised Trust (Trust in Others)	0.127	0.200**
	(0.084)	(0.091)
Trust in CBO	0.253***	0.301***
	(0.062)	(0.106)
Trust in Family	0.0799	0.174**
	(0.062)	(0.077)
Trust in Neighbours	0.185**	0.296**
	(0.115)	(0.153)
Trust in NGO	0.232***	0.245***
	(0.050)	(0.089)
Trust in Municipality	-0.014	0.020
	(0.081)	(0.101)

Notes; N= 630. Models are Differences in Differences Estimates (DD). Comparison is Group 1 and Group 3. All models include the full set controls: socio-demographic, socioeconomic variables, length of residence, tenure and legality, heterogeneity indicess for migrant condition, income, length of residence and tenure. Robust Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4.3.1. TRUST AND LEGAL/TENURE STATUS

Table 5.12 reports the results for the same models that were reported in Table 5.10, which are now estimated for the four ownership and tenure categories that were defined based on legality and tenure. Again, the results are reported for ITT and LATE, and the same three different model specifications. The likelihood of reporting trust in others is higher for declared formal owners and non-legal owners

in Group 1 (the intention to treat estimates) compared to those holding the same tenure and legal status in the control group. In this case, the experience itself and the interactions might have contributed to generate higher levels of generalised trust for these groups of residents. The coefficients are all positive and significant at conventional significant levels. The results are robust to the inclusion of the full set of controls and heterogeneity measures. Compared to the control group the coefficient for non-titled residents is 0.077 to 0.093 percentage points over the control mean. The results are even stronger for the same category when the effects on the residents that enrol and were connected to the programme are assessed.[96] In this case, the positive coefficient of the reported agreement with the trust in others statement is 0.097 to 0.119 percentage points higher than what is reported by the same group of residents in the control group. The likelihood of formal owners reporting a positive answer to the generalised question is from 0.098 to 0.123 percentage points on average higher for respondents that live in the neighbourhoods where the complete experience was implemented rather than in the control group, depending on the intention to treat model specification. The effect is even higher in magnitude when the average effect on formal owner "participants" is considered (from 0.147 to 0.182 percentage points over control group) and all the estimates are robust to the different specifications of the models.

These results are consistent with the concept of informal owners – at least non-legal ones –displaying higer levels of trust in others as a result of the co-produced complete experience than their counterparts in the control group. This is in contrast to legal owners, from whom the likelihood of reporting trust in others is not statistically different than what is displayed by the same group in control neighbourhoods. One plausible explanation is that legal rights to property enable market transactions that are less dependent on trust among parties to take place.

[96] The effect on the "treated" residents through the Local Average Treatment Effect (LATE) estimate.

4.4. TRUST AND LEGAL/TENURE STATUS

Finally, the sample is split by tenure and document status of residents. The coefficients for the effect of the co-production programme -after several years of implementation- report positive and statistically significant coefficients for the incremental effect on trust in the municipality. This is a residual effect of the intervention for the most informal residents only – those that are squatters and occupants – but the results are not robust to all the specifications since the coefficient loses its significance when adding the contextual effects of heterogeneity to the basic estimation. Additionally, positive coefficients on the same estimator are reported for non-titled informal residents, and the results are robust to all the specifications. The positive incremental effect of the coefficients on trust in the municipality ranges from 0.12 to 0.65 percentage points and from 0.02 to 0.07, for non-formal owners and non-titled residents, respectively.

These observations can be at least indicative of a differentiated effect of residents' interaction in exchanges with the municipality that provides more reassurance for building trust for residents holding more informal rights to property rather than formal ones. In the case of residents holding informal rights, the programme provides some benefits in terms of allowing for cadastral registration of informal subdivisions, and contributing to service access. These would not have been achieved without the co-production institutional framework. It is plausible to expect that the increase in the level of trust in the public sector can affect the incentives to invest in the house for the more informal group of residents in these neighbourhoods.

TABLE 5.12. TRUST 2006-2009: BY LEGALITY AND TENURE

THE AFTER CONNECTION STAGE DIFFERENCES-IN-DIFFERENCES ESTIMATES

Differences- in- Differences Intention to Treat Estimates - Post-Connection Stage - reduced sample by tenure and legal status

Table 5.12.A

Dependent variable	Model	AFTER CONNECTION STAGE IN OC (GROUP 1) Legal Owners	Formal owners	Users Rights Non-Ownership	Non-Legal Owners
		(1)	(2)	(3)	(4)
trust others	Model 1	-0.255**	-0.118	0.182	0.00191
		(0.106)	(0.0770)	(0.203)	(0.0993)
	Model 2	0.0153	-0.0727	-0.354	-0.225
		(0.178)	(0.0956)	(0.410)	(0.146)
	Model 3	-0.0877	-0.0841	0.0253	-0.134
		(0.116)	(0.0701)	(0.271)	(0.118)
trust neigh	Model 1	-0.0547	0.0441	0.0653	0.111
		(0.139)	(0.0977)	(0.243)	(0.125)
	Model 2	0.146	0.180	-0.252	0.0531
		(0.218)	(0.125)	(0.767)	(0.216)
	Model 3	0.0809	0.102	-0.141	-0.0282
		(0.172)	(0.111)	(0.288)	(0.178)
trust family	Model 1	0.0144	0.0995*	0.505***	0.263***
		(0.0885)	(0.0539)	(0.186)	(0.0722)
	Model 2	-0.0535	0.0750*	0.183**	0.164**
		(0.0989)	(0.0557)	(0.272)	(0.0819)
	Model 3	-0.0517	0.0870*	0.337**	0.203**
		(0.102)	(0.0560)	(0.154)	(0.0774)
trust CBO	Model 1	0.367***	0.228***	0.230	0.171**
		(0.104)	(0.0631)	(0.151)	(0.0783)
	Model 2	0.336***	0.340***	-0.0144	0.181*
		(0.120)	(0.0651)	(0.282)	(0.0988)
	Model 3	0.346***	0.313***	-0.101	0.196**
		(0.111)	(0.0614)	(0.167)	(0.0770)
trust NGO	Model 1	0.211**	0.159***	0.0607	0.143*
		(0.0878)	(0.0555)	(0.168)	(0.0743)
	Model 2	0.287***	0.260***	-0.224	0.282***
		(0.0973)	(0.0497)	(0.331)	(0.0832)
	Model 3	0.239***	0.241***	-0.155	0.215***
		(0.0900)	(0.0520)	(0.207)	(0.0759)
trust_munic	Model 1	-0.116	-0.0646	0.269*	0.0515
		(0.0961)	(0.0596)	(0.154)	(0.0772)
	Model 2	-0.114	-0.0515	0.658**	0.0725
		(0.136)	(0.0767)	(0.326)	(0.118)
	Model 3	-0.134	-0.0466	0.128	0.0285
		(0.130)	(0.0719)	(0.199)	(0.0895)

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

THE INFORMATION GATHERING STAGE. DIFFERENCES-IN-DIFFERENCES ESTIMATES

Differences- in- Differences Intention to Treat Estimates - -Information Gathering Stage -reduced sample by tenure and legal status

Table 5.12.B

Dependent variable		INFORMATION GATHERING STAGE in NUA (GROUP 2)			
	Model	Legal Owners	Formal owners	Users Rights Non-Ownership	Non-Legal Owners
		(5)	(6)	(7)	(8)
trust others	Model 1	-0.00792	-0.0814	0.131	-0.0340
		(0.114)	(0.0755)	(0.203)	(0.0997)
	Model 2	0.279*	0.115	0.0310	0.0165
		(0.142)	(0.0773)	(0.309)	(0.102)
	Model 3	0.299**	0.106	0.658	-0.159
		(0.150)	(0.0908)	(0.399)	(0.145)
trust neigh	Model 1	0.208	0.105	0.170	0.156
		(0.136)	(0.0893)	(0.243)	(0.118)
	Model 2	0.251*	0.256**	-0.107	0.119
		(0.144)	(0.115)	(0.273)	(0.157)
	Model 3	0.218	0.258**	0.593	0.0795
		(0.150)	(0.108)	(0.501)	(0.185)
trust family	Model 1	-0.140	-0.0138	0.296**	0.134**
		(0.0899)	(0.0575)	(0.145)	(0.0647)
	Model 2	-0.119	-0.0778	0.122	-0.00614
		(0.0994)	(0.0667)	(0.175)	(0.103)
	Model 3	-0.234*	-0.0881	0.00979	0.0864
		(0.138)	(0.0707)	(0.357)	(0.117)
trust CBO	Model 1	0.216**	0.161**	0.0839	0.0619
		(0.105)	(0.0712)	(0.199)	(0.0900)
	Model 2	0.432***	0.165*	-0.435	-0.145
		(0.145)	(0.0880)	(0.273)	(0.0909)
	Model 3	0.324*	0.176	-0.808	0.0493
		(0.193)	(0.117)	(0.496)	(0.120)
trust NGO	Model 1	0.225**	0.212***	0.0651	0.189**
		(0.0904)	(0.0653)	(0.188)	(0.0884)
	Model 2	0.264**	0.161*	0.153	0.0583
		(0.125)	(0.0886)	(0.245)	(0.112)
	Model 3	0.258*	0.165*	0.429	0.0580
		(0.153)	(0.0887)	(0.586)	(0.113)
trust_munic	Model 1	-0.186*	-0.212***	0.103	-0.144
		(0.108)	(0.0720)	(0.161)	(0.0893)
	Model 2	-0.231**	-0.223**	-0.0788	-0.257**
		(0.109)	(0.0902)	(0.303)	(0.124)
	Model 3	-0.378**	-0.226**	0.153	-0.216
		(0.150)	(0.0983)	(0.475)	(0.144)

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When the level of trust in the municipality for titled and formal owner samples is compared to control at the social interactions stage, all the coefficients for the

different specifications of the model display negative and statistically significant coefficients, of 0.22 percentage points (titled residents) and from 0.22 to 0.25 percentage points for formal owners. The same sample estimators as residual effects after several years of implementation are negative as well but non-significant. Importantly, the results indicate a reduction in the level of trust in the municipality for these groups during the initial implementation stage and non-statistical significant difference from the control group attributable to the programme after connection.

5. CONCLUSIONS

The chapter provides evidence on several points related to co-production, participation and trust in informal neighbourhoods before, after and long after service provision. It gives strength to notions in the academic literature, such as the cycle of participatory efforts in informal settlements, and some quantitative insights on the sustainability of participatory efforts. First, the results measuring the willingness to undertake a collaborative effort empirically support the assertion of development practitioners (and the co-production academic literature) on the subject of sustainability of efforts. The empirical evidence supports the idea of the internalisation of benefits from services. Savings obtained from energy consumption substitution are central to residents' enrolment in the programme. Despite the specific analysis of tenure, legality and length of permanence supporting these investments, the study provides empirical evidence of neighbourhood-enhancing individual efforts strongly affected by contextual characteristics of neighbours. This notion underscored by the change in the statistical significance of the participation coefficients once the neighbourhood context is controlled, adds to other individual determinants and can contribute to provide accurate explanations for the internalisation of benefits that drive participation in community enhancing social capital, or incentives to free ride on the efforts of others.

The results are in line with the academic literature that indicates that residents with stronger claims to property in informal markets are more likely to participate in activities that aim to improve their neighbourhood (Lall et al., 2004; Lanjouw and Levy, 2002). However, titled residents are not the only ones to participate, at least when the internalisation of benefits from services through the co-produced programme support that incentive. Importantly, as the results indicate, the non-possession of a legal title or being a formal (non-legal owner) does not affect the residents' willingness to get involved in activities that are expected to promote neighbourhood consolidation and improvements in overall living standards. In fact, as a result of the co-produced programme formal and non-titled residents are more likely to participate, an effect that is measurable and attributable to the programme. Renters, occupants and squatters have fewer incentives to invest in community enhancing social capital, but their participatory involvement – and perhaps physical investment as well – might be framed by the internalisation of benefits of doing so, such as savings or contextual effects.

The evidence indicates that co-production institutions are able to frame a collaborative capacity that allows other neighbourhood initiatives to develop. At the local level, its persistence seems to be tightly related to the role played by the CBO, and indeed the institutional framework that supports any cooperative efforts as part of programme implementation. At different programme stages, an increase in the level of trust in the CBO is attributed to the co-produced programme and the effect is greater for the residents that have participated and obtained the gas piped connection.

The results are at least indicative of a positive effect on the level of generalised trust as a result of the co-produced programme implementation- the "complete experience"- rather than the familiarity and information gathering stages. This supports the arguments by scholars and development practitioners in Argentina (Fidanza, 2005; Paladino and Blas, 2007; Zavalia-Lagos, 2005) who point to the value of co-produced programmes. The results on non-participants generalised trust might be taken as preliminary evidence of externalities produced after the connection stage of the co-produced programme. In addition, to the study of the

CBOs' role, the chapter provides evidence that average levels of trust in the municipality have not increased as result of the intervention. In other words, had the programme created a space of interaction between residents and the public sector, a positive effect on trust in the municipality would have been expected, at least as result of the "complete experience", once the service was connected to the neighbourhoods. In fact, the opposite is true, at each stage of the co-production trust in the municipality is negatively associated with programme implementation, and it becomes even more negative when the effect of the co-produced programme on those that did participate is assessed. In sum, the evidence clarifies that co-production efforts which emphasise collaborative schemes and self-help as a means to achieve the basic task of providing services should not be expected to help promote greater confidence in the public sector, particularly for those residents that hold formal rights to their property. One possible explanation lies in that individual efforts are substituting for public sector duties that are carried on completely by the State in other areas of the cities.

CHAPTER 6: PHYSICAL INVESTMENT: HOUSING IMPROVEMENTS AND TRUST

1. INTRODUCTION

The assessment of the causal effect of the programme on the likelihood of residents undertaking housing improvements is reported in this Chapter. The premise is the expectation that the network gas programme will have positive impacts on a series of construction transformations in the house. The theoretical conceptualisation of investments and internalisation of benefits is associated with legality and security, and with services improving security and savings (see Chapter 3). First, there are savings and use value induced by the substitution of more expensive energy sources. The availability of a piped service could foster incentives to invest in transformations in comfort. For example, the new service may foster the opportunity to improve comfort by the installation of a water network inside the house, since now it will be possible to have hot water in the bathroom. The same can be said about the installation of space heating systems that now can be operated at a much lower cost. Indeed, the gas connection itself requires some transformations and formalisation of housing construction to cope with gas service safety regulations (ENARGAS, 1997). Second, the internalisation of benefits through capitalisation of household's efforts will be greater when the provision of the piped service improves overall neighbourhood consolidation status, and houses and neighbourhood transformation are capitalised in housing values. Therefore, savings, comfort, service provision regulation and capitalisation may affect the incentives for housing improvements.

The analysis of the co-produced programme effects on housing improvements takes six matters into consideration, based on the methodological strategy explained in Chapter 4. First, it structures the measurement of the two types of effects. It compares the level of housing improvements undertaken by residents in the participant neighbourhoods to those of residents in the control group, and measures the average effect regardless of enrolment in the programme (the

intention-to-treat group, ITT). Although full compliance was not usual in this type of intervention, it might be expected that spill-overs should affect the non-participants among the neighbourhood's groups. It then presents an estimate of the average effect on the households that have decided to participate, and have enrolled in the co-produced programme (the local average treatment effect, LATE).

Second, the effect on physical investment may be diverse at the different implementation stages. In this case, the empirical models estimate the effects expected from the programme at two different stages: the after-connection stage in Group 1 (OC), taking into consideration the 2006 to 2009 timeframe for residents that were located in the serviced group of neighbouhoods,[97] and the information gathering and social interactions stage that was implemented at the same time in Group 2 (NUA). Both are individually compared to Group 3 (Primavera), the control group, where the co-produced model was not implemented. Since housing improvements develop progressively over time, this period of analysis is meaningful enough to affect housing transformations.

Third, there are three different housing improvement variables defined in the study: the proportion of houses that undertake improvements (a dummy variable that indicates whether the household has undertaken a housing improvement during the last year); the number of improvements in the dwelling affecting the quality of construction materials, such as walls and plasterwork, ceramic tile floors, and an improved roof; and the total number of improvements undertaken to the house.

Fourth, the sample is divided into the four categories of ownership rights and tenure as already described in Chapter 4. Two are based on the legality explanation for investments (legal titled or non-titled residents) and two are based on tenure considerations (declared formal owners and non-owners, such as squatters, occupants and renters).

[97] Since the housing improvement questions asked about the changes made during the previous year, the assessment of the effects extends from 2005 to 2008.

Fifth, there are two types of econometric models used in this section of the study. One set of estimations is based on the OLS and 2SLS models for panel data from 2006 and 2009. The second uses a differences-in-differences methodology.

Sixth, the analysis examines whether the co-production intervention effect on trust might have affected residents' investment in their houses. Therefore, the models provide empirical evidence about the association between investments in the house and the dimensions of trust.

2. EFFECTS OF THE PROGRAMME ON HOUSING IMPROVEMENTS

The strength of property rights as a sole requirement for investment is challenged by the contribution of services and savings to housing investments. The results indicate that the co-produced intervention is associated with an increase in the likelihood of making housing transformations, and that these effects are greater for households that have been connected to the network. The first model (Table 6.1) examines whether, all else being equal, households in Group 1 (after connection) are, on average, more likely to invest in improvements than the households in the control group. In this case, the dependent variable is the (dummy) variable that indicates whether there was a housing improvement during the previous year. The intention-to-treat estimator, which indicates the average effect of the programme in the undertaking of improvements in the neighbourhoods where the programme was offered and fully implemented, suggests a strong, positive and statistically significant effect attributable to the programme on housing upgrading. The range is 55 to 56 percent, and nine percent in the neighbourhoods that are in the first stage of programme implementation (Group 2), where only the information gathering stage was implemented. These effects are all robust to the inclusion of the variables that control for the differences in socio-demographic and socioeconomic characteristics of the respondent and the household, as well as several housing features, such as conditions of overcrowding, number of units on the plot, tenure and documents that prove status and length of stay in the house (all detailed in Chapter 4). It should be noted that overcrowding, which is correlated with

improvements, is included as a socio-demographic control since incentives to invest in housing transformations might be driven by any group difference in the overcrowding of the housing units.

TABLE 6.1. HOUSING IMPROVEMENTS (2006-2009).

AFTER CONNECTION AND INFORMATION GATHERING STAGES.
INTENTION TO TREAT AND LOCAL AVERAGE TREATMENT ESTIMATES. (OLS AND 2SLS)

Dep Var.: Housing improvements	INTENTION TO TREAT ESTIMATES					LOCAL AVERAGE TREATMENT EFFECT ESTIMATES-				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
intention_to_treat_OC	0.55***	0.56***	0.55***	0.55***	0.55***					
	(0.04)	(0.04)	(0.04)	(0.04)	(0.0)					
intention_to_treat_NUA	0.08*	0.09*	0.09**	0.08*	0.08*					
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)					
treatment_1						0.75***	0.75***	0.75***	0.75***	0.74***
						(0.07)	(0.07)	(0.07)	(0.0)	(0.07)
treatment_2						0.14	0.15	0.13	0.14	0.12
						(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
howlong		-0.01	-0.01				-0.01	-0.01		
		(0.02)	(0.02)				(0.02)	(0.02)		
socio demographic controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
income and employment controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
tenure and title dummies	no	tenure	title	tenure	title	no	tenure	title	tenure	title
howlong dummies				yes	yes				yes	yes
Constant	0.092	0.184	0.143	0.162	0.15	0.506**	0.630***	0.592**	0.501**	0.477**
	(0.20)	(0.20)	(0.20)	(0.21)	(0.21)	(0.23)	(0.23)	(0.23)	(0.24)	(0.24)
r2	0.272	0.236	0.296	0.237	0.281	0.242	0.301	0.247	0.284	0.250

Notes: N= 1360. Baseline Category is Group 3 (Control Group) Models specifications reported in columns (1) to (5) are intention-to-treat estimates of Group 1 (OC) – the post connection stage- and Group 2 (NUA) compared to Group 3 (OLS)- the information gathering stage-, columns (6) to (10) are local average treatment effects of participants of Group 1 (OC) and Group 2 (NUA) compared to Group 3 (OLS) (2SLS). N= Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

All the significant effects in Group 1 for the after connection stage in OC are confirmed under the local average treatment effect estimator when the effect on the households that enrolled in the programme is considered. Tthe programme induced an increase of 75 percent on the decision to undertake housing improvements (in Columns 4 to 6). This finding indicates a strong effect of the co-produced service programme on participants.

The strength of the contribution of services and savings to housing investments is strongly supported by the results on Group 2. At the initial stage of the implementation – based on social interactions and information gathering – the significance of the positive coefficient disappears in the tested specifications for participants in Group 2 (row 4). For this group, the decision to undertake transformations is caused by the availability of the energy connection in the house.

3. LEGALITY, TENURE AND LEVEL OF INVESTMENTS

Table 6.2 reports the results for housing improvement but now it provides the effects of the programme for residents in four different tenure or legal groups. In each case, four different models are displayed: two report the intention-to-treat estimation for Group 1 (after connection stage) and Group 2 (information gathering stage), compared with the control group, and the other two show the local average treatment effect estimation for each of the groups[98]. The intention-to-treat variable reports the results for households where the programme was offered regardless of their participation while the local average treatment effect reports the estimated effects on participants.

As mentioned before, the estimates obtained from these models cannot be equally interpreted. The models comparing Group 1 (OC) and control will shed light on the incremental effects, if any, that arise on the outcomes under analysis as a result of the whole co-production experience and gas network connection after some years of its implementation. The models comparing Group 2 (NUA) and Control group will inform on the effect of introducing an exogenous source of social interactions prompted by the information gathering phase of the co-production intervention.

The models control for the differences between groups, adding the socio-demographic controls (education level and age of the head of the household, number of children, number of members in the house), the monthly per capita

[98] Based on Angrist and Imbems (1994)

income, employment of the household head and the set of dummies for the length of residence in the house.

The model examines whether, all else being equal, the effect on housing improvements is different between households holding each legal and tenure status in Group 1 than the households in the control group. The results provide strong evidence that housing improvements increase for households located in the neighbourhoods where the service was delivered, regardless of tenure and legality status, and this effect is higher when households possess the gas connection in their house. The results provide strong evidence that services are a relevant incentive for housing improvement and that legality is not a matter of concern when the energy service is made available. Investment based on the internalisation of services benefits extends beyond a strict legal consideration.

The probability that a legal and a non-titled owner in Group 1, the OC neighbourhoods, undertake housing improvements is 55 percent higher for either one of them when compared with legal and non-legal owners located in the control group, who have no access to the programme. Second, non-legal owners living in houses that were connected to the grid are 76 percent more likely to improve their house than the same group in the control neighbourhoods, and titled owners connected to the grid are 62 to 63 percent more likely to. Third, legality is not more relevant than security for housing improvement: the probability of formal owners improving their house is 53 percent higher than the same tenure category group in the control neighbourhoods and 66 percent higher for those connected to the gas network. Importantly, non-legal owners are more likely to undertake an improvement in the house when they are located in the neighbourhoods where the gas service is provided.

Fourth, when the sample is restricted to households that do not hold ownership rights (columns 15 and 16), within the group that has participated in the programme and was effectively connected to the new service, almost all have made transformations in their houses. This result provides evidence that the provision of services has been effective in driving investments for this group.

TABLE 6.2. HOUSING IMPROVEMENTS. BY LEGALITY AND TENURE

CONNECTION AND INFORMATION GATHERING STAGES.
INTENTION TO TREAT AND LOCAL AVERAGE TREATMENT ESTIMATES. (OLS AND 2SLS).
REDUCED SAMPLE

TABLE 6.2.A.

Dep Var.: HOUSING IMPROVEMENTS	LEGAL OWNER				FORMAL OWNER			
	Intention-To-Treat		Effects on Participants (LATE)		Intention-To-Treat		Effects on Participants (LATE)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intention_to_treat_OC	0.54***	0.55***			0.53***	0.53***		
	(0.038)	(0.040)			(0.027)	(0.027)		
intention_to_treat_NUA	0.028	0.042			0.066**	0.071**		
	(0.038)	(0.039)			(0.028)	(0.028)		
treatment_OC			0.62***	0.63***			0.66***	0.66***
			(0.046)	(0.047)			(0.038)	(0.037)
treatment_NUA			0.047	0.07			0.142**	0.143**
			(0.070)	(0.071)			(0.070)	(0.070)
howlong1_5		-0.091		0.114		0.068		0.225***
		(0.097)		(0.080)		(0.047)		(0.043)
howlong6_15		0.13***		0.12***		0.008		0.024
		(0.044)		(0.044)		(0.024)		(0.026)
howlong23_29		0.100**		0.11***		0.022		0.03
		(0.040)		(0.040)		(0.026)		(0.028)
howlong30_more		0.076*		0.097**		-0.02		-0.009
		(0.042)		(0.047)		(0.030)		(0.035)
Constant	0.206	0.232	0.158	0.175	0.091	0.103	0.044	0.035
	(0.148)	(0.150)	(0.165)	(0.167)	(0.093)	(0.094)	(0.105)	(0.107)
r2_w	0.001	0.001	0.012	0.002	0.002	0.002	0.023	0.009
r2_b	0.313	0.327	0.357	0.364	0.272	0.281	0.277	0.291
r2_o	0.282	0.293	0.294	0.298	0.243	0.248	0.216	0.227

TABLE 6.2.B

Dep Var.: HOUSING IMPROVEMENTS	NON LEGAL OWNER				USER RIGHTS (NO OWNERSHIP)			
	Intention-To-Treat		Effects on Participants (LATE)		Intention-To-Treat		Effects on Participants (LATE)	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
intention_to_treat_OC	0.53***	0.54***			0.64***	0.65***		
	(0.035)	(0.034)			(0.048)	(0.051)		
intention_to_treat_NUA	0.11***	0.13***			0.23***	0.24***		
	(0.036)	(0.036)			(0.053)	(0.055)		
treatment_Ooc			0.76***	0.76***			0.96***	0.92***
			(0.063)	(0.061)			(0.207)	(0.198)
treatment_NUA			0.318**	0.32***			0.649**	0.620*
			(0.129)	(0.127)			(0.325)	(0.318)
howlong1_5		0.019		0.180***		-0.087		0.149*
		(0.040)		(0.042)		(0.064)		(0.083)
howlong6_15		-0.059		0.001		-0.075		0.120*
		(0.025)		(0.030)		(0.052)		(0.070)
howlong23_29		-0.026		0.034		-0.096		0.258**
		(0.030)		(0.038)		(0.060)		(0.117)
howlong30_more		-0.047		-0.004		0.044		0.224*
		(0.041)		(0.048)		(0.074)		(0.117)
Constant	0.102	0.143	0.021	0.03	-0.128	-0.041	-0.047	0.027
	(0.107)	(0.108)	(0.125)	(0.127)	(0.212)	(0.219)	(0.291)	(0.291)
r2_w	0.004	0.001	0.048	0.026	0.004	0.001	0.058	0.046
r2_b	0.223	0.235	0.204	0.215	0.246	0.256	0.163	0.164
r2_o	0.202	0.210	0.146	0.155	0.208	0.212	0.102	0.102

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The coefficient of the local average treatment effect estimation, which reports the effect of the programme on those who were connected to the energy grid, is on average, around 0.95 percentage points higher than the control group. Importantly, in this case, length of residence in the neighbourhood is always positively and significantly correlated with housing improvements, which indicates that people have an incentive to secure their rights through house and service investment despite issues of tenure and legality. Security may be one driver for investment but services contribute to security.

There are three main peculiarities that have to be considered in relation to this tenure group and housing investments. First, as already noted, there is the enrolment, which does not have to be conditioned by legal rights. Second, the savings derived from substitution are an incentive to adhere to the service, as long as the stability of residence in the house is long enough to generate internalisation of benefits. In addition, the consolidation of the neighbourhood itself is an incentive for non-participants – informal owners and squatters – to make further housing investments. Finally, the service programme and the institutional framework of co-production introduce some particularities for service enrolment, which forces mainstream views about renters' and landlords' behaviours to be reconsidered. It is generally argued that renters would not be supportive of neighbourhood transformations due to potential increases in their rents. In fact, the co-produced model of enrolment provides benefits for both landlords and tenants.

From the tenants' point of view, a new source of safe energy that generates savings in current expenses is attractive when renters and occupants expect to stay in the house for a long time. The programme contributes to dissociate use from ownership rights when contractual obligations are endorsed by the adult members of the household and not tied to ownership of the house. This means that renter and landlord responsibilities in the payment for the service can be linked. Renters assume responsibilities for paying the instalments out of the savings generated by the substitution and any necessary changes to the house are negotiated with the

landlord, who capitalises the investments. Yet, from the landlords' point of view, the fact that they generally live in the same neighbourhood – even in the same block or plot – provides support for a positive approach to enrolment.

In addition, since the programme helps in cadastral registration, which means greater transfer rights that could decrease the exchange cost if the property were sold, the acquisition of the service and subsequent improvements constitute another positive outcome of enrolment. As a result, the programme builds on land-right imbalances within the block to achieve new negotiated outcomes. These matters have been established for collective action schemes based on common-pool resource maintenance and the provision of public goods (Olson, 1965, 1992; Ostrom, 1990; Baland and Platteau, 1995, 1997).

In this case, it is important to acknowledge that tenure in practice is diverse and deserves more detailed consideration in our analysis. Indeed, the econometric analysis encountered a limitation imposed by a low proportion of residents in each of the individual categories, which made it necessary to aggregate them under a definition of informality that involved only temporary rights of use, either formalised or not. Although the share of renters in the neighbourhoods is very low (2 percent, on average), some qualitative insights from a tenant who decided to enrol in the programme provided some interesting views about the way in which renters feel attracted by the scheme:

> *We had decided to have it and told our decision to the landlord, because here, we are renting. We are using a carafe [bottled gas] and we are four in the family; it's been a year and a couple of months ... we came on June last year. We agreed with him to pay half and half for any additional connection charges ... anyway, we pay the rent once a month, and he could discount this from the rent (Maria G., 2009).*

Nevertheless, a precarious tenancy (i.e., squatter) or a short length of residence may constitute an obstacle because occupants wonder about the responsibility of paying the costs of installations and connections when they may have to leave. A woman explained this dilemma clearly and in detail:

> *We didn't participate in this because ... We wanted the gas, but we can't because the house is borrowed, because we can't buy a plot and, well ... for me, it's better if I put the gas, but I'm going to lose in all the installation, which is more expensive. It wouldn't be because of the cost of gas and so on, but because of the equipment and everything it takes (Juana F., 2009).*

The comments reveal the willingness of occupants and renters to have the connection. They do not resist enrolling in the programme; although the landlord's support is required.

The model also examines whether, all else being equal, households holding different legal and tenure status in Group 2 - the neighbouhoods where the information stage of the programme was implemented - are more likely to invest in improving the house than the households in the control group. The probability that a household improves the dwelling is from 6 to 24 percentage points higher than that of the control group. Yet, the likelihood of undertaking improvements in the house is higher than those of the control group across all tenure forms, except legal owners. Legal owners in Group 2, during the information stage, are no more likely to improve the dwelling than the control group. This issue may suggest that, for this group, the co-production effects on improvements are exclusively determined by the gas connection. For example, houses may require fewer initial transformations to comply with gas provision safety measures.

In addition, the probability that programme participants who are formal owners, non-legal owners or non-formal owners will undertake improvements is from 14 percent to 65 percent higher in Group 2 than in the control group. This may indicate that these groups are progressively improving their houses, in order to qualify for the safety connection requirements prescribed by ENARGAS (1997), for example by replacing wood walls with concrete or completing windows and insulation requirements. The results are all robust to the different model specification when all the variables that control the differences in the individual socio-demographic and socioeconomic characteristics of the respondents, and the length of permanent residence in the house, are included.

4. HOUSING IMPROVEMENTS

I want to turn now to the changes in housing transformation induced by the co-produced service programme for Groups 1 and 2 in each stage. Differences-in-differences estimates provide a measure of the changes through time for the three different housing-improvement variables. The three model specifications are structured in the same way: they compare the average changes in outcomes for the whole group of residents – whether they enrol or not (ITT) – in each group, from 2006 to 2009, to the changes in outcomes for the same period in the control group.

In Table 6.3, Models 1 to 3 display the results for the dummy variable that indicates the undertaking of housing improvements, Models 4 to 6 show the number of housing improvements, and the number of them that affected the quality of construction materials are reported in Models 7 to 9. All models include the socio-demographic and other housing characteristics[99] that control observable differences among groups, added to the length of residence, tenure and legality characteristics that may condition investments. These are the basic Models 1, 4 and 7 (Columns 1, 4 and 7). Models 2, 5 and 8 (Columns 2, 5 and 8) add a set of dummies for income and employment, tenure and length of residence in the house, which can affect the incentives to invest. Models 3, 6 and 9 (Columns 3, 6 and 9) repeat the same models, but the tenure dummies are now replaced by dummies for documents held, indicating the legal status of the resident's ownership rights.

In general, the results suggest that the co-produced energy programme generated a positive and statistically significant incremental effect (at a 1 percent significance level) on the likelihood of undertaking housing improvements in the Group 1 neighbourhoods. These are the neighbourhoods where the service extension has already been completed and at least two-thirds of the hosueholds are using piped gas in domestic activities. In the case of housing transformations, the coefficient of the intention-to-treat estimator, which reports the average effect of the co-produced programme, on the households located in the neighbourhoods where the

[99] These include: years of education of the household head, age and age square, sex, marital status, dependent ratio, number of members in the house, number of houses in the plot and dummies for migrant status.

program was implemented, is 0.45. This relative change from the control group mean of 0.34 represents a 132 percent increase in the proportion of residents undertaking transformations in their housing as the result of having obtained the gas connection. This effect is meaningful in economic terms, and the coefficients increase slightly when the set of income, employment, and tenure and documentation controls are included. This means that such differences among groups affect investment in housing improvements.

As discussed earlier in the thesis, progressive housing faces many financial constraints (Datta and Jones, 1999). The data from the Buenos Aires survey indicates that upfront costs charged for the introduction of services distort investment behaviour. The average effect on households in Group 2 – the intention to treat estimates - are all negative and statistically significant at conventional significance levels (from 0.08 to 0.09). These results indicate a decrease in the number of residents reporting transformations in their houses attributable to the co-produced programme, when compared with the equivalent figure for the control group during the same time period.

The explanation for this finding is that planning for an upfront expense affects the cycle of progressive transformations (Engelhardt, 1996, Haurin et al., 1996; Dietz and Haurin, 2003). Housing construction done progressively depends on savings – ranging from monthly income to other sources of informal financial aid – were enough for this task. At this stage, the decrease in recorded improvements may suggest that residents have to save in advance to acquire the gas service and thus forego planned improvements or, decrease their expenditure on housing improvements in the short-term in order to undertake consolidation work in the future after acquisition of new service. Although the savings generated by the substitution of energy should cover the cost of the energy connection, all the necessary complementary housing transformations require some additional investment. These can include buying a kitchen appliance or heating devices, installing an indoor gas connection, or installing water pipes to the bathroom in order to accommodate water-heating devices, besides a toilet discharge with

running water that may replace the bucket (*el balde*) that is usually used. As an indication that these necessary but unforeseen improvements put pressure on domestic financial management, the data show an increase (trend) in the supply of labour prior to and during programme enrolment.[100]

TABLE 6.3. HOUSING IMPROVEMENTS – CONNECTION AND INFORMATION GATHERING STAGES.

	HOUSING IMPROVEMENTS			NUMBER OF HOUSING IMPROVEMENTS			NUMBER OF HOUSING IMPROVEMENTS IN CONSTRUCTION MATERIALS QUALITY		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
intention_to_treat_OC	0.42***	0.42***	0.45***	0.63***	0.64***	0.65***	0.88***	0.87***	0.89***
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)	(0.01)	(0.02)	(0.02)
intention_to_treat_NUA	-0.08***	-0.09***	-0.080***	-0.16***	-0.17***	-0.2***	-0.2***	-0.18***	-0.2***
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)
howlong		-0.01	-0.01		0.04***	0.03**		-0.02**	-0.02**
		(0.01)	(0.01)		(0.01)	(0.01)		(0.01)	(0.01)
Socio-demographic controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
employment and income		yes	yes		yes	yes		yes	yes
tenure and documents		tenure	doc		tenure	doc		tenure	doc
Constant	-0.08	0.55***	0.41**	-0.07	-0.27	-0.16	0.57***	0.59***	0.60***
	(0.11)	(0.18)	(0.18)	(0.32)	(0.34)	(0.33)	(0.17)	(0.18)	(0.18)
Observations	550	550	550	550	550	550	550	550	550
R-squared	0.46	0.52	0.511	0.17	0.19	0.18	0.40	0.40	0.41
F-test		34.2	2.012		65.8	3.39		13.3	15.2
Prob > F		0	0.0901		0	0.00882		0.0086	0

Notes: N=550. Differences in Differences –Intention to Treat Estimator. Model 1, 4, 7 socio-demographic controls. Model 2,5,8 and 3,6, 9 add the whole set of socio-demographic and socio-economic characteristics, employment and income covariates, as well as tenure and documents dummies, respectively.Robust Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

[100] During the November 2009 follow-up survey several interviewees stated that non-working adults in the house (either the wife or the husband) had sought a job at this stage in order to pay for housing improvements.

Table 6.3 . Differences in Differences Estimates- Dwelling Improvements

	Dwelling Improvements			Number of Dwelling Improvements			Number of Improvements (construction materials quality)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
intention_to_treat_1	0.424***	0.421***	0.452***	0.637***	0.648***	0.654***	0.884***	0.879***	0.895***
	(0.026)	(0.025)	(0.026)	(0.041)	(0.043)	(0.044)	(0.018)	(0.020)	(0.020)
intention_to_treat_2	-0.081***	-0.097***	-0.080***	-0.166***	-0.175***	-0.144***	-0.165***	-0.183***	-0.194***
	(0.027)	(0.026)	(0.027)	(0.040)	(0.042)	(0.042)	(0.023)	(0.024)	(0.024)
howlong		-0.001	-0.001		0.004***	0.003**		-0.002**	-0.002**
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
sociodempgraphic controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
employment and income		yes	yes		yes	yes		yes	yes
tenure/documents		tenure	documents		tenure	documents		tenure	documents
Constant	-0.008	0.553***	0.416**	-0.079	-0.279	-0.166	0.573***	0.596***	0.602***
	(0.114)	(0.183)	(0.180)	(0.324)	(0.340)	(0.335)	(0.177)	(0.185)	(0.180)
Observations	1,046	1,046	1,046	1,046	1,046	1,046	1,046	1,046	1,046
R-squared	0.466	0.520	0.511	0.179	0.195	0.183	0.404	0.407	0.414
F-test		34.28	2.012		65.81	3.397		13.33	15.24
Prob > F		0	0.0901		0	0.00882		8.61e-11	0

Notes: N=550. Differences in Differences – Intention to Treat Estimator. Model 1, 4, 7 socio-demographic controls. Model 2,5,8 and 3,6, 9 add the whole set of socio-demographic and socio-economic characteristics, employment and income covariates, as well as tenure and documents dummies, respectively. Robust Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

As expected, the results for the effects on the number of housing improvements (Columns 4 to 6), and the number of transformations affecting the quality of construction materials (Columns 7 to 9) suggest an incremental effect on improvements for those houses located in the neighbourhoods where the connection has been granted. The results indicate large and statistically significant incremental effects (at a 1 percent significance level). The intention to treat estimates, of 0.63 to 0.65, report the average effect on the whole group – besides enrolment in the co-produced programme- indicates an incremental effect compared to the mean of 0.21 changes in the control group, where the intervention was not implemented. Furthermore, the intention to treat estimator for the number of improvements affecting quality of construction materials of 0.87 to 0.89, is also significant. In this case, the relative change, from a mean of 0.33 in the control group, also indicates a large incremental effect in the number of changes in the quality of the construction materials for households that belong to the neighbourhoods connected to the new infrastructure service grid. These effects are meaningful in economic terms. It is worth noting that the coefficients increase slightly when the set of income employment, tenure and document controls is

included, which means that differences among groups affect investment in housing transformations.

It is important to notice that the coefficient for “years of residence in the house” is always negative and statistically significant in the last two models which have “number of housing transformations” as a dependent variable. This means that, as expected for these neighbourhoods, the length of residence, which is highly correlated to house age, is negatively associated with the incremental number of improvements that are undertaken. The result implies that the progressive process of housing construction over a longer time frame had allowed the completion of more basic features and achieved a greater degree of house consolidation. Notably, the programme, and the service, provided a boost in housing transformations for the residents that had been living there for a longer period of time. For this group, it reversed the negative correlation of the number of housing transformations and length of residence. Long-standing residents, who would otherwise be less inclined to make changes, became more willing to invest in their houses because of the availability of the service intervention.

In order to capture any particular effect of the programme associated with housing age, an interaction term between the intention-to-treat dummies and the age of the house is introduced as control (Table 6.4). What is important to note is that the independent (positive) effect of the co-produced programme on the number of housing improvements is slightly reduced and still statistically significant. Only the interaction term that includes the intention-to-treat for Group 1 is positive and statistically significant at the one percent level of significance. This means that, despite the direct effect of the programme on transformations, the number of improvements undertaken among respondents in Group 1 is explained by the interaction between the effect of offering the programme and the length of permanence in the house. This result provides evidence of a further step towards the consolidation of the house, since different transformations are made thanks to the new functions that piped gas makes available.

TABLE 6.4. NUMBER OF HOUSING IMPROVEMENTS AFFECTING QUALITY OF CONSTRUCTION MATERIALS.

CONNECTION AND INFORMATION GATHERING STAGES. DIFFERENCES IN DIFFERENCES ESTIMATES WITH INTERACTION (INTENTION-TO-TREAT AND LENGTH OF RESIDENCE)

Table 6.4. Differences in Differences Estimates - Dependent variable: Number of Housing Improvements affecting quality of housing construction materials (without and with interaction intention_to_treat*howlong)

Dep Var: Number of Improvements affecting the quality of construction materials	(1)	(2)	(3)	(4)	(5)	(6)
	Diff in Diff Estimates- - withouth interaction howlong*intention_to_treat			Diff in Diff Estimates- with interaction howlong*intention_to_treat		
intention_to_treat_OC	0.884***	0.879***	0.895***	0.707***	0.707***	0.806***
	(0.018)	(0.020)	(0.020)	(0.047)	(0.050)	(0.047)
intention_to_treat_NUA	-0.165***	-0.183***	-0.194***	-0.280***	-0.305***	-0.243***
	(0.023)	(0.024)	(0.024)	(0.060)	(0.062)	(0.058)
howlong		-0.001	-0.002**	-0.005***	-0.004***	-0.004***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
inter_howlong_intent_OC				0.005***	0.005***	0.003*
				(0.002)	(0.002)	(0.002)
inter_howlong_intent_NUA				0.003	0.003	0.001
				(0.002)	(0.002)	(0.002)
title			0.111***			0.112***
			(0.024)			(0.024)
regularized			0.178***			0.176***
			(0.033)			(0.034)
none			0.245***			0.242***
			(0.038)			(0.038)
other			-0.076			-0.070
			(0.067)			(0.068)
formal_owner2		0.015			0.028	
		(0.072)			(0.074)	
formal_renter2		0.267***			0.298***	
		(0.076)			(0.079)	
informal_owner2		.160**			0.167**	
		(0.076)			(0.076)	
occupant2		0.123			0.140	
		(0.108)			(0.111)	
socio demographic controls	yes	yes	yes	yes	yes	yes
income and employment controls	no	yes	yes	no	yes	yes
Constant	0.573***	0.596***	0.602***	0.761***	0.736***	0.668***
	(0.177)	(0.185)	(0.180)	(0.180)	(0.185)	(0.179)
R-squared	0.404	0.407	0.414	0.404	0.408	0.414
F-test		13.33	15.24		14.09	14.65
Prob > F		8.61e-11	0		0	0

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

This is an interesting result since it was expected that recently-built houses were the ones that needed more changes made to them. In contrast, the new service allows an upgrading in investment efforts that are focused on improving other functional characteristics that could not be upgraded without the introduction of piped services. These include a bathroom with appropriate floor material and equipment, or a better kitchen space, where the floor and walls are improved and appliances incorporated. New heating devices make heat loss a concern, and can lead to improving materials, such as re-plastering walls or replacing windows and doors.

5. LEGALITY, TENURE AND TRENDS ON INVESTMENT

Table 6.5 reports the differences-in-differences results for the intention-to-treat effects on the three variables for housing improvement. Again, these results display the average effect of the intervention on the whole group of residents- have they participated in the programme or not. Here, the sample is divided into the four categories that have been already described, considering legality and tenure status. Two models are reported for each sample: the first includes the socio-demographic and housing characteristics controls; the second includes employment, income per capita and dummies for the length of stay in the house as controls that account for the differences among samples.

The effect of the programme on the improvement of the houses shows that residents behave differently from the rest of the neighbourhood groups, when located in the neighbourhoods that were targeted by the complete co-produced programme.

TABLE 6.5. HOUSING IMPROVEMENTS. CONNECTION AND INFORMATION GATHERING STAGES. BY LEGALITY AND TENURE

CONNECTION AND INFORMATION GATHERING STAGES. DIFFERENCES IN DIFFERENCES ESTIMATES (REDUCED SAMPLE BY TENURE /LEGAL STATUS)

Table 6.5. A
Dependent Variables : Housing Improvments, Number of Housing Improvements and Number of Quality of Construction Materials Improvements . Reduced Sample by tenure / documents status

	TITLED OWNERS						FORMAL OWNER					
Dep. Variables:	Housing Improvements		number of Housing Improvements		Number of Improvements - Quality of		Housing Improvements		number of Housing Improvements		Number of Improvements - Quality of	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.451***	0.425***	0.370***	0.134*	0.874***	0.850***	0.466***	0.420***	0.594***	0.579***	0.892***	0.900***
	(0.020)	(0.024)	(0.072)	(0.080)	(0,037)	(0,038)	(0.013)	(0.014)	(0.039)	(0.050)	(0,021)	(0,022)
intention_to_treat_NUA	-0.107***	-0.107***	-0.007***	-0.040***	-0.133***	"-0.148**	-0.068***	-0.055***	-0.094***	-0.072***	-0.213***	-0.219***
	(0.016)	(0.017)	(0.053)	(0.064)	(0,029)	(0,032)	(0.014)	(0.014)	(0.039)	(0.045)	(0,025)	(0,025)
howlong1_5								-0.154***		-1.422***		-0.569***
								(0.033)		(0.166)		(0,115)
howlong6_15		-0,013		0,105		0,001		-0.030**		-0.111*		-0,029
		(0.029)		(0.135)		-0,064		(0.015)		(0.059)		(0,043)
howlong23_29		-0,022		0.402***		0,005		0.019		0.023		0,01
		(0.023)		(0.073)		(0,053)		(0.014)		(0.055)		(0,036)
howlong30_more		-0.154***		-0.329***		-0,049		-0.108***		-0.204***		-0,011
		(0.020)		(0.079)		(0,044)		(0.017)		(0.052)		(0,034)
Constant	-0.283***	-0,216	-0,373	-0,619	1.099***	1.180***	0.135***	0.107984	-0,315	0,042	0.486**	0.591**
	(0.077)	(0.139)	(0.342)	(0.547)	(0,218)	(0,217)	(0.051)	(0.086)	(0.274)	(0.376)	(0,234)	(0,244)
R-squared	0.249	0.279	0.270	0.366	0,573	0,574	0.278	0.306	0.186	0.232	0,427	0,437
F-test		22.10		34.35		50,23		21.36		23.80		2,513
Prob > F		0		0		0,00124		0		0		1,23E-05

Table 6.5.B

	NON TITLED OWNERS						NON FORMAL OWNERSHIP					
Dep. Variables:	Housing Improvements		number of Housing Improvements		Number of Improvements - Quality of		Housing Improvements		number of Housing Improvements		Number of Improvements - Quality of	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.545***	0.485***	0.786***	0.907***	0.939***	0.889***	0.375***	0.503***	0.772***	0.975***	0.933***	1.325***
	(0.020)	(0.021)	(0.049)	(0.063)	(0,029)	(0,030)	(0.024)	(0.053)	(0.101)	(0.198)	(0,068)	(0,089)
intention_to_treat_NUA	0,022	-0,004	0,065	0,058	-0.074**	-0.125***	-0.116***	0,024	0.256*	0,101	0,065	0,095
	(0.021)	(0.021)	(0.056)	(0.065)	(0,037)	(0,037)	(0.021)	(0.047)	(0.137)	(0.173)	(0,099)	(0,095)
howlong1_5		-0,025		-0.825***		-0,08		0,023		0.840***		0.387***
		(0.031)		(0.145)		(0,083)		(0.061)		(0.183)		(0,062)
howlong6_15		0,016		-0,017		0,006		0.196***		0.555***		-0,081
		(0.015)		(0.057)		(0,043)		(0.035)		(0.121)		(0,060)
howlong23_29		0.031*		-0,032		-0,044		-0.137***		-0,056		-0.320***
		(0.017)		(0.061)		(0,040)		(0.052)		(0.193)		(0,080)
howlong30_more		-0.091***		-0,078		-0.152***		-0.070*		-0,233		-1.121***
		(0.022)		(0.060)		(0,044)		(0.042)		(0.207)		(0,126)
Constant	0.112**	0.312***	0,217	-0,142	0,177	0,276	-0,013	-0.670***	-0,033	-0.048***	-0,369	-0.541*
	(0.057)	(0.101)	(0.267)	(0.404)	(0,225)	(0,243)	(0.116)	(0.212)	(0.544)	(0.764)	(0,367)	(0,304)
R-squared	0.317	0.331	0.209	0.236	0,381	0,383	0.360	0.468	0.299	0.466	0,397	0,521
F-test		8,5		9,07		4,42		15.46		23.61		50,53
Prob > F		7.31e-07		2.78e-07		0,001		0		0		0,0011

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Note: N=630 (full sample); Title=214; Formal Owner= 485; Non-Titled=415 and Informal/Use rights =145. Intent-To-Treat Difference uses OLS and control for the baseline survey characteristics. Models in columns 1,3,5,7, 9 and 11 include socio-demographic controls (sex, primary education, age and age square, marital status, migrant status, number of residents, dependent ratio, number of houses per plot, distance to avenue). Models in columns 2, 4, 6,8,10 and 12 add employment dummies and logarithm of income per capita, as controls.

The results confirm the evidence that there is a powerful incremental effect on the trend of housing investment that is generated by the offer of the service. The results certainly indicate that the intervention does not only affect the titled residents when it comes to investing (property rights view). Instead, the programme induces a positive, incremental effect on housing transformations and this effect is not limited to formal legal owners but includes residents holding diverse tenures and ownership rights.

Indeed, the intention-to-treat coefficient for residents across all tenure categories, located in the neighbourhoods within Group 1 – either adherents to the service programme or non-compliers – reports a considerable, positive and significant incremental effect as a residual effect of the programme on all the transformation variables, when compared to that of the residents from the control group with the same tenure status. The effects are meaningful in quantitative terms. They support strongly the argument that services per se constitute a powerful incentive to encourage a progressive investment in housing transformations, and that this incentive is not conditioned by the presence of property rights.

In the case of residents who do not hold legal ownership rights, or who declare formal tenure, or have use or informal ownership rights over the property, there is an incremental effect for each category, when the causal effects of the co-produced programme on the number of housing improvements is compared with the equivalent level reported by residents in the control group.

Importantly, the positive and statistically significant sign of the intention-to-treat coefficient for the residents within Group 1 that are included in the last tenure category (residents whose rights comprise less permanent or temporary occupancy) indicates that the benefits from the programme, at the connection stage, also motivate a positive, incremental effect on housing transformations for this group . This is an unexpected result for informal owners, renters and occupants, and arises in two different ways: through enrolment in the programme

or through the incentives provided (that is to say, the neighbourhood effects) via the consolidation of the neighbourhood once the connection has been provided. There is a positive correlation between “permanence of 1 to 5 years” and the “number of transformations”, that suggests newcomers in this group may feel more encouraged to invest in a greater number of works as a result of the intervention.

This observation leads to several considerations. First, the academic literature, on rural areas especially, has established that informal rights may be enforced by investments and housing transformations and, very frequently, have represented a well-recognised means of tenure-security enhancement when residents hold temporary rights (Brasselle et al., 2002; Sjaastad and Bromley, 1997). Arguably, the programme and the service connection have made the area in Buenos Aires more attractive. Therefore, squatters will be more inclined to invest to secure their rights, and other newcomers may be attracted to the area. In contrast, almost all groups of residents (by tenure types) that have been offered the social interaction stage of the programme (Group 2) decrease the average number of transformations compared to the trend in the control group. This negative effect gets stronger in the case of formal owners and those residents with titles to their houses.

Results are less clear in the case of non-formal owner categories (occupants, squatters and renters having temporary-user rights), where non-significant effects on changes are shown compared with the trend in transformations made by non-formal owners within the control group. It means that, for this group of residents, this stage of the intervention does not have a clear differential effect on transformations; they would have been practically the same had they not been offered the programme. This result seems to contradict our a priori hypothesis of households planning for an upfront investment, since any restrictions in monthly expenses might affect this group of low-income households, too. In the case of tenants, it is possible that they are sharing the expenses with their landlords which could explain the finding. Nevertheless, the positive and significant effect on the number of transformations in construction materials quality once the programme has been implemented and the connection granted (in the coefficient for the

intention-to-treat) indicate that the main effects on housing investment for this group are determined by the connection stage.

Finally, the complete results for the differences-in-differences model that corresponds to the number of housing transformations as a dependent variable - with a full set of controls for the average change in the outcome in Group 1 - are reported in Table 6.6. Again, the results seem consistent with the explanation that the provision of infrastructure through co-produced intervention induces a process of housing upgrading that is not confined to households holding legal ownership rights. In these results, it is possible to observe that the provision of infrastructure to the neighbourhoods has been successful in stimulating housing investment for all tenure groups (row 1, columns 1 to 8). More importantly, when both adherents and non-participants are considered, all tenure groups display greater activity in housing upgrading than their counterparts in nearby neighbourhoods without the piped service.

The service extension to the neighbourhoods has increased the proportion of households undertaking housing improvements, and that effect is very large for households holding informal rights to property when compared to those that belong to the control group. Importantly, for non-titled residents the number of improvements is from 78 to 90 percentage points higher than the control mean (columns 5 and 6). The effect on housing improvements for non-formal owners is significantly higher in the treatment group; with an estimated effect of 72 to 97 percentage points difference from the control mean (columns 7 and 8).

TABLE 6.6. HOUSING IMPROVEMENTS. CONNECTION AND INFORMATION GATHERING STAGES. BY LEGALITY AND TENURE

Number of Housing Improvements. Differences-in-Diffrences Estimates. Reduced Sample by tenure/legality

De.Var: Number of Housing Improvements	TITLED OWNERS		FORMAL OWNERS		NON TITLED OWNERS		NON FORMAL OWNERHIP	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intention_to_treat_OC	0.370***	0.134224*	0.594269***	0.579944***	0.786575***	0.907797***	0.772258***	0.975153***
	(0.072)	(0.080)	(0.039)	(0.050)	(0.049)	(0.063)	(0.101)	(0.198)
intention_to_treat_NUA	-0.307***	-0.540871***	-0.194444***	-0.272285***	0.065393	0.058094	0.256619*	0.101595
	(0.053)	(0.064)	(0.039)	(0.045)	(0.056)	(0.065)	(0.137)	(0.173)
sex_dmale	0.342***	0.732769***	-0.024412	0.018483	-0.158254***	-0.251186***	-0.285019***	-0.643536***
	(0.065)	(0.070)	(0.036)	(0.043)	(0.041)	(0.049)	(0.076)	(0.108)
edu_prim	-0.149***	-0.069758	-0.114203***	-0.023282	-0.157342***	-0.028450	-0.323669***	-0.269329**
	(0.049)	(0.050)	(0.037)	(0.043)	(0.043)	(0.055)	(0.075)	(0.118)
dwellingperplot	-0.174413***	0.139358***	0.029755	0.084045***	0.131092***	0.099438***	-0.152854	-0.150749*
	(0.054)	(0.045)	(0.027)	(0.024)	(0.029)	(0.030)	(0.095)	(0.079)
depend14	0.010578***	0.011355***	-0.000631	0.004502***	-0.004871***	-0.001048	-0.003550	-0.013811***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
age	0.020208*	0.000325	-0.010866	-0.024470**	-0.052432***	-0.040008***	0.012432	0.111217***
	(0.012)	(0.011)	(0.009)	(0.010)	(0.009)	(0.010)	(0.020)	(0.024)
age_2	-0.000159	0.000031	0.000200**	0.000309***	0.000548***	0.000408***	-0.000438*	-0.001118***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
div_sep_wid	0.063272	0.223928***	0.041390	0.032310	0.298484***	0.398258***	0.273754	0.855021***
	(0.084)	(0.077)	(0.051)	(0.057)	(0.055)	(0.062)	(0.180)	(0.217)
mar_concu	0.161679***	0.395096***	-0.106641***	-0.024357	-0.317233***	-0.235462***	-0.610266***	-0.180319**
	(0.058)	(0.057)	(0.040)	(0.040)	(0.043)	(0.046)	(0.075)	(0.077)
nat_migrant	0.101628**	0.232118***	0.125266**	0.217361***	0.445266***	0.423180***	0.824311***	-0.399898***
	(0.046)	(0.057)	(0.049)	(0.056)	(0.096)	(0.092)	(0.259)	(0.142)
intornat_migrant	-0.163706**	-0.119414	0.046677	0.095590	0.335992***	0.246543**	0.321398	-0.283426*
	(0.077)	(0.082)	(0.063)	(0.072)	(0.102)	(0.102)	(0.252)	(0.145)
n_members	-0.134815***	-0.146619***	-0.043569***	-0.078365***	0.018361	0.005722	-0.011800	0.050369**
	(0.030)	(0.033)	(0.013)	(0.016)	(0.011)	(0.014)	(0.022)	(0.024)
unemployed		-0.280117**		0.154309*		0.107435		-0.237918
		(0.116)		(0.086)		(0.105)		(0.155)
employee		-0.781040***		-0.329879***		-0.137982**		0.613943***
		(0.071)		(0.051)		(0.057)		(0.142)
retired		-0.270946***		-0.210085***		-0.212838***		
		(0.086)		(0.064)		(0.080)		
employer		0.084410		-0.035473		0.103468		0.639669***
		(0.119)		(0.109)		(0.121)		(0.164)
incomepercapita_ln		0.066116		0.024995		0.037880		0.085171
		(0.048)		(0.030)		(0.034)		(0.066)
Av3		0.126749**		0.007981		-0.109779*		0.286919*
		(0.064)		(0.050)		(0.058)		(0.166)
Av6		0.365051***		0.004608		-0.005706		0.545806***
		(0.070)		(0.047)		(0.050)		(0.106)
Av6more		-0.819298***		-0.295314***		-0.356368***		0.240029**
		(0.177)		(0.067)		(0.067)		(0.110)
howlong1_5				-1.422106***		-0.825361***		0.840287***
				(0.166)		(0.145)		(0.183)
howlong6_15		0.105530		-0.111544*		-0.017273		0.555102***
		(0.135)		(0.059)		(0.057)		(0.121)
howlong23_29		0.402147***		0.023585		-0.032306		-0.056938
		(0.073)		(0.055)		(0.061)		(0.193)
howlong30_more		-0.329890***		-0.204135***		-0.078848		-0.233789
		(0.079)		(0.052)		(0.060)		(0.207)
Constant	-0.373532	-0.619397	-0.315778	0.042111	0.217506	-0.142461	-0.033956	-3.048401***
	(0.342)	(0.547)	(0.274)	(0.376)	(0.267)	(0.404)	(0.544)	(0.764)
R-squared	0.270	0.366	0.186	0.232	0.209	0.236	0.299	0.466
F-test		34.35		23.80		9.087		23.61
Prob > F		0		0		2.78e-07		0

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Intent-To-Treat Difference uses OLS and control for the baseline survey characteristics. Sample sizes of residents are Title=214; Formal Owner= 485; Non-Titled=415 and Informal/Use rights =145. Models in columns 1,3,5,7, 9 and 11 include socio-demographic controls (sex, primary education, age, marital status, migrant status, number of residents, dependent ratio, number of houses per plot, distance to avenue). Models in columns 2, 4, 6,8,10 and 12 add employment dummies and logarithm of income per capita, as controls.

Similarly, the number of improvements undertaken by formal owners – not titled – in the treatment group is 59 percentage points higher than the control group mean (columns 3 and 4). Finally, the number of housing improvements is from 13 to 33 percentage points higher for titled residents in the treatment group than the control mean (columns 1 and 2). The results points to a marginal effect of the programme that is greater for non-legal owners than titled ones, underscoring the strength of the improvement effect on non-titled and non-formal owners, who otherwise would have only completed much lower upgrading activity or at a lower path.

6. HOUSING TRANSFORMATIONS AND TRUST

This section evaluates the association between trust measures and housing investment, as an effect of programme implementation, after the connection was granted to residents in Group 1 (OC), from 2006 to 2009. This is the group in which the co-produced programme has been implemented fully and residents who enrolled in the programme have beed connected to the networked gas service.

The interpersonal networks that create trust are relevant assets that contribute to support sustainable livelihoods. Relationships of trust and reciprocity in exchanges facilitate cooperation and provide for informal social networks as valuable resources. This explanation validates the relevance of the main contribution of this study in reconceptualising the benefits of interventions, and in considering how several dimensions of trust may mutually reinforce complementarities between the social and physical dimensions of investments. The suggestion from my research is that (exogenous) change in social distance introduced by CPSI may further

reciprocity, which facilitates trust-building in two different spaces and levels of interaction. First, interactions with neighbours, local associations, and within the family, where obligations turn from personal and moral to economic, where there is a strict (tacit) obligation to repay (Sahlins, 1974). Second, exchanges in wider social spaces, with unknown others, such as the municipal public sector or the utility firm, where links and exchanges among those involved contribute to the construction of new knowledge across institutional boundaries (Mitlin, 2004).

The preliminary explanation is based on mainstream social capital literature that considers that generalised trust may affect the incentives for housing investment. The results in Table 6.6 provide empirical evidence of a negative correlation between generalised trust after connection and investment in the house. In particular we have already discussed that the probability of reporting a positive answer to the generalised trust question was higher after the connection stage of the programme, which explains the negative correlation between the "trust in others" indicator and the transformations variable.

Nevertheless, there are other channels upon which the positive effects of the co-produced intervention on generating trust may affect housing transformations. Scholars who write about urban livelihoods claim that this type of "capital" is an economically productive asset that affects individuals' ability to take advantage of opportunities to enhance their wellbeing (Moser, 1998; Rakodi, 1999). For example, it could be expected that new (informal) connections might allow access to (informal) credit sources or the help of neighbours in the practical realisation of home improvements. However, the survey does not collect data on access to credit, which would have allowed the analysis of these effects.

TABLE 6.7. HOUSING IMPROVEMENTS AND TRUST IN THE FAMILY (YEARS 2006-2009). CONNECTION STAGE

Connection Stage - Intention to Treat Estimates and Local Average Treatement Effect (OLS and 2SLS).

Table 6.7. A.	CONNECTION STAGE IN OC - INTENTION TO TREAT ESTIMATES (OLS)							
Dep. Var:Housing Improvements (2006-2009)	HOUSING IMPROVEMENTS				HOUSING IMPROVEMENTS AND TRUST IN THE FAMILY			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intention_to_treat_OC	0.521***	0.519***	0.523***	0.515***	0.522***	0.523***	0.526***	0.518***
	(0.023)	(0,025)	(0,026)	(0,028)	(0.026)	(0.027)	(0.028)	(0.028)
trust_family_1					0.090***	0.093***	0.086***	0.087***
					(0.050)	(0.052)	(0.051)	(0.052)
sociodemographic-income and employment		yes	yes	yes		yes	yes	yes
tenure/documents dummies			tenure	documents			tenure	documents
howlong dummies			yes	yes			yes	yes
Constant	0.294***	-0,172	-0,119	-0.114	-0.241*	-0.201***	-0.186	-0.185
	(0.022)	(0.057)	(0.051)	(0.067)	(0.058)	(0.059)	(0.101)	(0.102)
Observations	1,046	1,046	1,046	1,046	1,046	1,046	1,046	1,046
r2_w	.	0.0189	0.0245	0.0349	0.0178	0.0269	0.274	0.0418
r2_b	0.309	0.284	0.311	0.301	0.294	0.301	0.310	0.301
r2_o	0.274	0.275	0.285	0.279	0.277	0.277	0.287	0.281

TABLE 6.7.B	CONNECTION STAGE IN OC - LOCAL AVERAGE TREATMENT EFFECT (2SLS)							
Dep. Var:Housing Improvements (2006-2009)	HOUSING IMPROVEMENTS				HOUSING IMPROVEMENTS AND TRUST IN THE FAMILY			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intention_to_treat_OC	0.758***	0.770***	0.768***	0.767***	0.759***	0.771***	0.770***	0.770***
	(0.042)	(0.048)	(0.049)	(0.043)	(0.044)	(0.043)	(0.048)	(0.049)
trust_family_1					0.045**	0.041**	0.0451**	0.051**
					(0.052)	(0.056)	(0.057)	(0.057)
sociodemographic-income and employment		yes	yes	yes		yes	yes	yes
tenure/documents dummies			tenure	documents			tenure	documents
howlong dummies			yes	yes			yes	yes
Constant	0.296***	-0.193	-0.098	-0.136	0.253***	-0.223	-.132	-0.177
	(0.022)	(0.058)	(0.056)	(0.058)	(0.051)	(0.059)	(0.056)	(0.073)
Observations	1,046	1,046	1,046	1,046	1,046	1,046	1,046	1,046

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6.7 reports the results for households in Group 1 compared to the control group on the probability of residents undertaking housing transformations, for both the average effect on the whole sample and the effect on households that participated in the co-produced programme (for the intention-to-treat and local average treatment effect on the treated). Now the trust variable is incorporated as an independent variable in the model where the dependent is the variable

indicating housing improvemts. Throughout, the estimated effect of the co-production programme on the likelihood of housing improvements is the result of its direct effect on the improvements outcome plus its indirect effect on the generation of generalised trust. Table 6.8 (Panel A) reports the estimates for the whole Group 1 (ITT) and Panel B the estimates on those that participate (LATE).

TABLE 6.8. HOUSING IMPROVEMENTS AND GENERALISED TRUST

Connection Stage. Intention to Treat Estimates and Local Average Treatement Effect (OLS and 2SLS)

Table 6.8. A.	CONNECTION STAGE IN OC - INTENTION TO TREAT ESTIMATES (OLS)							
Dep. Var :Housing Improvements (2006-2009)	HOUSING IMPROVEMENTS				HOUSING IMPROVEMENTS AND TRUST IN THE FAMILY			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intention_to_treat_OC	0.521***	0.519***	0.523***	0.515***	0.512***	0.507***	0.507***	0.502***
	(0.123)	(0.105)	(0.106)	(0.120)	(0.106)	(0.106)		
trust_others					-0.068*	-0.074**	-0.078**	-0.076**
					(0.157)	(0.112)	(0.114)	
sociodemographic-income and employment		yes	yes	yes		yes	yes	yes
tenure/documents dummies			tenure	documents			tenure	documents
howlong dummies			yes	yes			yes	yes
Constant	0.294***	-0,172	-0,119	-0.114	-0.260*	-0.172	-0.074	-0.116
	(0.022)	(0.057)	(0.051)	(0.067)	(0.058)	(0.059)	(0.101)	(0.102)

TABLE 6.8.B	CONNECTION STAGE IN OC - LOCAL AVERAGE TREATMENT EFFECT (2SLS)							
Dep. Var :Housing Improvements (2006-2009)	HOUSING IMPROVEMENTS				HOUSING IMPROVEMENTS AND TRUST IN THE FAMILY			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intention_to_treat_OC	0.758***	0.770***	0.768***	0.767***	0.725***	0.719***	0.716***	0.727***
	(0.042)	(0.048)	(0.049)	(0.043)	(0.046)	(0.051)	(0.050)	(0.051)
trust_others					-0.069*	-0.064	-0.063	-0.062
					(0.052)	(0.056)	(0.057)	(0.057)
sociodemographic-income and employment		yes	yes	yes		yes	yes	yes
tenure/documents dummies			tenure	documents			tenure	documents
howlong dummies			yes	yes			yes	yes
Constant	0.296***	-0.193	-0.098	-0.136	0.260***	-0.108	0.144	-0.095
	(0.022)	(0.058)	(0.056)	(0.058)	(0.026)	(0.076)	(0.077)	(0.073)

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Notes: Estimations in Panel A are based on Intention-to-Treat (OLS) for panel data (2006 and 2009). In Tablel B estimates use the intention-to-treat variable as an instrument for the identification of treatment effects in 2SLS (LATE) Dependent Variable. HousingImprovements (equals 1 if an improvement in the house was done during the last year).

The four different specifications of the model are similar to those already included in previous estimations (in Columns 1 to 4). Columns 5 to 8 reproduce the same models but now the trust variable is included as control in each case. Panel B reports the results for LATE estimates based on the same frame of models.

A priori, we would have expected a positive and significant correlation between generalised trust and investment. This conceptual association between trust and investment is based on the mainstream social capital literature that points to the association between the reductions in transaction costs effects of trust and exchanges (Arrow, 1969, 1972), as a central feature that determines investment behaviour (Zak and Knack, 2001). The results provide evidence of a positive effect of the programme on improvements induced by the connection in the neighbourhoods while a negative effect correlated to generalised trust. The coefficients of generalised trust reported in Columns 5 to 8 in Panels A and B are all negatively correlated to the likelihood of housing improvements, both in the intention-to-treat (ITT) and the LATE estimations.[101]

The same model is now reported, with trust in the family as a social capital variable. The variable is defined computing the "high and quite high" category answers to the particularised trust survey question. The results are reported in Table 6.9 (Panels A and B). The effect of the intervention on the level of trust in the family is positively associated with the likelihood of undertaking an improvement in the house.

TABLE 6.9. HOUSING IMPROVEMENTS AND TRUST IN THE FAMILY - BY LEGALITY AND TENURE

DEPENDENT VARIABLE: NUMBER OF HOUSING IMPROVEMENTS

[101] The coefficients are significant (p value is <0.05) for the ITT estimations and lose their significance once LATE estimators are modeled.

Connection Stage .Intention to Treat Estimates and Local Average Treatement Effect (OLS and 2SLS).
Reduced Sample by Legality and Tenure.

TABLE 6.9.A	CONNECTION STAGE - LEGAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	1.186***	1.218***	1.218***	1.171***	1.211***	1.212***						
	(0.123)	(0.105)	(0.106)	(0.120)	(0.106)	(0.106)						
trust_family_1				0,137	0.279**	0.281**				0,227	0,137	0,131
				(0.157)	(0.112)	(0.114)				(0.151)	(0.140)	(0.141)
treatment_OC							1.617***	1.552***	1.552***	1.447***	1.459***	1.458***
							(0.168)	(0.157)	(0.158)	(0.165)	(0.151)	(0.152)
sociodemographic-income and employment		yes	yes	yes		yes		yes	yes	yes		yes
howlong dummies		yes				yes		yes				yes
Constant	0.537***	-0,038	-0,068	0.432***	-0,274	-0,32	0.537***	0,233	0,194	0.393**	0,055	0,107
	(0.062)	(0.057)	(0.051)	(0.144)	(0.059)	(0.057)	(0.101)	(0.608)	(0.061)	(0.155)	(0.061)	(0.066)

TABLE 6.9. B	CONNECTION STAGE - FORMAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.756***	0.689***	0.687***	0.759***	0.705***	0.702***						
	(0.074)	(0.075)	(0.075)	(0.073)	(0.074)	(0.073)						
trust_family_1				0.351***	0.337***	0.351***				0.372***	0.346***	0.361***
				(0.088)	(0.120)	(0.118)				(0.090)	(0.103)	(0.103)
treatment_OC							1.019***	0.951***	0.940***	0.979***	0.945***	0.935***
							(0.099)	(0.109)	(0.108)	(0.099)	(0.109)	(0.108)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.742***	0.181	0.214	0.433***	0.198	0.185	0.741***	0.051	0.111	0.615***	-0.210	0.196
	(0.059)	(0.058)	(0.056)	(0.058)	(0.061)	(0.059)	(0.056)	(0.073)	(0.074)	(0.059)	(0.073)	(0.074)

TABLE 6.9.C	CONNECTION STAGE - NON LEGAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.533***	0.547***	0.557***	0.532***	0.544***	0.556***						
	(0.079)	(0.084)	(0.085)	(0.078)	(0.083)	(0.083)						
trust_family_1				0.271**	0.289***	0.310***				0.191	0.199	0.216
				(0.097)	(0.113)	(0.113)				(0.103)	(0.120)	(0.120)
treatment_OC							0.823***	0.868***	0.873***	0.856***	0.903***	0.913***
							(0.122)	(0.143)	(0.142)	(0.122)	(0.143)	(0.142)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.925***	-0.180	-0.174	0.882***	-0.290	-0.299	0.925***	-0.341	-0.321	0.891***	-0.450	-0.443
	(0.066)	(0.366)	(0.363)	(0.065)	(0.373)	(0.369)	(0.060)	(0.430)	(0.432)	(0.061)	(0.431)	(0.433)

TABLE 6.9.D	CONNECTION STAGE - NON FORMAL OWNERSHIP											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.779***	0.967***	0.990***	0.774***	0.946***	0.949***						
	(0.152)	(0.168)	(0.170)	(0.152)	(0.171)	(0.173)						
trust_family_1				0.049	0.021	0.032				-0.325	-0.336	-0.341
				(0.173)	(0.207)	(0.212)				(0.155)	(0.101)	(0.103)
treatment_OC							1.814***	2.136***	2.196***	1.752***	2.075***	2.116***
							(0.174)	(0.127)	(0.129)	(0.171)	(0.133)	(0.135)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.909***	-1.234**	-1.638***	0.825***	-1.291**	-1.740***	0.912***	-1.616	-1.101**	1.202***	-1.046	-1.560*
	(0.087)	(0.115)	(0.143)	(0.092)	(0.144)	(0.155)	(0.120)	(0.294)	(0.125)	(0.120)	(0.198)	(0.128)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The coefficients of trust are now positively correlated to housing investment, in both ITT and LATE models (i.e., either for houses that are connected to the grid and also as the average effect on residents located in the neighbourhoods where the programme was implemented and the gas service was made avilable). The coefficients are significant in both cases: p value is <0.10 in the ITT model and p value <0.05 in LATE models. This result is relevant since a priori we would have expected the social capital argument for trust to hold true, in which the household's choice of investment is positively correlated to generalised trust. In contrast, the results provide greater support for domestic economy arguments that should be correlated to incentives to invest in the house.

Table 6.10 reports the same estimations as before but with the number of housing improvements as the dependent variable. Trust in family is included in the model in the same way as in previous estimations. The sample has been split into the four informality categories that are defined based on legality and tenure status. Those are reported in Panels A to C of this table. The results again indicate that after the gas connection the number of improvements for all groups of residents is higher than the control group. As expected, the number of transformations is even greater for treated residents. The coefficients for the intention-to-treat and the local average treatment effects on the treated are all positive and significant (p values <0.01). The number of transformations is positively correlated to trust in the family. This coefficient is positive in most of the specifications of the model, for both ITT and LATE estimates. The finding applies either when residents declared themselves to be formal owners or when they do not have legal documents as proof of their ownership rights; it is a positive and statistically significant correlation.

TABLE 6.10. NUMBER OF HOUSING IMPROVEMENTS AND TRUST IN THE FAMILY - BY LEGALITY AND TENURE

Connection Stage. Intention to Treat Estimates (OLS) and Local Average Treatement Effect.
Reduced Sample by Legality and Tenure.

TABLE 6.10.A	CONNECTION STAGE - LEGAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	1.186***	1.218***	1.218***	1.171***	1.211***	1.212***						
	(0.123)	(0.105)	(0.106)	(0.120)	(0.106)	(0.106)						
trust_family_1				0,137	0.279**	0.281**				0,227	0,137	0,131
				(0.157)	(0.112)	(0.114)				(0.151)	(0.140)	(0.141)
treatment_OC							1.617***	1.552***	1.552***	1.447***	1.459***	1.458***
							(0.168)	(0.157)	(0.158)	(0.165)	(0.151)	(0.152)
sociodemographic-income and employment		yes	yes	yes		yes		yes	yes	yes		yes
howlong dummies		yes				yes		yes				yes
Constant	0.537***	-0,038	-0,068	0.432***	-0,274	-0,32	0.537***	0,233	0,194	0.393**	0,055	0,107
	(0.062)	(0.057)	(0.051)	(0.144)	(0.059)	(0.057)	(0.101)	(0.608)	(0.061)	(0.155)	(0.061)	(0.066)

TABLE 6.10. B	CONNECTION STAGE - FORMAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.756***	0.689***	0.687***	0.759***	0.705***	0.702***						
	(0.074)	(0.075)	(0.075)	(0.073)	(0.074)	(0.073)						
trust_family_1				0.351***	0.337***	0.351***				0.372***	0.346***	0.361***
				(0.088)	(0.120)	(0.118)				(0.090)	(0.103)	(0.103)
treatment_OC							1.019***	0.951***	0.940***	0.979***	0.945***	0.935***
							(0.099)	(0.109)	(0.108)	(0.099)	(0.109)	(0.108)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.742***	0.181	0.214	0.433***	0.198	0.185	0.741***	0.051	0.111	0.615***	-0.210	0.196
	(0.059)	(0.058)	(0.056)	(0.058)	(0.061)	(0.059)	(0.056)	(0.073)	(0.074)	(0.059)	(0.073)	(0.074)

TABLE 6.10.C	CONNECTION STAGE - NON LEGAL OWNERS											
Dep. Var: Number of Housing Improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.533***	0.547***	0.557***	0.532***	0.544***	0.556***						
	(0.079)	(0.084)	(0.085)	(0.078)	(0.083)	(0.083)						
trust_family_1				0.271**	0.289***	0.310***				0.191	0.199	0.216
				(0.097)	(0.113)	(0.113)				(0.103)	(0.120)	(0.120)
treatment_OC							0.823***	0.868***	0.873***	0.856***	0.903***	0.913***
							(0.122)	(0.143)	(0.142)	(0.122)	(0.143)	(0.142)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.925***	-0.180	-0.174	0.882***	-0.290	-0.299	0.925***	-0.341	-0.321	0.891***	-0.450	-0.443
	(0.066)	(0.366)	(0.363)	(0.065)	(0.373)	(0.369)	(0.060)	(0.430)	(0.432)	(0.061)	(0.431)	(0.433)

TABLE 6.10.D	CONNECTION STAGE - NON FORMAL OWNERSHIP											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.779***	0.967***	0.990***	0.774***	0.946***	0.949***						
	(0.152)	(0.168)	(0.170)	(0.152)	(0.171)	(0.173)						
trust_family_1				0.049	0.021	0.032				-0.325	-0.336	-0.341
				(0.173)	(0.207)	(0.212)				(0.155)	(0.101)	(0.103)
treatment_OC							1.814***	2.136***	2.196***	1.752***	2.075***	2.116***
							(0.174)	(0.127)	(0.129)	(0.171)	(0.133)	(0.135)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.909***	-1.234**	-1.638***	0.825***	-1.291**	-1.740***	0.912***	-1.616	-1.101**	1.202***	-1.046	-1.560*
	(0.087)	(0.115)	(0.143)	(0.092)	(0.144)	(0.155)	(0.120)	(0.294)	(0.125)	(0.120)	(0.198)	(0.128)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regarding the effects within the household, the effects of the programme on trust might be associated to households undertaking housing investments on improvements. Notably, these results are indicative of a positive correlation between the numbers of improvements and trust in the family as an effect of the intervention in these Group 1 households. The coefficients for trust in the family are positive and significant (p values <0.01) for these two categories of residents (Panels B and C), although the LATE coefficient loses its significance in the model for untitled residents.

One plausible explanation for the correlation of trust in the family and investment in the house is related to the non-definition of succession rights in untitled parcels. The family has relevance in investment decisions because all members are potential owners of the asset (succesion rights may not always be well determined). Furthermore, among the housing characteristics of the neighbourhoods studied, plots had been subdivided and multiple family members shared the same plot. This is in contrast to what happens when legal rights are documented to favour one or some particular member/s of the family. In such a case, it is plausible to consider that decisions will rely less on other family members.

The results on the intention-to-treat (ITT) and local average treatment effect (LATE) for the titled residents sample, report a very high number of transformations compared to the control group, and a positive although non-significant coefficient of trust in family. Thus, titled residents can dispose of their asset without strong family requirements while informal non-legal owners' ownership rights are more diffused, the succession line is not always well defined, which determines a higher reliance on the family as the economic unit for home production and housing improvements (Ward et al., 2011b).

The only exception is the coefficient for the participant group of non-formal residents, which is negative but statistically non-significant at conventional significance levels. In this case, trust in the family is negatively correlated to the number of transformations (Panel C, Columns 5 to 8). Renters and occupants can

display a higher number of improvements but results suggest that those are negatively correlated with trust in the family.[102]

The other association between housing improvements and trust focuses on trust in neighbours as the explanation. Table 6.11 reports the results for the same model as used in the previous analysis when the sample was split into tenure categories. Now, the estimated effect of the co-produced programme on outcomes is the result of its direct effect on the number of housing improvements plus its indirect effect on the generation of trust in neighbours. The number of improvements and the likelihood of reporting (high and quite high) trust in neighbours are positively correlated for formal owners, both in the whole sample or when the effect on participants is estimated in Group 1 compared to control group. The coefficients are statistically significant at conventional significance levels (p value <0.01) and robust to all the different specifications of the model, either for ITT (average effect on all the residents) and LATE (effect on those that participate in the coproduced programme and where conneted to the energy grid), as shown in Table 6.8, Panel B. In the case of non-formal owners, the number of improvements in the house is negatively correlated to the probability of reporting trust in neighbours. The coefficients are negative and statistically significant (with p values <0.01). Interestingly, no clear pattern of association is displayed for samples related to legal rights, either for those who have legal rights or those who do not.

TABLE 6.11. NUMBER OF HOUSING IMPROVEMENTS AND TRUST IN NEIGHBOURS - BY LEGALITY AND TENURE

[102] The data do not suggest an obvious explanation of why this might be the case.

Connection Stage .Intention to Treat Estimates and Local Average Treatement Effect (OLS and 2SLS).
Reduced Sample by Legality and Tenure.

TABLE 6.11.A	CONNECTION STAGE - LEGAL OWNERS											
Dep. Var: Number of Housing Improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	1.186***	1.218***	1.218***	1.180***	1.225***	1.224***						
	(0.123)	(0.105)	(0.106)	(0.120)	(0.106)	(0.106)						
trust_neigh_1				0.204*	-0.227	-0.334				0,139	-0,023	-0.028
				(0,118)	(0,115)	(0,115)				(0.151)	(0.140)	(0.141)
treatment_OC							1.617***	1.552***	1.552***	1.455***	1.478***	1.477***
							(0.168)	(0.157)	(0.158)	(0.165)	(0,154)	(0,155)
sociodemographic-income and employment		yes	yes	yes		yes		yes	yes	yes		yes
howlong dummies		yes				yes		yes				yes
Constant	0.537***	-0,038	-0,068	0.432***	-0,274	-0,32	0.537***	0,233	0,194	0.393**	0,055	0,107
	(0.062)	(0.057)	(0.051)	(0.144)	(0.059)	(0.057)	(0.101)	(0.608)	(0.061)	(0.155)	(0.061)	(0.066)

TABLE 6.11. B	CONNECTION STAGE - FORMAL OWNERS											
Dep. Var: Number of Housing Improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.756***	0.689***	0.687***	0.759***	0.705***	0.702***						
	(0.074)	(0.075)	(0.075)	(0.073)	(0.074)	(0.073)						
trust_neigh_1				0.210***	0.108***	0.111***				0.161***	0.075***	0.079***
				(0.070)	(0.74)	(0.075)				(0.090)	(0.103)	(0.103)
treatment_OC							1.019***	0.951***	0.940***	0.979***	0.945***	0.935***
							(0.099)	(0.109)	(0.108)	(0.099)	(0.099)	(0.097)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.742***	0.181	0.214	0.433***	0.198	0.185	0.741***	0.051	0.111	0.615***	-0.210	0.196
	(0.059)	(0.058)	(0.056)	(0.058)	(0.061)	(0.059)	(0.056)	(0.073)	(0.074)	(0.059)	(0.073)	(0.074)

TABLE 6.9.C	CONNECTION STAGE - NON LEGAL OWNERS											
Dep. Var: Number of Housing Improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.533***	0.547***	0.557***	0.532***	0.544***	0.556***						
	(0.079)	(0.084)	(0.085)	(0.078)	(0.083)	(0.083)						
trust_neigh_1				0.271**	0.289***	0.310***				-0.035	-0.106	-0.093
				(0.097)	(0.113)	(0.113)				(0.073)	(0.081)	(0.081)
treatment_OC							0.823***	0.868***	0.873***	0.844***	0.833***	0.895***
							(0.122)	(0.143)	(0.142)	(0.122)	(0.143)	(0.142)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.925***	-0.180	-0.174	0.914***	-0.204	-0.187	0.925***	-0.341	-0.321	0.931***	-0.321	-0.298
	(0.066)	(0.366)	(0.363)	(0.068)	(0.343)	(0.350)	(0.060)	(0.430)	(0.432)	(0.066)	(0.415)	(0.417)

TABLE 6.9.D	CONNECTION STAGE - NON FORMAL OWNERSHIP											
Dep. Var: Number of Housing Improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.779***	0.967***	0.990***	0.755***	0.906***	0.916**						
	(0.152)	(0.168)	(0.170)	(0.148)	(0.156)	(0.156)						
trust_neigh_1				-0.339***	-0.486***	-0.510***				-0.387**	-0.518***	-0.541***
				(0.131)	(0.116)	(0.115)				(0.170)	(0.102)	(0.103)
treatment_OC							1.814***	2.136***	2.196***	1.735***	2.018***	2.043***
							(0.174)	(0.127)	(0.129)	(0.189)	(0.131)	(0.128)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
howlong dummies			yes			yes			yes			yes
Constant	0.909***	-1.234**	-1.638***	0.825***	-1.291**	-1.740***	0.912***	-1.616	-1.101**	1.202***	-1.046	-1.560*
	(0.087)	(0.115)	(0.143)	(0.092)	(0.144)	(0.155)	(0.120)	(0.294)	(0.125)	(0.120)	(0.198)	(0.128)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

An alternative measure for trust in neighbours considers exclusively the higher responses for the trust question, rather than those related to high and quite high responses. The results for declared formal owners are robust to this specification only when the differences between groups are controlled, either for ITT or LATE. This means that the differences in socio-demographic, employment and income characteristics, as well as length of residence, explain the association between trust in neighbours and housing improvements. Importantly, for the non-titled group, "high" trust in neighbours is positively correlated with the number of improvements and statistically significant at p values <0.01 in all the LATE specifications of the model. Therefore, for this group only higher levels of trust with neighbourhoods explain the association with housing improvements.

Finally, Table 6.12 reports the results for the same models but with trust defined as trust in the municipality. Recall that the programme does not have an incremental effect on the average level of trust in the municipality at the information gathering stage, nor a number of years after connection. Only in the group anticipating implementation of the programme was the likelihood of trusting the municipality higher because of this expectation. Nevertheless, there is a positive correlation between the number of improvements in the house and the likelihood of trusting the municipality for residents who do not have legal ownership rights and for those that declared themselves formal owners. The coefficient of trust in the municipality is positive and statistically significant in almost all the specifications of the number of transformations for the intention-to-treat and local average treatment effects estimations on formal owners and non-titled ones (Panels B and C).

TABLE 6.12. NUMBER OF HOUSING IMPROVEMENTS AND TRUST IN THE MUNICIPALITY - BY LEGALITY AND TENURE

Connection Stage. Intention to Treat Estimates (OLS) and Local Average Treatement Effect.
Reduced Sample by Legality and Tenure.

TABLE 6.12.A	CONNECTION STAGE - LEGAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	1.305***	1.276***	1.281***	1.312***	1.276***	1.280***						
	(0.120)	(0.107)	(0.108)	(0.122)	(0.108)	(0.109)						
trust_munic_1				-0.184	0.043	0.041				-0.180	0.083	0.077
				(0.125)	(0.157)	(0.158)				(0.148)	(0.165)	(0.166)
treatment_OC							1.617***	1.552***	1.552***	1.626***	1.550***	1.550***
							(0.168)	(0.157)	(0.158)	(0.168)	(0.157)	(0.158)
sociodemographic-income and employment		yes	yes	yes		yes		yes	yes	yes		yes
how long dummies		yes				yes		yes				yes
Constant	0.458***	-0.059	-0.096	0.489***	-0.064	-0.102	0.458***	0.197	0.159	0.488***	0.184	0.145
	(0.050)	(0.044)	(0.049)	(0.050)	(0.044)	(0.050)	(0.102)	(0.210)	(0.219)	(0.105)	(0.211)	(0.221)

TABLE 6.12. B	CONNECTION STAGE - FORMAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.756***	0.689***	0.687***	0.759***	0.705***	0.702***						
	(0.074)	(0.075)	(0.075)	(0.073)	(0.074)	(0.073)						
trust_munic_1				0.151*	0.288**	0.284**				0.134	0.319***	0.313***
				(0.088)	(0.120)	(0.118)				(0.090)	(0.103)	(0.103)
treatment_OC							1.019***	0.951***	0.940***	1.023***	0.975***	0.962***
							(0.099)	(0.109)	(0.108)	(0.099)	(0.109)	(0.108)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
how long dummies			yes			yes			yes			yes
Constant	0.742***	0.171	0.214	0.713***	0.118	0.157	0.741***	0.051	0.111	0.715***	-0.010	0.046
	(0.059)	(0.358)	(0.356)	(0.058)	(0.361)	(0.359)	(0.056)	(0.373)	(0.374)	(0.059)	(0.373)	(0.374)

TABLE 6.10.C	CONNECTION STAGE - NON LEGAL OWNERS											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.533***	0.547***	0.557***	0.541***	0.563***	0.573***						
	(0.079)	(0.084)	(0.085)	(0.078)	(0.083)	(0.083)						
trust_munic_1				0.235**	0.338***	0.350***				0.186*	0.319***	0.331***
				(0.103)	(0.126)	(0.124)				(0.103)	(0.120)	(0.120)
treatment_OC							0.823***	0.868***	0.873***	0.834***	0.892***	0.898***
							(0.122)	(0.143)	(0.142)	(0.122)	(0.143)	(0.142)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
how long dummies			yes			yes			yes			yes
Constant	0.925***	-0.180	-0.174	0.882***	-0.290	-0.299	0.925***	-0.341	-0.321	0.891***	-0.450	-0.443
	(0.066)	(0.366)	(0.363)	(0.065)	(0.373)	(0.369)	(0.060)	(0.430)	(0.432)	(0.061)	(0.431)	(0.433)

TABLE 6.12.D	CONNECTION STAGE - NON FORMAL OWNERSHIP											
Dep. Var: Number of Housing improvements	INTENTION TO TREAT ESTIMATES IN OC						LOCAL AVERAGE TREATMENT EFFECT IN OC					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
intention_to_treat_OC	0.779***	0.967***	0.990***	0.780***	0.966***	0.989***						
	(0.152)	(0.168)	(0.170)	(0.152)	(0.171)	(0.173)						
trust_munic_1				0.049	0.021	0.032				-0.195	-0.322	-0.319
				(0.173)	(0.207)	(0.212)				(0.255)	(0.301)	(0.303)
treatment_OC							1.814***	2.136***	2.196***	1.680***	2.057***	2.116***
							(0.174)	(0.127)	(0.129)	(0.171)	(0.133)	(0.135)
sociodemographic-income and employment		yes	yes		yes	yes		yes	yes		yes	yes
how long dummies			yes			yes			yes			yes
Constant	0.909***	-1.234**	-1.638***	0.902***	-1.241**	-1.649***	0.912***	-1.616	-1.101**	0.939***	-1.442	-1.934*
	(0.087)	(0.115)	(0.143)	(0.092)	(0.144)	(0.155)	(0.120)	(0.294)	(0.125)	(0.120)	(0.198)	(0.128)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Significance is even stronger when the set of controls are added to the models, reaching p values <0.01, which means that the individual and housing differences among groups are relevant in these cases. The exchanges among formal and non-titled owners and the municipal public sector contribute to the construction of new knowledge across institutional boundaries (Mitlin, 2004), and in the urban livelihood sense of interactions among physical and social capital (Moser, 1998). Finally, there is no clear pattern of association between the number of transformations and the coefficient of trust in the municipality when the sample is reduced to residents who have legal rights to their property.

7. CONCLUSIONS

The results of the analysis of housing improvements outlined in this chapter are broadly consistent with the claim that the gas service extension programme fosters a boost to investment. In line with the preliminary study by Strassmann (1984), it is absolutely clear that service introduction causes high investment in the house. Four main results can be drawn out from the econometric analysis.

First, these results show that the implementation of the programme and the connection to the gas service have a significant and positive effect on the number and occurrence of housing improvements. Specifically, once houses were connected, the co-produced programme induced an increase by 75 percent in the occurrence of housing improvements. The strong, positive effects are found for all residents in the neighbourhoods, which indicate a high social return from the intervention. This finding in turn suggests the presence of neighbourhood effects on investment attributable to the programme.

Second, the results support the predictions forwarded in the academic literature concerning infrastructure as an incentive for investment that is not constrained by a lack of legal ownership rights.[103] The chapter considers results that the programme

[103] Estimated by OLS and 2SLS, the intention to treat and LATE coefficients for group 1 are positive and significant for all tenure categories, at conventional significance levels (p values always below 0.01).

does not provide title-holders alone with incentives to invest, as one might argue from a strict property rights perspective. Rather, all residents across the diverse tenure and legal status categories are shown to invest once services are provided. When the residents' ability to invest in the improvement of housing considers different legality and tenure characteristics of residents' ownership rights, almost all the groups display higher average levels of housing improvements attributed to the after connection stage of the programme. The co-produced intervention is associated with a higher probability of non-legal, declared formal owners and informal (tenure status) residents undertaking changes to housing when compared with reports by residents in a control group (for whom service connection was not made available). This effect is greater for residents with the individual service connection. An important result on this point shows the complementarity between savings and capitalisation in the relation between landlords and tenants, when savings from energy substitution complement landlord capitalisation incentives. However, the results suggest distortions in the cycle of investment in the improvement of the house. The decrease in the implementation of housing improvements at the information stage of the programme indicates that households have had to adjust their plans for future expenditures to take in to account potentially costly consolidation works to their houses.

Third, both those connected to services and non-participants may benefit. The chapter has proposed that this result might be explained because of the household's internalisation of benefits generated by the substitution of the energy source, and through capitalisation from savings and neighbourhood transformation. In the period under study the programme has been effective at raising substantially overall housing upgrading in the targeted area when investments extend from housing formalisation requirements and savings to increased security and positive externalities elicited by the provision of services to the neighbourhoods.

However, housing improvements are also associated with trust generated through the process of co-producing services. Trust in this context is considered an asset that provides utility to residents through the reduction of transaction costs

increasing the rate of investment (Arrow, 1969, 1972; Zak and Knack, 2001). Yet, the interesting fact is that generalised trust is not correlated with the undertaking of progressive improvements to people's houses. Notably, the results support arguments associating particularised dimensions of trust to physical investments, such as trust in the family, neighbours and the municipality, which are positively associated with the occurrence and number of housing improvements.

Fourth, the results indicate that investments and trust work together when residents lack legal rights. These results provide some evidence that contribute to stress the urban livelihood viewpoint of interactions among physical and social capital (Moser, 1998). Indeed, the results indicate that this association is stronger when households declare formal ownership or non-legal ownership rights, and extends to residents who have decided to enrol to obtain the connection.

The results on trust in the family are interesting and require explanation. One plausible explanation might be associated with a certain level of complementarity between ownership without holding legal rights and family decision to invest and to capitalise their investments through housing improvements. Improvements in the house require higher levels of reliance within the family in the case of informal non-legal owners, whose ownership rights are diffused; that is,the succession line in the family structure is not always well defined (Ward et al., 2011b). In contrast, titled residents can dispose of their asset without strong family oversight.

Trust in the municipality is positively associated to housing consolidation. Importantly, the results provide evidence that the trust in the municipal public sector is associated to an increase in housing improvements by formal owners or residents that do not have legal rights, but not for legal owners, nor for occupants and renters, who only have use rights.

Finally, while only high levels of trust with neighbours explain the association with housing improvements for the non-titled group, the contextual effects are especially relevant to explain the association between trust in neighbours and housing improvements.

In sum, the empirical evidence contributes to underline the association between trust and investments in informal neighbourhoods. The results provide strong evidence of the boost of housing improvements that are not circumscribed to legal owners but extend to all tenure choices. Then, the internalisation of benefits – through savings and capitalisation, and greater security, provided by the new energy service induces a significant change in household's investment in their house.

CHAPTER 7: CONCLUSIONS

1. CONCLUSIONS

The thesis presents a comprehensive institutional theoretical approach in order to reappraise the consolidation efforts of residents in informal settlements of Buenos Aires. The research focused in particular on the social and physical dimensions of people's investments; that is, how they associated with others and how they conducted house improvements. It did so by use of a natural experiment that was constructed around the extension of a gas pipeline and domestic connections to three groups of neighbourhoods. One group has received the service, another was in the process of obtaining the service and a third had not been offered the service. The research could therefore control for service effects and it could also do so over time by drawing from two surveys, in 2006 and 2009, as well as earlier benchmark surveys. The gas programme itself conformed to what is often referred to as a co-production; the programme relied upon explicit cooperation and coordination between households, CSOs, NGOs, the municipality and the utility company. This Chapter outlines the thesis conclusions. It summarises the eight key issues that emerge from the empirical research, frames the main contributions to the academic literature on informality and suggests some ways in which new research and policy directions can extend from it.

First, and a relatively new dimension to understanding household decisions that emerges from this thesis, is that it extends knowledge of the internalisation of benefits, explaining residents' participation, enrolment in the service programme and housing investments.[104] It contrasts the conventional institutional wisdom that grounds the causal association between legal title and investment, to provide evidence on services – and savings – as important to household behaviours towards investment. The research provides empirical evidence on the importance of the capitalisation of savings: the internalisation of benefits starts with savings from the

[104] There are also cultural issues related to having a networked source of infrastructure service, since people associate having gas with a particular sense of 'making it'and even of being 'citizens'.

substitution of the cheaper and more reliable piped service for expensive bottled gas, includes the new service use value, and the full capitalisation when all installation costs are covered. A boost to dwelling improvements is made possible by the availability of the new energy source that allows for the capitalisation of savings from substitution (energy savings amount to 2.3 percent of the average monthly income). Households for whom the savings from substitution do not offset the enrolment costs, in time and money, have lower incentives to participate. At the same time, all households experienced the possibility of internalised benefits from neighbourhood improvement that created incentives to improve their dwellings as well.

Second, the research was interested in the association of dwelling improvements with the possession of legal property rights. This view has become a dominant paradigm in a great deal of international policy and research. In Chapters 2 and 3 I outlined why this view is simplistic; it adopts a narrow legal-illegal position on informality, and has a limited appreciation of how people understand their tenure, security and status. In Buenos Aires, titleholders are not the only ones who are able to internalise the benefits from programme participation. Households whose property has been regularised, have other documents or are unclear about the documentation, are not statistically associated with lower enrolment in the programme. One-third of the households that hold no dwelling documentation to assert their rights, had enrolled in the programme. Moreover, in regard to tenure, residents declaring formal ownership rights are not more likely to participate than those who report being informal owners (owners of the dwelling but not of the plot). Nor is renting a deterrent to participation since landlords' and renters' internalisation of benefits from the connection are complementary, as long as tenants' length of permanent residence is long enough to capitalise – in terms of use value and savings – the cost of investment. Data on non-formal owners show that as the result of the specific co-produced programme institutional framework, residents enrol in the programme through internalising the benefits from use and savings and landlords can reap the benefits from capitalisation and cadastral registration. Stability through length of residence in the dwelling is correlated with

participatory voluntary involvement for this group. But it is also shown that occupants have fewer incentives to engage in costly infrastructure improvements when their expectation of future residency is uncertain.

As a related point, a third central finding of this study is that neither legal status nor income are significant constraints on accessing services. Length of permanent residence in the neighbourhood is a good predictor of the households' internalisation of benefits through participation. It increases the probability of enrolment, as compared with those families that have been living in the neighbourhood for less than five years. Tenure and documents are significant, while length of permanent residence is central for participation of those residents who are categorised as informal, and for whom the transaction cost of moving is a significant predictor for participation in the co-produced programme. In this sense, the results of this study follow the homeownership urban economic literature that emphasises transaction costs of moving and immobility, beyond capitalisation, as powerful incentives for investment in the provision of public goods and services (Di Pasquale and Glaeser, 1999; Hilber, 2010). Furthermore, the internalisation of benefits from involvement is not determined by tenure nor legal or permanence considerations, but is also due to contextual heterogeneity effects. The research is therefore consistent with findings that heterogeneity among the contextual environment of nearby residents frames the marginal benefits from individual efforts (Alesina and La Ferrara, 2000; Baland and Platteau, 1997).

Fourth, the co-production programme provided a boost to housing changes in low-income neighbourhoods of BAMA. The data are fairly clear that a higher investment in the dwelling is caused by the introduction of the service. Indeed, all residents – and the diverse tenure and legal status of the dwellings – are inclined toward investing once the services are provided. This idea in which formal, legal title is not necessary to boost neighbourhood consolidation efforts complements other studies (De Souza, 2001; Gilbert, 2002; Gilbert and Ward, 1985; Payne, 1989; Razzaz, 1993; Varley, 1987). This thesis provides quantitative evidence of the residents' ability to invest in the improvement of their housing unit, where almost all the groups display

higher average levels of dwelling transformations, attributable to the programme, when compared with the control group. Importantly, it was found that the financial contributions required as part of the programme motivate an 'adjustment' in household investment behaviours. Such adjustments distort the 'normal' cycle of dwelling transformations and increase labour-force participation.

Fifth, the study tackles the issue of voluntary participation in informal settlements, a long-standing subject in Latin American informality research. Participatory involvement is shown to have increased when it is required by the co-produced model even when fewer than one-third of respondents report being involved in community organisations and other arrangements, and decreases after the connection is obtained. The research provides evidence that participatory involvement in the co-production programme is tightly associated with the internalisation of benefits. Residents increase their participation when it is required and when benefits are internalised, and reduce it when such motivations cease. There are two more detailed and important observations that can also be drawn out from this discussion. First, the data give strong support to the hitherto widely observed trend in Latin America that participatory involvement is a means to an end, increased when involvement is needed and ending once services are obtained. Indeed, as Gilbert and Ward (1984b), and Portes and Walton (1976) suggest, the average level of participatory involvement in neighbourhood voluntary activities is very low. The opening of spaces for interaction "through invitation" are not enough to ensure effective and sustained participatory efforts (Cornwall, 2008). Here is where the internalisation of benefits and the costs and benefits notion becomes relevant. At the information stage, titled (legal) owners, declared formal owners and informal (non-titled) owners, are more likely to report participatory involvement, since they are more able to reap the direct benefits of an improved neighbourhood through capitalisation. More specifically, longer permanence of residence is highly correlated to participatory involvement. It indicates that stability has a powerful significant impact on increasing participation in voluntary neighbourhood activities despite the tenure condition of these groups. Furthermore, almost all of the households that participated in the programme and

were effectively connected to the new gas service, would be willing to participate in a new collective intervention in their neighbourhood.

The second sub-point concerns people's willingness to collaborate. The co-produced programme induces an increase in the willingness to collaborate: an increase by 21.1 to 24.4 percent in the proportion of respondents that report such disposition attributable to the co-produced programme, whereas the average effect on the treated estimator reports stronger effects, with an increase of 29 to 32.4 percent. Collaboration increases despite tenure and legal status of residents but the effects seem less robust for titled owners and non-formal owners, whose willingness to collaborate is determined by contextual effects of the heterogeneity/homogeneity of the group.

The sixth contribution of the research is to examine and measure whether the effect of the intervention on investment in the dwelling might be affected by the generation of trust. The findings indicate that the links of balanced reciprocity have contributed to levelling investments in the dwelling. The effects can be related to the social capital and transaction cost literature (Zak and Knack, 2001; Arrow, 1972, respectively) that emphasises the economic impact of trust on the residents' incentives to invest when uncertainties are reduced in exchanges. What I have called the "complete experience" is shown to have had positive effects on several dimensions of residents' trust.

In contrast, the association of trust and investments does not fit to the strict social capital conceptualisation. Instead, the empirical evidence supports the argument of the reliance on the family as an economic unit, which seems from the analysis to be especially the case for dwellings with non-legal rights to property (formal owners and non-titled ones). Since trust among family members appears to be strongly associated with investment in the dwellings within these settlements, particularly for residents who are not entitled with legal rights, the results provide evidence of complementarities between decisions on dwelling improvements and trust in the family. Importantly, when legal rights are documented favouring a particular member(s) of the family, there is no effect on decisions on dwelling investments

associated with trust that are attributable to the entire co-produced service experience. This observation may be related to the non-definition of succession rights in untitled parcels, where the family has greater reliance in investment decisions because more adult members may be potential holders of the asset. The evidence for the titled residents' sample, reporting very high number of transformations – although none are associated with trust in the family – provides support for this explanation. This information can be associated with the succession and inheritance research on informal settlements and extends the relevance of such relationships among household members, the dwelling and investments (Ward et al., 2011b).

The number of dwelling improvements for the non-titled residents enrolled in the programme is positively correlated with the links of reciprocity involving very high levels of trust in neighbours. In this case, the association holds true only when residents report the highest measurement option of this particularised dimension of trust. Furthermore, there is a positive correlation between the number of improvements in the dwelling and the level of trust in the municipality for formal owners and non-titled ones, and even more for those who are enrolled in the co-produced scheme. However, there is no clear pattern of association between the level of trust in the municipality and the number of dwelling improvements when residents have legal rights to their property. Therefore, the evidence can be taken to indicate that informal institutions are complementary to formal ones, at the time of forging the configuration of incentives for investment. Legal ownership – through property rights – seems to enable lower reliance on social capital to transact or exchange.

There are several interesting insights regarding the effects of the engagement in reciprocal obligations that change moral obligations between neighbours or family members into economic ones. Overall, these indicate that a rise in the level of trust among residents or family members is a process that takes time to develop, at least until the programme has been delivered and financial commitments to repay are enforced. A strong and significant impact on the likelihood of reporting high levels

of trust among neighbours is evidenced four years after connection. However, the results indicate that the programme decreases the level of trust in the municipality reported by the residents and the effect is stronger for participants. Nevertheless, expectations were high before co-production implementation. Although these results cannot be generalised, the interaction space between residents and the municipality was not able to positively affect the levels of trust in that institution. Instead, the results are indicative of exactly the opposite; that the co-produced model caused a decrease in trust of the local government.

2. FUTURE RESEARCH AGENDA AND POLICY IMPLICATIONS

As Rodgers, et al. (2012) state, research on informality may be improved when drawing out connections across disciplinary contributions. This research opens up a number of new matters, questions and issues for the research agenda on informality. It also suggests topics and approaches around which the urban economics literature can open a broader dialogue with development studies and informality research. I would like to underscore three possible areas of future research that could contribute to deepening the understanding of neighbourhood consolidation and also address the issue of different scales: the macro aspects of urban policy, neighbourhood governance, the block and the family.

First, future research could be designed to take a closer look at family structure and decision-making in contexts of socioeconomic uncertainty and different pressures for collaborative efforts through, for example, service or regularisation programmes. Dwelling investments and consolidation are correlated to trust in the family, but the study describes both increases and decline in trust among members. Moreover, throughout the study, a clear substitution for generalised trust by trust in the family is suggested at different stages of programme implementation. It will be valuable to deepen our knowledge of this association, which has recently been addressed in other contexts, indicating the role of the family as an interesting avenue of research (Alesina and Giuliano, 2011; Ermisch and Gambetta, 2010),

since trust among family members appears to be strongly associated with investment in dwellings within these settlements, particularly for residents who are not entitled with legal rights.

Second, the natural experiment introduces the presence of "neighbourhood effects". This topic is not addressed by much of the urban studies literature but is not new in the urban economics scholarship that has been interested in the spatial effects of neighbourhood relations. This study starts to challenge the rigidity of disciplinary conceptualisations of legality and tenure associated with investment by introducing a topic of contextual neighbourhood effects. This strand of research can be advanced to provide useful insights for measuring contextual or endogenous effects and behavioural externalities that arise in the proximate geographical and social space (i.e. that particular and constrained spatiality of neighbourhood and family interaction). For example, further studies might investigate a random sample within blocks – rather than few or one plot per block – to facilitate the analysis of interactions among member' decisions at the block level. Given the importance that the block has as the unit of social organisation that channels coordination matters in programme implementation, it should constitute a specific subject of neighbourhood studies.

Third my research strengthens scholarly arguments that request that we pay greater attention to the temporal dimension of urban processes (Kemper, 2002, cited in Rodgers et al., 2012). This view stresses the need for extensive research and to devise a "new public policy agenda" that contemplates the specificities of consolidation processes within long-standing irregular settlements in Latin America today (Ward, 2012a; 2012b). My research contributes to this claim because our general knowledge of the effects of interventions on informality is usually based on case-studies where results are assessed in cross-section analysis, at one point in time. By taking a temporal frame of four years, which involves the different stages of a co-production intervention, the longitudinal dimension determined by the intervention is addressed in this study. The main rationale is that several processes must take time to develop. This makes possible the isolation of the effects of social

interaction, the connection to the service phase of implementation, and the residual effect several years after connection. This, in turn, helps consider the causal effects of the physical and social investment processes, as part of the "consolidation ladder" of settlements. In short, in order to sustain and extend many of the progressive claims made by social science, which have direct bearing on policy, we need more research that considers change over time in complex scenarios and adopts methods that allow for the collection and analysis of robust data.

I would like to identify three avenues for extending research into urban policy. First, this thesis sheds light on some topics missing from the empirical literature on informal neighbourhoods, but at the same time it introduces a vision for "another path" on neighbourhood consolidation efforts. This thesis gives support to a more holistic approach embracing services, housing finance and community and social organisational development, when considering the process of neighbourhood consolidation. This approach is supported by the urban development literature that explains the analytical oversimplification of the "legal" diagnosis of the issues at stake in informality (Royston, 2006; Gilbert, 2002; Marx, 2009; Sjaastad and Cousins, 2008). The study contests the idea that legality is mandatory in service provision policies, challenging the usual legality-illegality dichotomy (Varley, 1987) that constrains access to services through market mechanisms. Since it is well accepted that services provide "quasi legal status" (Arnott, 2009), services such gas, through its rigorous registration process and the payment slip, constitute a suitable way for co-produced efforts to extend to cadastral registration and land regularisation over time. Indeed, it is worthwhile to discuss the potential to reverse the conventional cycle of legality of tenure preceding access to services, and consider whether, in circumstances of co-producing services, the more valuable approach for States to adopt is for the provision of services to lead to legalisation.

Second, the co-production programme introduces a boost to housing improvements in the context of low-income neighbourhoods of BAMA. Considering the demands for services and dwelling improvements that all of these

neighbourhoods face, the study demonstrates that co-production is suitable for inducing consolidation efforts. However, the study underlines an incipient path for institutional change that cannot be broadly generalised, since it is strongly determined by the macro institutional considerations guiding service provision. This means the programme introduces an institutional frame that minimises the costs of obtaining public goods and services – otherwise difficult to obtain by individual means within State constraints. The constraints identified in Chapter 2 are attached to the menu of political agendas. How can we ensure that a conducive environment to consolidation through neighbourhood organisations is attainable without marginalising the value and role of local government actions? In this context, it is important to note that, surrounded by greater expectations, the level of trust in the municipal public sector had not increased as the result of any of the implementation stages of the co-produced programme. Nevertheless, co-produced programmes do not excuse the state from contemplating the residents' requests of commitment on its part (Mitlin, 2008), or its broader responsibility for protecting lower-income groups (Jones and Ward, 1994: 9). The fact that dwelling investment incentives for formal and non-titled owners are positively correlated to increased levels of trust in the municipality strongly supports this recommendation, since this group has certainly benefited from a new way to access services under normative (regulatory) constraints.

Finally, the evidence should contribute to making clear that the emphasis on collaborative schemes and self-help in the policy discourse may help in the basic task of providing services. However, these policies may not contribute to promoting more confidence in the public sector, particularly among those residents that hold formal rights to their properties. One possible explanation lies in the fact that individual efforts are substituting public sector duties, when such duties are certainly undertaken by the State in other areas of the city. It also points to the fact that municipal officials cannot divest themselves from their responsibility to protect lower income groups (Jones and Ward, 1994: 9). From one side, the State avoidance of responsibilities and mandatory duties in terms of infrastructure provision is balanced by the higher level of willingness to collaborate in practical

matters in all neighbourhoods (treated and non-treated). Nevertheless, by handing on greater responsibilities in finance and implementation to residents, the trust in the CBO expressed at each implementation stage (and confidence in the NGO) is almost always positive and greater than that expressed for the municipality. The research therefore lends support for co-production but should not be interpreted as meaning an abandonment of such responsibilities by the municipal State but rather a call to find new ways for the State to conceptualise and legitimise its role.

APPENDICES

1. Variable List and Definitions

age	Age of respondent
sex_male	Equals one if respondent is male
no_educ	Equals one if respondent has not completed the primary education level. Equals zero otherwise
compl_prim	Equals one if respondent has primary education completed. Equals zero otherwise
compl_secun	Equals one if respondent has secondary education completed. Equals zero otherwise
single	Equals one if respondent is single. Equals zero otherwise.
married_cohabitant	Equals one if respondent is married or cohabitant. Equals zero otherwise.
divorced_separated or widowed	Equals one if respondent is divorced, separated or widowed. Equals zero otherwise.
Houses_perplot	Number of houses in the plot of land
depend14	Ratio of dependency: adults per number of children under 14 years
n_residents	Number residents in the house
n_households	Number of households per house
n_children	Number of children below 14 years in the house
work	Equals one if respondent is working. Equals zero otherwise.
int_migrant	Equals one if the respondent is an immigrant coming from another country. Equals zero otherwise
nat_migrant	Equals one if respondent is a domestic migrant for another province. Equals zero otherwise
intornat_migrant	Equals one if the respondent is a domestic migrant from Buenos Aires Metro Area Equals zero otherwise
formal_owner	Equals one if declares to be the owner of both the house and the plot of land. Equals zero otherwise.
formal_renter	Equals one if declares to rent the house. Equals zero otherwise.
informal_owner	Equals one if declares to be the owner only of the housedwelling. Equals zero otherwise.
occupant	Equals one if declares to be an occupant with permission or paying taxes. Equals zero otherwise.
squatter	Equals one if declares to be an occupant without permission. Equals zero otherwise.
other_tenure_rights	Equals one if respondent gives other answer or the person doesn't know. Equals zero otherwise.
title	Equals one if declares to have ownership legal rights. Equals zero other wise
conveyance	Equals one if respondent has a conveyance or receipt that shows ownership. Equals zero otherwise.
regularised	Equals one if respondent declares to having a precarious revocable permit or regularized deed. Equals zero otherwise
none	Equals one if respondent has no document as prove of ownership. Equals zero otherwise.
other	Equals one if respondent declares having other type of document. Equals zero otherwise.
unknown	Equals one if respondent does not know his tenure situation. Equals zero otherwise.
howlong	Number of years the household has been living in the house.
howlong1_5	Equals one if he/she has been living in the house for 1 to 5 years. Equals zero otherwise.
howlong6_15	Equals one if he/she has been living in the house for 6 to 15 years. Equals zero otherwise.
howlong16_22	Equals one if he/she has been living in the house for 16 to 22 years. Equals zero otherwise.
howlong23_29	Equals one if he/she has been living n the house for 23 to 29 years. Equals zero otherwise.
howlong30_more	Equals one if he/she has been living in the house for more than 30 years. Equals zero otherwise.

howold	Age (in years) of the house
howold 0_5	Equals one if the house is 1 to 5 years old. Equals zero otherwise.
howold6_15	Equals one if the house is 6 to 15 years old. Equals zero otherwise.
howold16_22	Equals one if the house is 16 to 22 years old. Equals zero otherwise.
howold23_29	Equals one if the house is 23 to 29 years old. Equals zero otherwise.
howold30_more	Equals one if the house is more than 30 years old. Equals zero otherwise.
unemployed	Equals one if respondent is inactive or unemployed. Equals zero otherwise.
temp_job	Equals one if respondent has temporary job. Equals zero otherwise.
social_plan_benef	Equals one if respondent is a social plan beneficiary. Equals zero otherwise.
freelancer	Equals one if respondent is freelancer worker -no stable formal occupation. Equals zero otherwise.
housewife	Equals one if respondent undertakes domestic occupations. Equals zero otherwise.
employee	Equals one if respondent is an employee. Equals zero otherwise.
student	Equals one if respondent is a student. Equals zero otherwise.
retired	Equals one if respondent is retired and pensioner. Equals zero otherwise.
employer	Equals one if respondent is an employer. Equals zero otherwise.
formal_worker	Equals one if respondent has social security contributions. Equals zero otherwise.
informal_worker	Equals one if respondent do not have social security contributions. Equals zero otherwise.
dw_1	House that has standard conditions
dw_2	Precarious House (called *rancho*)
dw_3	House is a shack (called *casilla*)
generalised trust (trust_others)	Equals one if respondent declares that most people can be trusted. Equals zero otherwise.
trust_family_1	Equals one if respondent has a high to quite high level of trust towards the family. Equals zero otherwise.
trust_family_2	Equals one if respondent has a high level of trust towards the family. Equals zero otherwise.
trust_neigh_1	Equals one if respondent has a high to quite high level of trust towards neighbours. Equals zero otherwise.
trust_neigh_2	Equals one if respondent has a high level of trust towards neighbours. Equals zero otherwise.
trust_NGO _1	Equals one if respondent has a high to quite high level of trust towards NGO. Equals zero otherwise.
trust_NGO_2	Equals one if respondent has a high level of trust towards NGO. Equals zero otherwise.
trust_gasban_1	Equals one if respondent has a high to quite high level of trust towards Utility. Equals zero otherwise.
trust_gasban_2	Equals one if respondent has a high to level of trust towards Utility. Equals zero otherwise.
trust_CBO_1	Equals one if respondent has a high to quite high level of trust towards Organized Communities. Equals zero otherwise.
trust_CBO_2	Equals one if respondent has a high level of trust towards Organized Communities. Equals zero otherwise.
trust_munic_1	Equals one if respondent has a high to quite high level of trust towards Local Municipal Government (*Municipio*). Equals zero otherwise.
trust_munic_2	Equals one if respondent has a high level of trust towards Local Municipal Government (Municipal). Equals zero otherwise.
part_neighbourhood_org	equals 1 if respondent participates in neighbourhood organisations and 0 otherwise
Q_orgs	Number of organizations and activities in which respondent participates
voluntary_active _social_org	equals 1 if respondent participates in an humanitarian and / or neighbourhood (vecinal) organization, or others and 0 otherwise
voluntary_leisure_org	equals 1 if respondent participates in an art or sports organisation, and 0 otherwise
formal_organisations_active	equals 1 if respondent participates in religious, political, labour union, and 0 otherwise
formal_organisations_passive	equals 1 if respondent participates in professional, consumers or environmental organisations and 0 otherwise
collective_part	Equals one if responded answers affirmatively that would definitely participate in collaborative project
income_p_capita	average monthly income per family member
intention_to_treat_OC	Equals 1 if the house is located in Group 1 (the neighbourhoods where the programme

	was completely implemented). Equals 0 if the house is located in Control Group 3
intention_to_treat_NUA	Equals 1 if the house is located in Group 2 (the neighbourhoods where the programme implementation has started). Equals 0 if the houseis located in Control Group 3
intention_to_treat	Equals 1 if the house is located in Group 1 (the neighbourhoods where the programme was completely implemented). Equals 0 if the house is located in Control Groups 2 and 3
treated_OC	Equals 1 if the house is located in neighbourhoods from Group 1 (where the programme was implemented in first place) and the house was connected to the energy grid. Equals 0 otherwise
treated_NUA	Equals 1 if the house is located in the neighbourhoods from Group 2 (where the programme was implementation started) and decided to enrol in the programme. Equals 0 otherwise
distance to avenue	Distance to main avenue (in meters)
distance to network	Distance to gas network (in meters)
service_index	Average number of services (from 5 in total)
goods_index	Average number of goods (from 5 in total)
Housing_improvements	Equals 1 if improvements in the house have been made in the last 12 months
n_improvements	Number of housing improvements made in the last 12 months
n_improvements_calmat	Number of housing improvements affecting the quality of construction/materials of the house, made in the last 12 months

2. Econometric Models

The expected effects of the programme are related to: i) participatory involvement, ii) trust and iii) housing improvements. The measure of the effects of the programme on these potential outcomes (Y) is estimated by econometric models of the different variables related to each of these outcomes. Those were detailed in the methodology explanation included in Chapter 4, Section 3.1. For a proper identification of the causality of the programme, the identification strategy controls for the existence of pre-treatment differences between the treatment and the control groups, as explained in Chapter 4, Section 4.

Since there is a common trade-off involved in the choice of these controls in order to avoid post-treatment bias, caused by adjusting for variables that are themselves affected by the programme, (Rosenbaum, 1984, 2002) observable characteristics that are statistically different among groups and that may not be directly affected by the programme are included as controls in the models.

Consequently, two different sets of control variables are incorporated. The first one consists of both the residents and housing characteristics already described (see Chapter 4, Sections 4.1 and 4.3) which are accounting for differences in observable features among groups.[105] Three groups of variables are identified as relevant controls for characteristics of the household's head, the household and the houses: i) socio-demographic controls include age (and age squared), sex, primary education (for the highest educational level completed), marital status (married, widowed and divorced), national and local migrant status; ii) employment and income controls include "retired" as the main occupational status of the respondent who is the household head, income per capita and ratio of dependency, and iii) housing characteristics controls are: number of houses in the plot and number of members in the house, plus the corresponding dummies for tenure/documents and length of permanence.

[105] Results were not changed if these were introduced fully factorised to avoid functional form assumptions.

The intention-to-treat specification of the econometric model is defined as follows:

$$Y_{it} = \alpha + \gamma . \textit{sample\_dummy} + \beta . X_{it} + \varepsilon_{i,t} \quad (1)$$

Where Y is one of the potential outcome variables (a dummy variable for all participation, trust and occurrence of housing improvements-related variables (and a continuous variable for the number of housing improvements and those related to the quality of construction materials), γ is the parameter of interest that captures the effect of the programme; *sample_dummy* is the dummy variable with value 1 for observations in the treatment group (i.e. households in the group of neighbourhoods where the programme was offered regardless of their participation, also called *intention-to-treat* variable) and 0 for observations in the control group (i.e. households in the neighbourhoods where the programme was not offered); X is the vector of control variables already described, and ε is the error term.

The estimated models are OLS. I use an instrumental variable specification (2SLS) in order to estimate the causal effect of the programme on those households who were effectively connected to the piped gas service through the co-produced programme implementation. In this case, I include a *treatment-dummy* that has value 1 for those who are programme participants, and 0 to indicate the opposite, while the *intention-to-treat* variable is used as the instrument.

The second econometric specification that is used to estimate the effect of the intervention in the different outcomes of interest is differences-in-differences (DD). It compares the difference in outcomes after and before the intervention for neighbourhoods affected by the programme implementation to the same difference for unaffected neighbourhoods. The similarities in neighbourhoods' origin and trends previous to the co-produced program introduction in the region, described in Chapter 4, indicates that the average outcome for the treated and the untreated groups would have experienced the same variation in case the intervention would not have been offered to the residents in CO.[106] Thus, since

[106] Usually known as "parallel trend" (Abadie, 2005).

treatment and control groups are unbalanced in some variables that are thought to be associated with the dynamics of the outcomes under study, the DD model allows the use of pre-treatment control variables based that take this fact into account.[107] Under the Differences in Differences estimator with covariates, a series of different specifications of the model are computed to shed light on the effects of the offering of the co-production programme. As previously indicated, among control variables those will be related to the individual characteristics of households and their houses.

In a regression framework, this is equivalent to indicate the following specification:

$$Y_{it} = \alpha_i + \lambda_t + \beta . \textit{sample dummy}_{it} + y. X_{it} + \varepsilon_{i,t} \qquad (2)$$

where λ_t is the effect of time common to all households, X_{it} is a vector of observed control variables that may vary over time and with households, sample dummy $_{it}$ is the treatment indicator (equal to 1 if the programme has been offered to the neighbourhoods and 0 if not), α_i is the fixed effect by household that captures all the observable characteristics and those non-observable and constant over time, and β is the effect of the co-production intervention. The main rationale behind fixed effects models is the removal of those non-observable factors α_i by means of exploding the panel aspects of the data.

[107] It guarantees that the parallel trend holds, though now conditional on cofounders.

3. Heterogeneity Index

Following the discussion in Chapter 4, Section 4.3, two different sets of control variables are included. The first one includes the household and housing level characteristics already described, accounting for differences in observable characteristics. The second group includes heterogeneity measures, an important factor related to the differences among the different neighbourhood's groups.

Thus, the heterogeneity indices are measures constructed to control for contextual effects related to a selected set of characteristics from nearby neighbours. The definition of nearby houses includes those that are at a distance of 200 metres or less from each other, to account for what could be a reasonable social and geographical space of daily interactions.[108]

The heterogeneity characteristics are: i) income index (computed using household income from the different surveys) to measure levels of income inequality; ii) the (migrant) origin heterogeneity index (that takes into consideration nationality and province of origin); iii) the education heterogeneity index; iv) the tenure heterogeneity index; v) housing heterogeneity index, and, finally; vi) the length of permanence heterogeneity index. The heterogeneity indices are calculated taking into account all categories within each characteristic and using a version of the Herfindahl index[109] by which:

$$Hetero\_index = 1 - \sum_i a_i^2$$

Where α_i is the share of the category of the variable of interest within the group and *I* identifies the category. Therefore, this index is bounded between 0 and 1, being 0 maximum level of heterogeneity and 1 perfect homogeneity.

[108] Robustness checks for different sizes of clusters were conducted finding no substantial differences in results.
[109] Described in Hirschman (1964).

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