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# Well-being and Social Policy

## INTRODUCTION.

A QUANTITATIVE ANALYSIS OF SOCIAL CAPITAL IN MEXICO.

RELATIONSHIP BETWEEN SOCIAL CAPITAL AND HEALTH INDICATORS IN MEXICO.

SOCIAL CAPITAL IN LABOR MARKET ACCESS AND POVERTY IN MEXICO.

THE EFFECT OF THE PERCEPTION OF VIOLENCE ON SOCIAL CAPITAL IN MEXICO.

ORGANIZATIONS AND SOCIAL CAPITAL.

DO INVESTMENTS IN PUBLIC SPACES GENERATE SOCIAL CAPITAL? EVIDENCE FOR MEXICO.

PUBLIC SPACES IN MEXICO AS A SOCIAL COHESION PROMOTERS: AN SCTRUCTURAL MODELING PERSPECTIVE.

# DO INVESTMENTS IN PUBLIC SPACES GENERATE SOCIAL CAPITAL? EVIDENCE FOR MEXICO<sup>1</sup>

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## Abstract

**T**he formation of social capital is critical for developing countries. This paper investigates the effects of attempts to recover public spaces in marginalized areas of Mexico. The effects are estimated through balancing in the propensity scores. We focus on the results of perception of safety, support and social capital. When efforts are made to recover public spaces, the perception of safety increases during the first year; however, this effect decreases during the second year. Attendance at public spaces increases in the first year, but remains constant in the second. Social capital increases two years after a given space has been rehabilitated. Our research suggests that the formation of social capital requires more time than that needed to change perceptions of safety or assistance.

Keywords: Impact Evaluation; Social Capital; Public Spaces; Propensity Score; Mexico.  
JEL: H30; I30; O54; R10.

## Introduction

**T**he creation and diffusion of social capital has been an attractive issue for economists to study in depth ever since the seminal work of Coleman (1988) was published. Another major reason to study the production of social capital relates to empirical findings that suggest the existence of a close relationship (largely positive) with economic development (see Neira et al., 2009; Brisson and Usher 2005; or Guiso et al., 2004). This relationship is a highly relevant issue for countries suffering from unequal distribution of income and opportunities.

Furthermore, numerous studies show that a high level of social cohesion among individuals results in the need to cooperate in order to optimize the solution of externalities in cases where

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governments or institutions are either inefficient, or lack high levels of income (see Ostrom and Ahn 2003). As such, studying policies aimed at providing optimum conditions for the formation of social capital is important from the scientific, as well as the social, standpoint. However, there are still many questions about how these policies should be implemented, as well as the short and long term returns they generate.

In recent years, developed countries have focused on policies aimed at breaking down barriers that prevent the production of social capital: reducing uncertainty; improving spaces for social interaction; and promoting recreational, cultural and sporting activities. And Mexico is no exception. In the past four years it has made a significant investment in improving social capital of low-income families through its Rescuing Public Spaces Program (or PREP, as per the acronym in Spanish). The PREP is a federal program aimed at improving quality of life and public safety levels through the recovery of deteriorated public spaces suffering from neglect or battling public safety issues. This is done in the hope that these spaces might be preferentially used by populations living in poverty within the nation's cities and metropolitan areas.

The aim of this paper is to analyze whether investments to rescue public spaces have an impact on social capital. To achieve this objective, the effects of the PREP program were analyzed for the years 2010 and 2011 through the use of propensity score matching (PSM). The data we use come from the survey conducted on households near public spaces. This survey provides data on the survey year from household near public spaces that are slated for revitalization projects, as well as spaces that have been revitalized within the past one or two years. The matching is performed based on sociodemographic characteristics of households living near spaces that have already undergone revitalization, as well as those slated for same. To ensure that comparisons are made are truly causal, we controlled using survey and population census variables. In order to determine what effects occurred, we sought out a causal relationship that indicated whether the perception of security was impacted by completed revitalization projects. Secondly, we identified if PREP-type programs resulted in increased attendance and participation rates. We also examined perceptions of the physical conditions of the public spaces in question. Finally, several factors were combined to construct an index of social capital and determine if capital levels had increased after public spaces were recovered.

We found that the PREP program improved perceptions of safety and physical conditions. However, the immediate impacts of the intervention, in terms of perceived safety, were greater than the levels reported two years after project completion. We also found an increase in attendance to public spaces. The index of social capital has a positive effect two years after an intervention occurs, implying that the process of generating good neighborhood cohesion takes time. Additionally, it only starts to occur once the externalities of insecurity are reduced and conditions for peaceful coexistence increase.

The paper is divided into several sections. In Section II, we review the literature that addresses similar programs internationally. In Section III, we analyze the available data and that used in the evaluation, together with the outcome variables to be used in the evaluation phase. In Section IV, we explain the methodology used in the study. In Section V, we discuss the descriptive statistics of the data used. Study results are presented in Section VI, while Section VII comprises the conclusion and policy recommendations. Finally, the Appendix includes the balancing and robustness tests in the estimation of the program results.

## 1. Review of Literature

Public spaces can help increase the social interaction level of populations and, as a consequence, generate social capital. In the study by Mäkinen and Tyrväinen (2008) citizens of Finland stated that parks are seen as places where one can be in physical contact with others. The study by Cohen et al. (2006) argues that the increase of 17 minutes a day in physical activity by an average teenager is the result of having a park one mile closer.

There are several barriers capable of thwarting the formation of social capital through social interaction in public spaces; the security situation in an area and the perception of security agents, to name a few. Mäkinen and Tyrväinen (2008) noted an increase in public park attendance in Finland when people have a positive perception of safety. Welsh and Farrington (2004) noted a reduction in crime rates when closed circuit cameras and street lighting were placed in different dangerous areas of England, especially avenues and public spaces. Cho (1972) argued that programs in the US designed to improve the quality of urban life (access to roads, public transport, parks and recreation) have more impact on crime reduction than increases in the number of law enforcement agents.

Other issues that discourages turnout to public places include the fact they may be located far away, are in poor condition or a simple lack of public spaces. Jim (1989) provided a long-term assessment of Hong Kong (i.e., 1978-1988) by focusing on a national program to provide parks. The study mentions that residents' demand for parks had an exponential behavior with respect to time and, as such, is rarely satisfied. Choumert (2010) found that the number of green areas on offer was below that desired by the average voter in France. In Mexico, there is no evidence on whether or not the provision of public spaces is adequate or whether existing spaces are truly functional.

The improvement of conditions in public spaces is essential if their use is to be encouraged. And there is literature on the subject of investments aimed at improving public infrastructure. Lokshin and Yemtsov (2003) designed various impact assessments for different infrastructure rehabilitation programs in rural areas of Georgia. The number of students was observed to be 13% higher in towns with active programs, as opposed to those without. In addition, student absenteeism decreased by 5.7% vis-à-vis improvement projects; and the time to reach the nearest district was reduced by 35 minutes. The number of agricultural activities increased and the time needed for ambulance assistance to arrive was reduced to 23 minutes. Fewer problems with diseases from contaminated water were also recorded. Pradhan and Rawlings (2002) analyzed the case of Nicaraguan social spending on education, health, drainage and sewerage. They found that investment in education had a positive effect on school attendance.

Long-term achievements are also needed for the design of public policies. Jalan and Ravallion (1998) find that anti-poverty programs in China have important effects in the short term, which tend to disappear over time. However, in the long run, inaction results in even worse conditions.

Besides finding effects on the use of public spaces, as well as the perception of them as safe places, this paper seeks to determine whether investment results in social capital increases. Gibbs (1974) explains that recreation in public spaces is a crucial factor in increasing the social interaction levels of individuals. In the paper by Kaźmierczak (2013) the presence of parks was determined to facilitate the coexistence of different social classes and races. Fan et al. (2011)

asserts that access to green areas in the city of Chicago reduces stress and increases social capital. Stewart et al. (2011) points out that living in a neighborhood with no amenities such as parks, gyms and social clubs increases the likelihood of youth becoming involved in risky behavior. Finally, the work of Spaaij (2012) discusses how the creation of sports programs and the restoration of soccer fields can increase social capital among disadvantaged youth.

The literature on investment in public spaces shows favorable results for the issues safety and use. However, there is little information on whether improving conditions in public spaces actually generates social capital. This paper investigates whether social capital can be strengthened through the existence of well-maintained, secure public spaces. Additionally, it should be noted that this is the first paper on the Mexican context in this area and, as a result, may provide policy recommendations.

## 2. Data

### A. Databases

Data from the *National Survey on Perception of Insecurity, Risk Behavior and Social Participation in Public Spaces*<sup>4</sup> was used. This survey compares the situation of pre-intervention spaces with rescued (or revitalized) spaces during the survey period, establishing some relationships among the results. The survey has been conducted annually since 2009<sup>5</sup>. Public spaces in the sample are selected randomly among the array of areas subject to intervention programs. It is also important to note that the survey occurs during the first half of the fiscal year. As such, the selected public spaces have not yet undergone revitalization actions during the survey period. Therefore, these public spaces can serve as a control group for said period. The survey aims to measure useful indicators for the programs: perception of insecurity in renovated public spaces, neighborhood cohesion, support to public spaces and satisfaction with physical surroundings of public spaces. This survey is conducted in households living no more than 250 meters of public space. This survey is conducted by the Ministry of Social Development and in particular PREP<sup>6</sup>.

Another source of data for this assessment was comprised of the PREP administrative records. Financial information on federal and state contributions was available; and, where applicable, data on individuals who benefited from the program. The information is listed in March 2009 US dollars. Additionally, data on public spaces from the 2010 Population and Housing Census was used. This involved households living no more than 250 meters from a given public space. Data was available<sup>7</sup> for approximately 190 variables at the public space level.

Our analysis was performed at the public space level. Therefore, data on individuals was not used to estimate impacts. To summarize, the outcome variables were obtained from the National Survey on Perception of Insecurity, Risk Behavior and Social Participation in Public

<sup>4</sup> *Encuesta Nacional sobre Percepción de Inseguridad, Conductas de Riesgo y Participación Social en Espacios Públicos.*

<sup>5</sup> In 2008, the first wave occurred, although it did not involve a standardized instrument.

<sup>6</sup> The SEDESOL's *Dirección General de Equipamiento e Infraestructura en Zonas Urbano-Marginadas (DGEIZUM)* and *Dirección General de Evaluación y Monitoreo de los Programas Sociales (DGEMPS).*

<sup>7</sup> The authors wish to thank officials from the *Secretaría de Desarrollo Social* and the PREP program for the providing this data.

Spaces. The control variables were obtained from PREP administrative records and the 2010 Population and Housing Census, which were disaggregated at the public space level. Descriptive statistics of these variables can be found in the appendix to this paper. To clarify, the impact variables were obtained from the survey, while the variables used in the score matching are from the census; both were aggregated at the public space level.

## B. Measurements in the variables

Useful survey variables were selected for estimating the effects of intervention on safety, conditions of a given public space and assistance such as capital. Table 1 shows the questions related to the perception of safety in public spaces. Panel A shows the response to the question “How do you feel in public spaces?” In general, most respondents feel completely or fairly secure. In 2010 and 2011, less than 5% felt completely unsafe in public spaces. The second comparison allows respondents to rate safety in public spaces from 1 to 10; thus providing more information. In 2011, the perception of safety increased on average, as compared to that of 2010.

**Table 1.**  
**Questions used to assess perception of safety**

<b>A. Perception of safety</b>					
<b>2009</b>		<b>2010</b>		<b>2011</b>	
P32.10 How do you feel (in public spaces)?		B4 How do you feel (in public spaces)?		B4 How do you feel (in public spaces)?	
Completely safe	20.11	Totalmente seguro	24.18	Totalmente seguro	20.62
Moderately safe	41.19	Medianamente seguro	49.38	Medianamente seguro	53.49
Moderately unsafe	20.97	Medianamente inseguro	15.03	Medianamente inseguro	18.82
Completely unsafe	10.36	Totalmente inseguro	3.75	Totalmente inseguro	4.73
Unsure/NR	4.58	Unsure/NR	7.66	Unsure/NR	2.33
No similar questions to be found in this survey.		B10 How secure do you feel (in public spaces)?		B10 How secure do you feel (in public spaces)?	
		On a scale of 1 to 10; 1 being very unsafe and 10 being very safe.		On a scale of 1 to 10; 1 being very unsafe and 10 being very safe.	
		Average 6.45		Average 8.53	
<b>B. Secure surroundings</b>					
P23 In general, how would characterize the safety of your surroundings (in public spaces)?		B5 In general, how would characterize the safety of your surroundings (in public spaces)?		B5 In general, how would characterize the safety of your surroundings (in public spaces)?	
Very good	4.89	Very good	7.75	Very good	7.10
Good	45.11	Good	54.14	Good	57.22
Bad	35.86	Bad	25.13	Bad	27.74
Very bad	8.50	Very bad	5.12	Very bad	6.27
Unsure/NR	5.64	Unsure/NR	7.86	Unsure/NR	1.67

Note: Information obtained from the database. Percentages listed alongside answers. The letter and number of the question indicate the corresponding questionnaire item. Unsure/NR indicates does not know or no reply. In 2009, the tabulation includes only public spaces that were revitalized, and does not include public spaces that were not.

DO INVESTMENTS IN PUBLIC SPACES GENERATE SOCIAL CAPITAL?  
EVIDENCE FOR MEXICO

There is only one indicator for the perception of secure surroundings, but it is comparable for all three years. Panel B in the table shows that each year more than 50% percent perceived that safety conditions in public space were at least good. However, each year also has a considerable percentage of the population that believes that the surroundings in public spaces were bad.

The form of measurement is as follows: the question on perception of safety in public spaces was interpreted as positive in cases where the household responded *Completely safe or Moderately safe and Completely safe*. For the question regarding the perception of insecurity we used the responses *Moderately unsafe* and *Completely unsafe*. For questions about secure surroundings, replies were considered successful if the household answered either *Very Good*, or a combination of *Very Good* and *Good*. In general, for the following questions or indicators success is defined as replying with first two response alternatives or the first alternative alone; although, as explained below, there may be variations in this method depending on the tabulated results observed in the databases.

Table 2 addresses the indicators related to increasing the use of public spaces. Panel A shows the percentage of households who visited a public space during a given survey year. In general, most homes had visited a public space during the survey period.

**Table 2.**  
**Questions used to assess use of public spaces**

<b>A. Visits to public spaces</b>					
<b>2009</b>		<b>2010</b>		<b>2011</b>	
P17 Have you or anyone in your household visited (a public space) this year?		B3. Have you or anyone in your household visited (a public space) this year?		B3. Have you or anyone in your household visited (a public space) this year?	
Yes	45.28	Yes	78.20	Yes	76.15
No	52.53	No	15.23	No	23.09
Unsure/NR	2.19	Unsure/NR	6.58	Unsure/NR	0.76
<b>B. Physical surroundings</b>					
P22 In general, how would you characterize the physical surroundings (of public spaces)?		B6. In general, how would you characterize the physical surroundings (of public spaces)?		B6. In general, how would you characterize the physical surroundings (of public spaces)?	
Very good	5.97	Very good	6.83	Very good	8.39
Good	50.50	Good	57.58	Good	60.64
Bad	30.56	Bad	24.11	Bad	23.79
Very bad	7.03	Very bad	3.82	Very bad	5.90
Unsure/NR	5.94	Unsure/NR	7.66	Unsure/NR	1.29
<b>C. Participation in sporting, cultural or recreational activities</b>					
P18 Which member of the household participated (or participates)? Mention all members who attend said event.		B8 Have you or anyone in your household participated in sporting, cultural, civic or recreational activities (held at public spaces) this year?		B8 Have you or anyone in your household participated in sporting, cultural, civic or recreational activities (held at public spaces) this year?	
Each member, as well as the related activity, must be recorded.		Yes	31.11	Yes	32.84
		No	62.53	No	66.33
		Unsure/NR	6.36	Unsure/NR	0.82

Note: Information obtained from the database. Percentages listed alongside answers. The letter and number of the question indicate the corresponding questionnaire item. Unsure/NR indicates does not know or no reply. In 2009, the tabulation includes only public spaces that were revitalized, and does not include public spaces that were not.

Panel B in Table 2 refers to whether households are satisfied with the physical condition of public spaces. Less than 10 percent perceived the physical surroundings of public space as being very good. On the other hand, about 60 percent considered them to be good physical conditions. Panel C shows participation in sports, cultural or recreational activities in public spaces. More than 60 percent of households did not participate in said activities during the last year.

Table 3 shows the questions with which social capital is evaluated. The results show that about 50 percent of households characterized the relationship between neighbors as *Somewhat united*, and about 15 percent considered the relationship to be *Very united*. It is noteworthy that neighborhood cohesion is one of the proxy variables used to measure social capital<sup>8</sup>.

**Table 3. Questions related to perception of neighborhood cohesion**

**A. Unity among neighbors**

	2009		2010		2011
P13 How would you characterize the relationship between neighbors in this community/neighborhood?		B1. How would you characterize the relationship between neighbors in this community/neighborhood?		B1. How would you characterize the relationship between neighbors in this community/neighborhood?	
Very united	14.97	Very united	17.36	Very united	15.23
Somewhat united	51.20	Somewhat united	53.35	Somewhat united	52.17
Indifferent	28.78	Indifferent	23.16	Indifferent	25.01
Some disputes or conflicts	2.81	Some disputes or conflicts	4.77	Some disputes or conflicts	6.22
Intense conflicts and violence	0.56	Intense conflicts and violence	0.66	Intense conflicts and violence	1.10
Unsure/NR	1.61	Unsure/NR	0.69	Unsure/NR	0.27

Note: Information obtained from the database. Percentages listed alongside answers. The letter and number of the question indicate the corresponding questionnaire item. In 2009, the tabulation includes only public spaces that were revitalized, and does not include public spaces that were not.

Additionally, an index of social capital was created using the survey data on public spaces. In order to achieve this purpose, it was proposed to use the questions listed in Table 4 for 2010 and 2011. Since households can answer each of these questions within a range of 1 to 10, where 1 means *Strongly disagree* and 10 *Strongly agree*, the response of each is added up and divided by 80 (the maximum possible value equals 80). This creates an index between 0 and 1 that can be compared across time. In the results section, we sought to determine whether the program has an effect on the ratio between the rehabilitated and non-rehabilitated areas.

<sup>8</sup> Although we would have preferred to have more objective measures of social capital (number of associations formed, activities undertaken, etc.), the survey only included questions related to perception.

**Table 4.**  
**Construction of comparable social capital index for 2010-2011**

- 
- D1 - . People who live in your area (colonia) are willing to help their neighbors**
- D2 - . Neighbors in your area (colonia) generally get along**
- D3 - . Neighbors in your area (colonia) can be trusted**
- D4- . Neighbors in your area (colonia) share the same moral values**
- D5 - . I enjoy in community events with neighbors**
- D6 - . I would request advice or help from my neighbors**
- D7 - . Neighbors organize activities for the benefit of the neighborhood (colonia)**
- D8 - .The relationship between neighbors in the area (colonia) is generally good**

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**Average Index Values: 2010, 0.649; 2011, 0.662.**

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Note: Data obtained from *Encuesta Nacional sobre Percepción de Inseguridad, Conductas de Riesgo y Participación Social en Espacios Públicos*.

### 3. Methodology

The methodology we utilized is that of propensity score matching (PSM) at the public space level. This methodology has been widely used in impact assessments (e.g., Rosenbaum and Rubin, 1983).

Once information is available on perceptions prior to revitalization for each of the public spaces, the objective is to find a suitable control group for rehabilitated areas. This study proposes the use of a control involving a group of public spaces that will undergo renewal at some point in the future. The impact estimation only includes the difference between the rehabilitated-area group and the control group. To achieve balance in observable characteristics, and with an eye to a more robust estimation, we propose to estimate said adjusted difference through the use of PSM.

In particular, we sought to estimate an equation such as the following:

$$Efecto = E[Y | T=1] - E[Y | T=0] \quad (1)$$

The average treatment effect on the treated (ATT) is calculated as an average of the interest variable in 2010 or 2011 for the treatment group and the control group. PSM was developed by Rosenbaum and Rubin (1983). Its main assumptions imply that, once one controls for the propensity score, the following is true: 1) the treatment and control group are similar (i.e., there are no biases due to unobservable variables); 2) matching of characteristics between the control and treatment groups is achievable. A general discussion of this method can be found in Caliendo and Kopeinig (2008), Dehejia and Wahba (1999, 2002), Smith and Todd (2005) and Todd (2008). In order to perform the estimation we assumed the following:

**Assumption 1.** Selection within observables:  $Y_0 \perp T|X$ . This means that once we control for  $X$ , there is no selection bias. Where  $\perp$  refers to independence, the assumption means that the potential outcomes are independent of treatment once we condition for the observed variables. We believe this to be a valid assumption, because we have access to public spaces that have yet to be revitalized; though eventually this will occur. We also have access to a large amount of variables associated with public space which were useful in making a comparison of comparable public spaces.

**Assumption 2.** Common support:  $0 < \Pr(T=1 | X) < 1$ . However, all that is needed to identify the ATT here is  $\Pr(T=1 | X) < 1$ . This assumption ensures that for public spaces that share an  $X$ -value, there exists a positive, imperfect probability of selection for public spaces within both the treatment and control units. It also implies that public spaces must be comparable, given  $\Pr(T = 1 | X)$ .

The propensity score is defined as:

$$P(X) = \Pr(T=1 | X)$$

where  $T$  is the treatment variable,  $X$  is the set of explanatory variables, and  $Pr()$  is a probability function, which may be the logistic model or the normal model. Within the set of  $X$ -variables, observable characteristics from the 2010 Population and Housing Census exist at the public space level, as do variables at the municipal level.

Therefore, the ATT effect of the program can be described as:

$$ATT\ Effect = E_{p(X), T=1} \{E[Y | T=1, p(X)] - E[Y | T=0, p(X)]\} \quad (2)$$

There are several methods in the literature on how to perform the matching: via the nonparametric method; the nearest neighbor method; and the radius method. Different matching methods were performed to demonstrate that there is no bias in the method used, and to avoid the problems identified in the critique authored by Smith and Todd (2005). Furthermore, Equation 2 states that public spaces are compared within the common support; i.e., the public spaces with similar values in the propensity score between the treatment and control groups. It is also possible that no appropriate control group exists for some revitalized public spaces.

The methodology adheres to that employed by Dehejia and Wahba (1999) for selecting appropriate propensity scores. Additionally, it employs other tests that they mention in order to ensure there is a balance in observable characteristics. Tests performed by grouping according to propensity score; thus, the control and treatment in within each group should be very similar. In addition to the test mentioned in Dehejia and Wahba (1999), we added the tests referred to in Caliendo and Kopeinig (2008). These tests include verisimilitude tests after matching, as well as an analysis of the standardized bias of observable characteristics before and after matching<sup>9</sup>.

Now we will explain, in more detail, the methodological aspect of the groups of public spaces we compared using available data. In Table 5 delineates the treatment and control groups.

<sup>9</sup> Let  $SB = 100 \times \frac{(\bar{X}_T - \bar{X}_C)}{\sqrt{0.5(\text{Var}(X_T) + \text{Var}(X_C))}}$  the standardized bias statistic, which is compared before and after matching for each of the variables.

Matching is considered successful if the median of the distribution of the SB is less than 5%. The joint significance test was used for estimating the propensity score ( $\Pr(T=1 | X) = F(\alpha + \beta X)$ ) before and after matching; and, in order to show the F statistic where  $H_0: \beta = 0$ . Additionally, stratification and balance tests, which consist of simple mean difference tests, were employed.

**Table 5.**  
**Rotation sampling in the survey. Proposed treatment and control groups**

Year survey begun	Wave year		
	2009	2010	2011
<b>2009</b>	Base line 2009	Revitalized in 2009 (Treatment)	
<b>2010</b>		Base line 2010 (Control)	Revitalized in 2010 (Treatment)
<b>2011</b>			Base line 2011 (Control)

Note: Table prepared by authors.

That is, public spaces treated in 2009, and then observed in the 2010 survey, were compared with untreated public spaces in the 2010 survey; though these, too, would eventually be treated during 2010. The process is similar for 2011. Information is gathered on all public spaces undergoing revitalization during 2009-2010, in order to ascertain the average annual impact of the program during said time period.

#### 4. Descriptive statistics

The following tables show the dynamics of public spaces throughout the treatment years and the year in which the survey was conducted. Table 6 presents information on all public spaces for which data is reported on in the National Survey on Perception of Insecurity, Risk Behavior, and Social Participation in Public Spaces. Consequently, we can see that there are 112 public spaces slated for renewal in 2009; of these 110 remain in 2010 and 109 in 2011. Conversely, there are 120 public spaces slated for renewal in 2010; of which 116 remained in 2011. Finally, in 2011 there were 130 public spaces scheduled to be renovated.

**Table 6.**  
**Tracking of public spaces**

Survey year	2009	2010	2011
0	112	120	130
1		110	116
2			109

Note: Authors' calculations based on data for renovated public spaces in *Encuesta Nacional sobre Percepción de Inseguridad, Conductas de Riesgo y Participación Social en Espacios Públicos*.

In order to assess the effect of the program on the target variables it is necessary to develop dichotomous measures for said variables. These measures were obtained by selecting the two most

favorable responses in the survey or by selecting the first most favorable response. Tables 7-9 contain information on dichotomous measures for each objective; both over time and for each survey year.

Table 7 describes the citizen responses to questions on perceived safety in public spaces, as well as perceptions of insecurity. For example, in the case of renewed spaces between 2009 and 2010, 81% (23%) felt moderately to totally safe (totally safe) in public spaces. In 2010 these same areas showed an increase in perceived safety of 5 percentage points; i.e., the perception of safety was 86 %. However, by 2011 the perception decreased by seven percentage points to 79 %. The proportion of households who felt completely safe decreased from 23% in 2009 to 20% in 2011.

**Table 7.**  
**Perception of security/insecurity.**  
**How do you feel when in the public space (in question)?**

Survey year	Response used as measure	2009	2010	2011
0	Completely safe and Somewhat safe	81 %	77%	74%
	Completely safe	23%	20%	18%
	Somewhat unsafe and Completely unsafe	24%	26%	30%
1	Completely safe and Somewhat safe		86%	83%
	Completely safe		28%	22%
	Somewhat unsafe and Completely unsafe		15%	17%
2	Completely safe and Somewhat safe			79%
	Completely safe			20%
	Somewhat unsafe and Completely unsafe			23%

Note: First row contains information on public spaces for responses in the *Completely safe and Somewhat safe* category. The second line refers only to Completely Safe responses. The third line includes the two responses Somewhat unsafe and Completely unsafe. For 2009, the question was P32.10 used. For 2010 and 2011, B4 was used.

Table 8 shows turnouts to public space through over time. Attendance increases significantly once a space enters the renovation program. This increase is high. Attendance rose from 46% in 2009 to 86% in 2010 for the same public spaces. It is also interesting to note that the increase persists after two years in the program, although to a lesser degree, as it increased from 86 % in 2010 to 81% in 2011.

**Table 8.**  
**Visiting public spaces.**  
**Have you or anyone in your household visited the public space (in question) this year?**

Survey year	Response used as measure	2009	2010	2011
0	Yes	46%	77%	72%
1	Yes		86%	77%
2	Yes			81%

Note: For 2009, question P17 was used for 2010 and B3 for 2011. It is noteworthy that the survey format was different in 2009, because it explains the increase in turnout to untreated public spaces.

DO INVESTMENTS IN PUBLIC SPACES GENERATE SOCIAL CAPITAL?  
EVIDENCE FOR MEXICO

Table 9 shows the responses related to people's perception of the physical surroundings of public spaces. Although this question is not part of the specific objectives of the evaluation, it is important to measure in order to ascertain whether changes in turnout at a given public space were due to positive perceptions of the related infrastructure. For spaces that underwent renovation between 2009 and 2010, 60% (6%) of residents rated their public spaces in very good or good (only good) conditions, a figure which increased to 80 % (9 %) by 2010 but then dropped to 75 % (8 %) from 2010 to 2011. However, from 2009 to 2011, there was an overall increase; i.e., of 60% to 75%.

**Table 9.**  
**Perception of physical surroundings.**  
**In general, how would you characterize the physical surroundings**  
**of the public space (in question)?**

Survey year	Response used as measure	2009	2010	2011
0	Very good and Good	60 %	57%	56%
	Very good	6%	5%	6%
1	Very good and Good		80%	80%
	Very good		9%	11%
2	Very good and Good			75%
	Very good			8%

Note: First row contains information on public spaces that were characterized as Very Good and Good. The second line refers only to Very Good. For 2009, P22 was the question used; for 2010, B6; for 2011, B5.

Table 10 describes the perceived relationship with neighbors in public spaces. Here you can see that from 2009 to 2010 perception of the quality of the relationships of the residents of public space slightly decreased, from Very united or *Somewhat united* (and, *Very united* in parentheses) as follows: 94% (14%) to 92% (18%). In the period from 2010 to 2011, it decreased another 2%. Finally, from 2010 to 2011, the perception of the relationship with neighbors decreased from 92% (17%) to 89% (15%). These differences are relatively small.

**Table 10.**  
**Relationship with neighbors. How would you characterize the relationship**  
**between neighbors in this area (colonia)?**

Survey year	Response used as measure	2009	2010	2011
0	Very united or Somewhat united	94 %	92%	87%
	Very united	14%	17%	15%
1	Very united or Somewhat united		92%	89%
	Very united		18%	15%
2	Very united or Somewhat united			90%
	Very united			16%

Note: First row contains information on public spaces related to the responses Very United and Somewhat united. The second line only refers only Very united. For 2009, question P13 was used. In the case of 2010 and 2011, B1 was used.

## 5. Results

Tables 11-13 include estimates with respect to the variables of interest. The tables are organized such that the columns include the variables of interest and the rows the respective survey year. Also, within each year we have two measures: either the two most-positive responses to each question (first row), or the single most-positive reply (second row).

### A. Balance

The balance tests described in Appendix II indicated that the strategy of controlling for the propensity score was successful. These tests were performed for different model specifications, and the models were specified with and without variable interactions. The method with the best balance on the observable characteristics is the nonparametric method employing the Epanechnikov kernel and a window of 0.02<sup>10</sup>. In light of the above, results discussed in the following section are those which were selected through by the Epanechnikov kernel and a window of 0.02. Annex II includes figures in which it is possible to see results prior to and after matching.

Although the impact may be sensitive to the matching method, or to the variables included in the propensity score, we performed several robustness tests and concluded that the results are very robust to changes in the matching method as well as the variables included in the propensity score. The statistical annexes include information on the balancing method for propensity scores, as well as methods used to ascertain method robustness.

### B. Effects on Perception of Safety

Table 11 includes the results for impact on the following: perception of security; the perception of insecurity, measured as respondents feel *Somewhat unsafe* or *Very unsafe*; the perception of safety, measured continuously; and perceptions of safety conditions in public spaces. These variables are indicated in Table 11. Overall, we found that perceptions of safety significantly improve during the first year following renovation. People feel safer in the area near and within the treated public space. Perception of insecurity produces similar results to those encountered for perception of security. The perception of insecurity decreases significantly, however, falling from 11 to 17 percentage points in the first year; and 9 percentage points during the second. When perception of safety is measured using the continuous variable, an improvement is observed. Although said impact is not significant for the period 2009-2010, it is significant for the period 2010-2011, as well as for 2009-2011. The perception of safety in public spaces performs similarly. There is an increase of 16.6 percentage points in households reporting the safety issue as being *Very good* or *Good*.

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<sup>10</sup> The estimated propensity score includes 26 linearly-included variables. In the statistical annexes the model is compared in terms of balance, and in terms of robustness of the matching method.

DO INVESTMENTS IN PUBLIC SPACES GENERATE SOCIAL CAPITAL?  
EVIDENCE FOR MEXICO

**Table 11.**  
**Results of the evaluation of impact on perception**  
**of security/insecurity, 2009-2011**

	Perception of security	Perception of insecurity	Perception of security, continuous variable	Perception of conditions of security
2009-2010	0.104*	-0.111*	0.048	0.166*
	(0.033)	(0.035)	(0.041)	(0.036)
	0.081*		0.028	0.042*
	(0.032)		(0.046)	(0.018)
2010-2011	0.116*	-0.168*	0.138*	0.261*
	(0.032)	(0.035)	(0.034)	(0.039)
	0.071*		0.077	0.045*
	(0.029)		(0.040)	(0.016)
2009-2011	0.061	-0.089*	0.097*	0.134*
	(0.034)	(0.038)	(0.039)	(0.048)
	0.045		0.025	0.005
	(0.027)		(0.039)	(0.017)

Notes: Calculations by the authors. All impacts are estimated using the nonparametric method of pairing via Epanechnikov Kernel, and a window of 0.02. Moreover, 25 linear variables are included in the propensity score. The first line refers to the impact on the indicator vis-a-vis the first two responses (Completely Safe and Somewhat safe, in response to perceived safety; Moderately unsafe and Completely unsafe in response to perception of insecurity; Very Good and Good for physical surroundings). The second line refers to the indicator when the optimal response (Completely Safe and Very Good, respectively) is taken into account. Standard errors are in parentheses. Standard errors achieved through resampling (300 replications). The “\*” indicates that the coefficient, at less than 5%, is statistically significant.

When the impact is measured as the two best answers, a significant effect on safety has been identified. However, this impact decreases when we limit the answer to the optimal response (*Very good*); and yet the effect remains statistically significant. Therefore, it follows that the program does, in fact, have an important effect on the perceived safety of the beneficiaries of the program, regardless of how it is measured. Importantly, the increase in the perception of security for in 2009-2010 is virtually identical to the decrease in perception of insecurity, which can be attributed to the impact of the program. Similarly, the impact on the perception of insecurity in 2009-2011 was greater than perceived safety.

### C. Effects on attendance to public spaces

Table 12 shows results with respect to the use of public spaces. The first column shows the attendance to public places during the last year, while the second refers to the perception of the physical conditions of the public space. The last column refers to participation in sporting

and cultural activities. The results imply that attendance at public spaces increased as a result of intervention and that beneficiaries generally have a very positive perception of the physical conditions of the public space in question. Attendance and perception of the physical conditions did not substantially decrease over time; as was the case with the perceived safety variable. However, a decrease was noted in sports and cultural activities participation for the period of 2 years in relation to the immediate period.

**Table 12.**  
**Results of the evaluation of impact on attendance to public spaces, 2009-2011**

	<b>Attendance</b>	<b>Perception of physical surroundings</b>	<b>Participation in sporting or cultural activities</b>
2009-2010	0.110* (0.042)	0.221* (0.039) 0.056* (0.012)	0.161* (0.026)
2010-2011	0.036 (0.037)	0.295* (0.037) 0.061* (0.017)	0.047 (0.033)
2009-2011	0.099* (0.037)	0.201* (0.049) 0.038* (0.018)	0.077 (0.041)

Notes: Calculations by the authors. All impacts are estimated using the nonparametric method of pairing via Epanechnikov Kernel, and a window of 0.02. Moreover, 26 linear variables are included in the propensity score. For the physical surroundings variable, the first row refers to the impact on the indicator when the two optimal responses are considered (*Very good, Good*). The second row refers to the indicator when a single optimal response is taken into account (*Very good*). The remaining variables consider Yes to be the only response. Standard errors are in parentheses. Standard errors achieved through resampling (300 replications). The “\*\*” indicates that the coefficient, at less than 5%, is statistically significant.

## D. Effects on social capital

### Effects on capital

Table 13 shows the results of impact with respect to social capital. The first column shows the relationship between neighbors measured as the ratio of neighbors in the area (*colonia*) who responded *Very united or Somewhat united*. The second column refers to the impact on the social capital index (per Table 4). In general, no improvement in relationships between neighbors were

noted in any year or by any measure (i.e., by using the two optimal answers or the single-most optimal response). However, when the rate of social capital is measured, results are positive but not significant in the case of immediate impact; although significant impacts are observed over a period of 2 years. This would mean that the program itself *does* have an impact on social capital, although not immediate. This is consistent with Table 12, which shows how attendance at public spaces does not diminish over time. Therefore, public spaces may be encouraging the creation of social capital through continued attendance to such spaces; however, repeated interaction is required to achieve this.

**Table 13.**  
**Results of the evaluation of impact on social capital, 2009-2011**

	Relationship between neighbors	Social capital index
2009-2010	0.013	0.017
	(0.019)	(0.016)
	0.017	
	(0.027)	
2010-2011	0.037	0.018
	(0.029)	(0.013)
	-0.003	
	(0.019)	
2009-2011	0.029	0.029*
	(0.027)	(0.013)
	0.029	
	(0.019)	

Notes: Calculations by the authors. All impacts are estimated using the nonparametric method of pairing via Epanechnikov Kernel, and a window of 0.02. Moreover, 26 linear variables are included in the propensity score. The first row includes *Very united and Somewhat united*, whereas the second only involves *Very united*.

Standard errors are in parentheses. Standard errors achieved through resampling (300 replications).

The "\*" indicates that the coefficient, at less than 5%, is statistically significant.

## 6. Conclusions

This paper seeks to answer if it is possible to impact social capital by investing in public spaces. The PREP program in Mexico was designed to recover dilapidated public spaces in highly-marginalized areas. In particular, we analyzed whether these investments provided the conditions necessary for an increase in social capital through an impact on perceptions of security, as well as the way in which populations in these areas view the infrastructure of public spaces. Later, we reviewed the impact of infrastructure renewal efforts in public spaces; i.e., in terms of neighborhood cohesion and social capital.

We employed propensity scores matching (PSM) at the public space level. Information from the survey carried out by PREP was used. This survey's design made it possible to obtain a heretofore untapped comparison group for the same year. Variables from the 2010 Population and Housing Census (*Censo de Población y Vivienda*) were disaggregated at the public space level in order to determine the propensity score. Although the estimated impact may be sensitive to the selected method, we found that the results are robust with respect both to the method used and the type of variables included in the propensity score.

In terms of security, we found that investment enhances individuals' perceptions of safety. This is robust to measurement of perceived safety: discrete or continuous, or when focusing on the perceptions of insecurity. However, the immediate impacts of intervention programs in public spaces are greater than the levels of impact two years on. It is important to continue evaluation efforts, so that these impact levels can continue to be assessed. However, should the negative trend in perceptions of safety continue, they may cause program beneficiaries to stop attending public spaces, and thus undermine the impact such interventions have on social capital. Social capital is important because it can have positive externalities in the reduction of crime and may also impact life-satisfaction levels among individuals. For example, the study by Buonnano et al. (2009) shows that social capital reduces crime. Moreover, increases in levels of social interaction leads to increased confidence; this, in turn, is linked to higher levels of life satisfaction and lower levels of stress. It is vital, therefore, for future research to examine the reasons why perceptions of safety levels have declined.

In terms of attendance to public spaces, it is clear that PREP caused a substantial increase. This turnout was maintained over time, but apparently the beneficiaries attended for entertainment reasons, and not sports or cultural activities.

Finally, evidence in terms of social capital is mixed, but positive. When neighborhood cohesion is reported as *Very united* or *Somewhat united*, no effect was observed. However, according to the index created for this study, the effects on social capital were largely positive. The impact is especially significant at the two-year mark; i.e., it is not immediate. This is understandable given that trust takes time to build; and trust can be built. It occurs when neighbors begin to repeatedly interact at public venues. This is clearly the most significant finding of this paper. Social capital is not durable. On the contrary, building it is difficult and time-consuming. And while not easily acquired in a short period of time, it can be destroyed rather quickly. It is therefore of utmost importance that the conditions for the formation of social capital are fulfilled: investments must be made in secure public spaces so that the public might turn out and the concomitant social capital generated.

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## Appendix I: Descriptive Statistics

The appendix presents mean comparisons of public spaces within the same year. These tests show how similar spaces, which were intervened, are in terms of observable characteristics. This comparison is important because it helps determine which variables should be included in the models in order to correct differences.

**Table I.1.**  
**Mean differences for public spaces in 2010**

Variable	Year 0	Year 1	Difference
Total population	2,462.87 (133.71)	2,444.11 (142.98)	18.76 (195.76)
Percentage of male population	48.27 (0.14)	48.75 (0.36)	-0.48 (0.38)
Percentage of female population	51.37 (0.14)	50.77 (0.37)	0.60 (0.40)
Percentage of population born in immediate area	77.00 (1.55)	76.05 (1.49)	0.96 (2.16)
Percentage of population that speaks indigenous language	1.44 (0.31)	1.18 (0.24)	0.26 (0.40)
Percentage of population between 6-11 years that do not attend school	0.52 (0.09)	0.54 (0.10)	-0.01 (0.14)
Percentage of population economically-active and above the age of 12	55.06 (0.40)	54.87 (0.62)	0.19 (0.74)
Percentage of occupied population over the age of 12	52.55 (0.40)	52.47 (0.61)	0.08 (0.73)
Percentage of population illiterate and over age 15	3.37 (0.33)	2.48 (0.22)	0.89 (0.40)
Percentage of population unaffiliated to a healthcare program of any kind	30.81 (1.10)	30.10 (1.17)	0.71 (1.60)
Percentage of population married, over age 12	54.71 (.46)	54.33 (.58)	3.82 (.74)
Percentage of population that is Catholic	82.80 (0.86)	82.80 (0.96)	0.00 (1.29)
Percentage of households with female head of household	24.16 (0.62)	22.92 (0.70)	1.23 (0.94)
Percentage of households with dirt floors	1.84 (0.27)	0.94 (0.15)	0.90 (0.31)
Percentage of households with no household assets (furniture, etc.)	0.10 (0.04)	0.10 (0.03)	0.00 (0.05)
Percentage of households with automobile	38.70 (1.22)	40.84 (1.41)	-2.14 (1.86)
Percentage of households with electric lighting	80.77 (0.81)	81.21 (0.75)	-0.44 (1.11)
Percentage of households with running water	73.69 (1.78)	77.70 (1.23)	-4.01 (2.16)
Percentage of households with drainage system	79.68 (0.84)	80.11 (0.79)	-0.43 (1.15)
Total municipal population	291,826 (32202.17)	254,983.6 (27926.1)	36,842.45 (42624.49)
Index of municipal social lag (rezago social)	-1.09 (0.14)	-1.13 (0.36)	.035 (0.38)

Note: Averages obtained from 2010 Population and Housing Census data. The average appears in the first row, standard error in the second. Year 0 had 111 public spaces and Year 1 had 126 spaces.

**Tabla I.2.**  
**Mean differences for public spaces in 2011**

Variable	Year 0	Year 1	Difference
Total population	2,272.36 (110.21)	2,436.16 (140.32)	-163.81 (178.43)
Percentage of male population	48.41 (0.16)	48.28 (0.15)	0.13 (0.22)
Percentage of female population	50.97 (0.16)	51.36 (0.15)	-0.39 (0.22)
Percentage of population born in immediate area	77.09 (1.53)	76.59 (1.59)	0.51 (2.21)
Percentage of population that speaks indigenous language	1.37 (0.35)	1.23 (0.27)	0.14 (0.45)
Percentage of population between 6-11 years that do not attend school	0.64 (0.11)	0.50 (0.09)	0.14 (0.14)
Percentage of population economically-active and above the age of 12	54.86 (0.41)	55.29 (0.40)	-0.43 (0.58)
Percentage of occupied population over the age of 12	52.22 (0.41)	52.77 (0.41)	-0.55 (0.58)
Percentage of population illiterate and over age 15	3.03 (0.27)	3.16 (0.29)	-0.13 (0.39)
Percentage of population unaffiliated to a healthcare program of any kind	31.27 (1.03)	30.53 (1.00)	0.75 (1.44)
Percentage of population married, over age 12	53.10 (.43)	54.63 (.45)	-4.66 (.62)
Percentage of population that is Catholic	81.63 (1.02)	83.02 (0.87)	-1.39 (1.34)
Percentage of households with female head of household	23.71 (0.59)	24.25 (0.64)	-0.54 (0.86)
Percentage of households with dirt floors	1.80 (0.26)	1.59 (0.26)	0.21 (0.37)
Percentage of households with no household assets (furniture, etc.)	0.11 (0.03)	0.06 (0.02)	0.04 (0.04)
Percentage of households with automobile	38.01 (1.33)	39.49 (1.23)	-1.48 (1.81)
Percentage of households with electric lighting	80.15 (0.96)	80.99 (0.85)	-0.84 (1.28)
Percentage of households with running water	76.94 (1.12)	74.78 (1.67)	2.16 (2.01)
Percentage of households with drainage system	78.70 (0.99)	80.03 (0.86)	-1.33 (1.31)
Total municipal population	267,524.7 (25673.3)	2283,393 (32689.48)	-15,868.32 (41565.85)
Index of municipal social lag (rezago social)	-1.12 (0.34)	-1.1 (0.38)	-.02 (0.05)

Note: Averages obtained from 2010 Population and Housing Census data. The average appears in the first row, standard error in the second. Year 0 had 134 public spaces and Year 1 had 116 spaces.

DO INVESTMENTS IN PUBLIC SPACES GENERATE SOCIAL CAPITAL?  
EVIDENCE FOR MEXICO

**Tabla 1.3.**  
**Mean differences for public spaces in 2011**

Variable	Year 0	Year 1	Difference
Total population	2,272.36 (110.21)	2,410.16 (140.16)	-137.81 (178.30)
Percentage of male population	48.41 (0.16)	48.76 (0.36)	-0.35 (0.39)
Percentage of female population	50.97 (0.16)	50.76 (0.37)	0.21 (0.40)
Percentage of population born in immediate area	77.09 (1.53)	76.40 (1.47)	0.69 (2.12)
Percentage of population that speaks indigenous language	1.37 (0.35)	1.19 (0.25)	0.18 (0.43)
Percentage of population between 6-11 years that do not attend school	0.64 (0.11)	0.54 (0.10)	0.10 (0.15)
Percentage of economically-active population above the age of 12	54.86 (0.41)	54.86 (0.63)	0.00 (0.75)
Percentage of employed population over the age of 12	52.22 (0.41)	52.48 (0.61)	-0.26 (0.74)
Percentage of illiterate population over the age of 15	3.03 (0.27)	2.50 (0.22)	0.54 (0.35)
Percentage of population unaffiliated to a healthcare program of any kind	31.27 (1.03)	30.11 (1.18)	1.17 (1.56)
Percentage of married population, over age 12	54.58 (0.43)	54.34 (0.58)	0.232 (0.72)
Percentage of Catholic population	81.63 (1.02)	82.83 (0.96)	-1.21 (1.41)
Percentage of households with female head of household	23.71 (0.59)	22.90 (0.71)	0.81 (0.92)
Percentage of households with dirt floors	1.80 (0.26)	0.93 (0.15)	0.87 (0.30)
Percentage of households with no household assets (furniture, etc.)	0.11 (0.03)	0.10 (0.03)	0.01 (0.04)
Percentage of households with automobile	38.01 (1.33)	40.78 (1.42)	-2.77 (1.95)
Percentage of households with electric lighting	80.15 (0.96)	81.26 (0.76)	-1.11 (1.22)
Percentage of households with running water	76.94 (1.12)	77.72 (1.24)	-0.78 (1.67)
Percentage of households with drainage system	78.70 (0.99)	80.16 (0.80)	-1.46 (1.27)
Total municipal population	267524.7 (25673.3)	241747.1 (25736.93)	-15868.32 (36352.55)
Index of municipal social lag (rezago social)	-1.13 (0.035)	-1.2 (0.04)	-0.1 (0.05)

Note: Averages obtained from 2010 Population and Housing Census data. The average appears in the first row, standard error in the second. Year 0 had 134 public spaces and Year 1 had 110 spaces.

**Table I.4.**  
**Mean differences in total expenditures during 2009-2010**

<b>Intervention year</b>	<b>2009</b>	<b>2010</b>	<b>Difference</b>
0	2,410,146 (105235.1)	2,068,540 (85039.84)	34,1605.2 (134464.1)
1	860,661.4 (115256.1)	692,868.3 (59046.06)	167,793.1 (129500.6)

Note: Amounts in Mexican pesos as of March 2009. Amounts in first row, standard errors in second.

**Table I.5**  
**Mean differences in total expenditures during 2010-2011**

<b>Intervention year</b>	<b>2010</b>	<b>2011</b>	<b>Difference</b>
0	2,488,296 (140990.3)	2,410,146 (105235.1)	78,150.48 (175933.7)

Note: Amounts in Mexican pesos as of March 2009. Amounts in first row, standard errors in second.

## Appendix II: Balancing tests

Annex II presents the results of balancing the comparison groups via propensity score matching (PSM). It is noteworthy that a good balance was determined for all the matching models, giving robustness to the results. In particular Appendix II incorporates figures where the previous results can be seen before and after matching for the method deemed the primary method.

**Table II.1.**  
**Evaluation 2009-2010**

<b>Model A: No interactions</b>										
	<b>DW test</b>		<b>Median bias</b>		<b>L-R test</b>		<b>Mean diff</b>		<b>Treated</b>	<b>Control</b>
	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>		
NN1,R 0.02	0.018	0.00	6.673	7.571	0.371	0.121	0.091	0.00	103	51
NN3,R 0.02	0.018	0.00	6.673	5.619	0.371	0.947	0.091	0.00	103	93
NN3,R 0.01	0.018	0.02	6.673	5.237	0.371	0.691	0.091	0.02	98	90
R 0.02	0.018	0.00	6.673	3.880	0.371	0.990	0.091	0.00	103	106
R 0.01	0.018	0.02	6.673	5.004	0.371	0.808	0.090	0.02	98	99
NP, v 0.02	0.018	0.00	6.673	4.150	0.371	0.981	0.091	0.00	103	106
NP, v 0.01	0.018	0.02	6.673	6.048	0.371	0.748	0.091	0.02	98	99
NP, v 0.0075	0.018	0.02	6.673	9.051	0.371	0.556	0.091	0.02	96	96
<b>Model B: With interactions</b>										
NN1,R 0.02	0.050	0.02	6.673	9.295	0.371	0.261	0.091	0.02	99	46
NN3,R 0.02	0.050	0.00	6.673	9.009	0.371	0.995	0.091	0.00	99	83
NN3,R 0.01	0.050	0.00	6.673	6.079	0.371	0.995	0.091	0.00	90	80
R 0.02	0.050	0.00	6.673	5.297	0.371	1.000	0.091	0.00	99	99
R 0.01	0.050	0.02	6.673	5.004	0.371	0.808	0.091	0.02	98	99
NP, v 0.02	0.050	0.00	6.673	5.864	0.371	1.000	0.091	0.00	99	99
NP, v 0.01	0.050	0.00	6.673	4.795	0.371	0.999	0.091	0.00	90	91
NP, v 0.0075	0.050	0.00	6.673	5.505	0.371	0.999	0.091	0.00	82	86

Note: NN1 R 0.02 indicates a single neighbor who is restricted to a radius of 0.02; NN3 R 0.02 requires three neighbors within 0.02; NN3, R 0.01 involves three restricted to a radius of 0.01. NP refers to a non-parametric method using Epanechnikov Kernel and window of 0.02, 0.01 and 0.0075. The first two columns refer to the mean-test stratified groups used in Dehejia and Wahba (1999). Median bias uses standardized bias test; L-R test refers to likelihood ratio test, both of which are described in Caliendo and Kopeinig (2008). Mean difference employed a simple t test. Model A includes the following variables: Total population,% of male and female population,% population originally from the entity,% indigenous population,% population 12 years old, population between 15 and 17, % of the population 18 -24, % of population 60 and older, % of illiterate population at 15 years of age, average schooling, % of married population,% Catholic,% of homes with female head of household, % of economically active population,% of employed population,% of households with floor dirt, % of households with no assets,% of households with auto,% of households with electricity,% of homes with water,% of households with drainage and project type. Model B includes Model A variables and 18 additional interactions with employment, housing, social lag index and stratum-type variables.

**Table II.2.**  
**Evaluation 2010-2011**

<b>Model A: No interactions</b>										
	<b>DW test</b>		<b>Median bias</b>		<b>L-R test</b>		<b>Mean diff</b>		<b>Treated</b>	<b>Control</b>
	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>		
NN1,R 0.02	0.023	0.02	9.982	9.197	0.135	0.007	0.000	0.02	104	57
NN3,R 0.02	0.023	0.00	9.982	7.526	0.135	0.519	0.000	0.00	104	90
NN3,R 0.01	0.023	0.00	9.982	5.684	0.135	0.256	0.000	0.00	96	87
R 0.02	0.023	0.00	9.982	7.579	0.135	0.927	0.000	0.00	104	110
R 0.01	0.023	0.00	9.982	5.922	0.135	0.510	0.000	0.00	96	94
NP, v 0.02	0.023	0.00	9.982	7.365	0.135	0.834	0.000	0.00	104	110
Np, v 0.01	0.023	0.00	9.982	5.767	0.135	0.349	0.000	0.00	96	94
Np, v 0.075	0.023	0.02	9.982	4.199	0.135	0.390	0.000	0.02	91	93
<b>Model B: With Interactions</b>										
NN1,R 0.02	0.014	0.05	9.982	5.601	0.135	0.479	0.000	0.05	102	56
NN3,R 0.02	0.014	0.00	9.982	2.609	0.135	1.000	0.000	0.00	102	93
NN3,R 0.01	0.014	0.00	9.982	4.360	0.135	1.000	0.000	0.00	92	88
R 0.02	0.014	0.00	9.982	6.218	0.135	1.000	0.000	0.00	102	106
R 0.01	0.014	0.00	9.982	5.151	0.135	1.000	0.000	0.00	92	97
NP, v 0.02	0.014	0.00	9.982	4.176	0.135	1.000	0.000	0.00	102	106
NP, v 0.01	0.014	0.00	9.982	6.071	0.135	1.000	0.000	0.00	92	97
NP, v 0.075	0.014	0.00	9.982	4.403	0.135	1.000	0.000	0.00	84	94

Note: NN1 R 0.02 indicates a single neighbor who is restricted to a radius of 0.02; NN3 R 0.02 requires three neighbors within 0.02; NN3, R 0.01 involves three restricted to a radius of 0.01. NP refers to a non-parametric method using Epanechnikov Kernel and window of 0.02, 0.01 and 0.0075. The first two columns refer to the mean-test stratified groups used in Dehejia and Wahba (1999). Median bias uses standardized bias test; L-R test refers to likelihood ratio test, both of which are described in Caliendo and Kopeinig (2008). Mean difference employed a simple t test. Model A includes the following variables: Total population,% of male and female population,% population originally from the entity,% indigenous population,% population 12 years old, population between 15 and 17, % of the population 18 -24, % of population 60 and older, % of illiterate population at 15 years of age, average schooling, % of married population,% Catholic,% of homes with female head of household, % of economically active population,% of employed population,% of households with floor dirt, % of households with no assets,% of households with auto,% of households with electricity,% of homes with water,% of households with drainage and project type. Model B includes Model A variables and 18 additional interactions with employment, housing, social lag index and stratum-type variables.

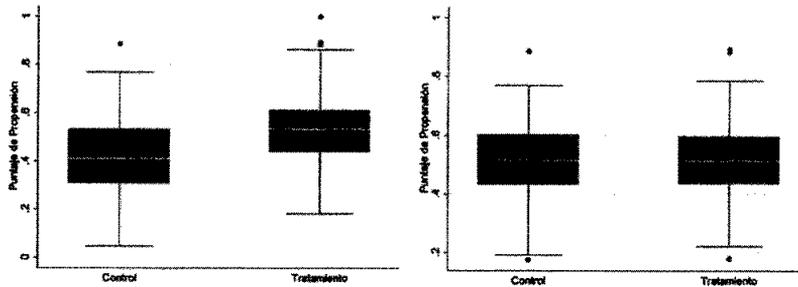
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EVIDENCE FOR MEXICO

Tabla II.3.  
Evaluation 2009-2011

<b>Model A: No interactions</b>										
	<b>DW test</b>		<b>Median bias</b>		<b>L-R test</b>		<b>Mean diff</b>		<b>Treated</b>	<b>Control</b>
	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>		
NN1,R 0.02	0.014	0.00	11.471	6.229	0.006	0.149	0.227	0.00	103	56
NN3,R 0.02	0.014	0.02	11.471	5.283	0.006	0.883	0.227	0.02	103	94
NN3,R 0.01	0.014	0.02	11.471	7.692	0.006	0.842	0.227	0.02	102	92
R 0.02	0.014	0.02	11.471	5.308	0.006	0.887	0.227	0.02	103	114
R 0.01	0.014	0.02	11.471	7.239	0.006	0.906	0.227	0.02	102	103
NP, v 0.02	0.014	0.02	11.471	5.500	0.006	0.907	0.227	0.02	103	114
NP, v 0.01	0.014	0.02	11.471	5.709	0.006	0.864	0.227	0.02	102	103
NP, v 0.075	0.014	0.02	11.471	4.874	0.006	0.885	0.227	0.02	95	101
<b>Model B: With interactions</b>										
NN1,R 0.02	0.050	0.00	11.471	9.393	0.006	0.355	0.227	0.00	96	46
NN3,R 0.02	0.050	0.00	11.471	6.724	0.006	1.000	0.227	0.00	83	79
NN3,R 0.01	0.050	0.00	11.471	5.448	0.006	1.000	0.227	0.00	83	89
R 0.02	0.050	0.00	11.471	2.234	0.006	1.000	0.227	0.00	96	104
R 0.01	0.050	0.00	11.471	4.529	0.006	1.000	0.227	0.00	96	104
NP, v 0.02	0.050	0.00	11.471	5.239	0.006	1.000	0.227	0.00	83	89
NP, v 0.01	0.050	0.00	11.471	3.751	0.006	1.000	0.227	0.00	73	79
NP, v 0.075	0.050	0.00	11.471	9.393	0.006	0.355	0.227	0.00	96	46

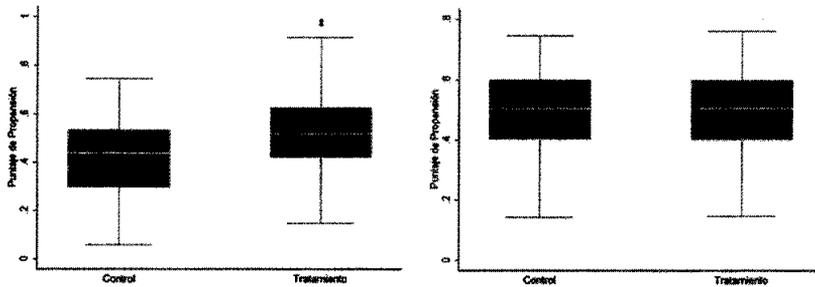
Note: NN1 R 0.02 indicates a single neighbor who is restricted to a radius of 0.02; NN3 R 0.02 requires three neighbors within 0.02; NN3, R 0.01 involves three restricted to a radius of 0.01. NP refers to a non-parametric method using Epanechnikov Kernel and window of 0.02, 0.01 and 0.0075. The first two columns refer to the mean-test stratified groups used in Dehejia and Wahba (1999). Median bias uses standardized bias test; L-R test refers to likelihood ratio test, both of which are described in Caliendo and Kopeinig (2008). Mean difference employed a simple t test. Model A includes the following variables: Total population, % of male and female population, % population originally from the entity, % indigenous population, % population 12 years old, population between 15 and 17, % of the population 18 -24, % of population 60 and older, % of illiterate population at 15 years of age, average schooling, % of married population, % Catholic, % of homes with female head of household, % of economically active population, % of employed population, % of households with floor dirt, % of households with no assets, % of households with auto, % of households with electricity, % of homes with water, % of households with drainage and project type. Model B includes Model A variables and 18 additional interactions with employment, housing, social lag index and stratum-type variables.

**Figure II.1.**  
**Propensity points before and after PSM for the evaluation, 2009-2010**



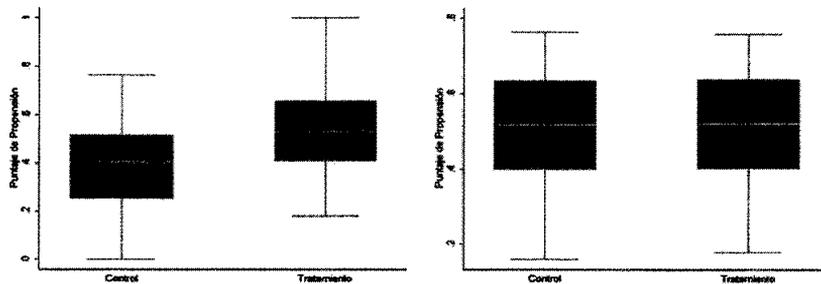
Note: Authors' calculations. All impacts estimated using the nonparametric matching, Epanechnikov Kernel and a window of 0.02. 25 linearly-included variables included in the propensity score. Before PSM on the left side, after PSM on the right.

**Figure II.2:**  
**Propensity points before and after PSM for the evaluation, 2010-2011**



Note: Authors' calculations. All impacts estimated using the nonparametric matching, Epanechnikov Kernel and a window of 0.02. 25 linearly-included variables included in the propensity score. Before PSM on the left side, after PSM on the right.

**Figure II.3:**  
**Propensity points before and after PSM for the evaluation, 2010-2012**



Note: Authors' calculations. All impacts estimated using the nonparametric matching, Epanechnikov Kernel and a window of 0.02. 25 linearly-included variables included in the propensity score. Before PSM on the left side, after PSM on the right.

### Appendix III. Robustness tests for matching methods

Appendix III shows the results of the evaluation via the various matching methods. The results are consistent, even when the matching method is changed. This ensures confidence in the assessment.

**Table III.1.**  
**Evaluation with regards to perception of safety, model with no interactions**

	Perception of safety		Perception of insecurity		Perception of safety, continuous variable		Perception of safe surroundings	
<b>2009-2010</b>								
NP, v 0.02	0.105*	(0.033)	-0.111*	(0.035)	0.048	(0.041)	0.166*	(0.036)
	0.081*	(0.032)			0.028	(0.047)	0.042*	(0.018)
NN3, R 0.02	0.118*	(0.041)	-0.125*	(0.042)	0.061	(0.045)	0.182*	(0.041)
	0.082*	(0.035)			0.032	(0.049)	0.043*	(0.019)
NP, v 0.01	0.121*	(0.038)	-0.124*	(0.041)	0.036	(0.041)	0.173*	(0.036)
	0.089*	(0.034)			0.018	(0.050)	0.041*	(0.019)
R 0.02	0.099*	(0.032)	-0.105*	(0.034)	0.046	(0.039)	0.161*	(0.035)
	0.082*	(0.031)			0.032	(0.045)	0.044*	(0.017)
<b>2010-2011</b>								
NP, v 0.02	0.116*	(0.032)	-0.169*	(0.035)	0.138*	(0.034)	0.261*	(0.039)
	0.071*	(0.029)			0.077	(0.040)	0.045*	(0.016)
NN3, R 0.02	0.132*	(0.037)	-0.192*	(0.040)	0.145*	(0.039)	0.292*	(0.044)
	0.078*	(0.033)			0.082	(0.044)	0.050*	(0.017)
NP, v 0.01	0.126*	(0.037)	-0.183*	(0.041)	0.131	(0.039)	0.261*	(0.045)
	0.068*	(0.033)			0.058*	(0.043)	0.048*	(0.017)
R 0.02	0.113*	(0.031)	-0.161*	(0.034)	0.135*	(0.034)	0.256*	(0.039)
	0.067*	(0.029)			0.076	(0.040)	0.044*	(0.016)
<b>2009-2011</b>								
NP, v 0.02	0.061	(0.034)	-0.089*	(0.038)	0.097*	(0.039)	0.135*	(0.049)
	0.045	(0.027)			0.025	(0.040)	0.005	(0.018)
NN3, R 0.02	0.061	(0.036)	-0.088*	(0.042)	0.084	(0.041)	0.127*	(0.053)
	0.044	(0.031)			0.016	(0.043)	0.005	(0.021)
NP, v 0.01	0.053	(0.036)	-0.082	(0.045)	0.083	(0.041)	0.128*	(0.049)
	0.041	(0.030)			0.010*	(0.042)	0.005	(0.018)
R 0.02	0.061	(0.034)	-0.087*	(0.036)	0.098	(0.038)	0.134*	(0.048)
	0.045	(0.026)			0.025	(0.039)	0.004	(0.017)

Note: The first row lists the impact on the indicator when considering the first two responses (Very safe and Somewhat safe for perceived safety; Completely unsafe and Somewhat unsafe in regards to perception of insecurity; Very Good and Good for safe physical surroundings). The second row refers to the optimal answer (Completely unsafe and Very Good, respectively). Model A includes the following variables: Total population,% of male and female population,% population originally from the entity,% indigenous population,% population 12 years old, population between 15 and 17, % of the population 18 -24, % of population 60 and older, % of illiterate population at 15 years of age, average schooling, % of married population,% Catholic,% of homes with female head of household, % of economically active population,% of employed population,% of households with floor dirt, % of households with no assets,% of households with auto,% of households with electricity,% of homes with water,% of households with drainage and project type. Standard errors calculated via 300 resampling repetitions.

The “\*” indicates coefficient is statistically significant at less than 5%.

**Table III.2.**  
**Evaluation with regards to safety, model with interactions**

	Perception of safety		Perception of insecurity		Perception of safety, continuous variable		Perception of safe surroundings	
<b>2009-2010</b>								
NP, v 0.02	0.067*	(0.038)	-0.074*	(0.036)	0.040	(0.041)	0.148*	(0.039)
	0.064*	(0.029)			0.012	(0.046)	0.046*	(0.016)
NN3, R 0.02	0.053	(0.033)	-0.061	(0.039)	0.036	(0.043)	0.138*	(0.044)
	0.057	(0.031)			0.011	(0.046)	0.044*	(0.017)
NP, v 0.01	0.076*	(0.033)	-0.084*	(0.038)	0.050	(0.043)	0.145*	(0.046)
	0.052	(0.029)			0.024	(0.046)	0.041*	(0.015)
R 0.02	0.069*	(0.031)	-0.078*	(0.037)	0.049	(0.041)	0.155*	(0.040)
	0.067*	(0.029)			0.018	(0.043)	0.045*	(0.016)
<b>2010-2011</b>								
NP, v 0.02	0.093*	(0.030)	-0.131*	(0.033)	0.105*	(0.033)	0.210*	(0.037)
	0.044	(0.027)			0.065	(0.042)	0.039*	(0.015)
NN3, R 0.02	0.103*	(0.033)	-0.143*	(0.036)	0.120*	(0.036)	0.223*	(0.041)
	0.056*	(0.028)			0.086	(0.044)	0.043*	(0.015)
NP, v 0.01	0.113*	(0.036)	-0.156*	(0.036)	0.119*	(0.038)	0.237*	(0.045)
	0.075*	(0.029)			0.090	(0.046)	0.044*	(0.017)
R 0.02	0.122*	(0.029)	-0.126*	(0.033)	0.121*	(0.033)	0.246*	(0.037)
	0.038	(0.027)			0.054	(0.041)	0.036*	(0.015)
<b>2009-2011</b>								
NP, v 0.02	0.085*	(0.036)	-0.113*	(0.040)	0.160*	(0.040)	0.110*	(0.047)
	0.065*	(0.027)			0.006	(0.050)	0.055*	(0.018)
NN3, R 0.02	0.080*	(0.038)	-0.115*	(0.041)	0.159*	(0.041)	0.112*	(0.048)
	0.063*	(0.029)			0.004	(0.051)	0.044*	(0.018)
NP, v 0.01	0.077	(0.040)	-0.106*	(0.043)	0.166*	(0.044)	0.081	(0.050)
	0.044	(0.034)			0.002	(0.050)	0.046*	(0.018)
R 0.02	0.082*	(0.035)	-0.108*	(0.039)	0.145*	(0.038)	0.100*	(0.045)
	0.068*	(0.025)			0.003	(0.047)	0.043*	(0.017)

Note: The first row lists the impact on the indicator when considering the first two responses (Very safe and Somewhat safe for perceived safety; Completely unsafe and Somewhat unsafe in regards to perception of insecurity; Very Good and Good for safe physical surroundings). The second row refers to the optimal answer (Completely unsafe and Very Good, respectively). Model A variables are included, plus 18 additional interaction with variables for occupation, housing, the social lag index and stratum type. Standard errors calculated via 300 resampling repetitions. The “\*\*” indicates coefficient is statistically significant at less than 5%.

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EVIDENCE FOR MEXICO

**Table III.3.**  
**Evaluation with relation to use of space, model without interactions**

	Attendance		Perception of physical surroundings		Participation in sports or cultural activities	
<b>2009-2010</b>						
NP, v 0.02	0.110*	(0.042)	0.221*	(0.039)	0.161*	(0.027)
			0.056*	(0.012)		
NN3, R 0.02	0.124*	(0.046)	0.239*	(0.045)	0.163*	(0.029)
			0.057*	(0.012)		
NP, v 0.01	0.115*	(0.045)	0.225*	(0.039)	0.171*	(0.032)
			0.057*	(0.013)		
R 0.02	0.105*	(0.041)	0.220*	(0.037)	0.156*	(0.027)
			0.056*	(0.012)		
<b>2010-2011</b>						
NP, v 0.02	0.036	(0.037)	0.295*	(0.037)	0.047	(0.033)
			0.061*	(0.017)		
NN3, R 0.02	0.037	(0.043)	0.323*	(0.042)	0.046	(0.040)
			0.067*	(0.018)		
NP, v 0.01	0.044	(0.041)	0.285*	(0.043)	0.044	(0.041)
			0.066*	(0.018)		
R 0.02	0.040	(0.036)	0.296*	(0.037)	0.053	(0.033)
			0.060*	(0.168)		
<b>2009-2011</b>						
NP, v 0.02	0.100*	(0.038)	0.201*	(0.049)	0.077	(0.041)
			0.038*	(0.018)		
NN3, R 0.02	0.088*	(0.039)	0.196*	(0.054)	0.095*	(0.044)
			0.035	(0.021)		
NP, v 0.01	0.076*	(0.038)	0.208*	(0.048)	0.067	(0.044)
			0.036	(0.020)		
R 0.02	0.108*	(0.038)	0.197*	(0.049)	0.078	(0.040)
			0.035	(0.018)		

Note: The first row lists the impact on the indicator when considering the first two responses (Very safe and Somewhat safe for perceived safety; Completely unsafe and Somewhat unsafe in regards to perception of insecurity; Very Good and Good for safe physical surroundings). The second row refers to the optimal answer (Completely unsafe and Very Good, respectively). Model A includes the following variables: Total population,% of male and female population,% population originally from the entity,% indigenous population,% population 12 years old, population between 15 and 17, % of the population 18 -24, % of population 60 and older, % of illiterate population at 15 years of age, average schooling, % of married population,% Catholic,% of homes with female head of household, % of economically active population,% of employed population,% of households with floor dirt, % of households with no assets,% of households with auto,% of households with electricity,% of homes with water,% of households with drainage and project type. Standard errors calculated via 300 resampling repetitions. The “\*” indicates coefficient is statistically significant at less than 5%.

**Tabla III.4.**  
**Evaluation with relation to use of space, model with interactions**

	Attendance		Perception of physical surroundings		Participation in sports or cultural activities	
<b>2009-2010</b>						
NP, v 0.02	0.092*	(0.034)	0.200*	(0.041)	0.162*	(0.031)
			0.045*	(0.014)		
NN3, R 0.02	0.079*	(0.036)	0.184*	(0.046)	0.169*	(0.032)
			0.040*	(0.016)		
NP, v 0.01	0.076*	(0.034)	0.209*	(0.047)	0.142*	(0.032)
			0.039*	(0.016)		
R 0.02	0.098*	(0.034)	0.207*	(0.042)	0.162*	(0.031)
			0.047*	(0.014)		
<b>2010-2011</b>						
NP, v 0.02	0.040	(0.042)	0.247*	(0.040)	0.043	(0.042)
			0.053*	(0.016)		
NN3, R 0.02	0.044	(0.045)	0.259*	(0.046)	0.055	(0.044)
			0.063*	(0.016)		
NP, v 0.01	0.045	(0.044)	0.276*	(0.046)	0.062	(0.047)
			0.064*	(0.018)		
R 0.02	0.044	(0.042)	0.239*	(0.039)	0.042	(0.041)
			0.050*			
<b>2009-2011</b>						
NP, v 0.02	0.085*	(0.042)	0.251*	(0.055)	0.104*	(0.044)
			0.042*	(0.018)		
NN3, R 0.02	0.093*	(0.044)	0.246*	(0.057)	0.104*	(0.045)
			0.044*	(0.018)		
NP, v 0.01	0.047	(0.043)	0.261*	(0.057)	0.095*	(0.048)
			0.037	(0.020)		
R 0.02	0.085*	(0.041)	0.227*	(0.053)	0.089*	(0.044)
			0.042*	(0.017)		

Note: For the Perception of physical surroundings variable, the first row refers to the impact on the indicator when considering the first two answers (Very Good, Good), the second line refers to the optimal response (Very Good). The rest of the variables considered consider Yes as the only possible response. Each column contains two measures. The first measurement refers to the first two responses of the individual. The second considers success to be when the individual answers the first response. Model A variables are included, plus 18 additional interaction with variables for occupation, housing, the social lag index and stratum type. Standard errors calculated via 300 resampling repetitions. The “\*” indicates coefficient is statistically significant at less than 5%.

DO INVESTMENTS IN PUBLIC SPACES GENERATE SOCIAL CAPITAL?  
EVIDENCE FOR MEXICO

**Table III.5.**  
**Evaluation with regards to relationship between neighbors, model without interactions**

	Relationship between neighbors		Social Capital Index	
<b>2009-2010</b>				
NP, v 0.02	0.013	(0.020)	0.017	(0.016)
	0.017	(0.027)		
NN3, R 0.02	0.020	(0.022)	0.018	(0.017)
	0.021	(0.028)		
NP, v 0.01	0.014	(0.021)	0.016	(0.017)
	0.011	(0.030)		
R 0.02	0.010	(0.019)	0.016	(0.016)
	0.020	(0.026)		
<b>2010-2011</b>				
NP, v 0.02	0.037	(0.030)	0.018	(0.013)
	-0.003	(0.019)		
NN3, R 0.02	0.054	(0.035)	0.020	(0.014)
	-0.001	(0.022)		
NP, v 0.01	0.041	(0.034)	0.012	(0.015)
	0.000	(0.021)		
R 0.02	0.033	(0.028)	0.018	(0.013)
	-0.006	(0.019)		
<b>2009-2011</b>				
NP, v 0.02	0.029	(0.027)	0.029*	(0.013)
	0.029	(0.019)		
NN3, R 0.02	0.033	(0.029)	0.027*	(0.014)
	0.025	(0.020)		
NP, v 0.01	0.027	(0.032)	0.023	(0.015)
	0.024	(0.021)		
R 0.02	0.028	(0.026)	0.029*	(0.013)
	0.026	(0.019)		

Note: The relationship between neighbors in the first row includes Very united and Somewhat united. The second row only includes Very united. Model A includes the following variables: Total population,% of male and female population,% population originally from the entity,% indigenous population,% population 12 years old, population between 15 and 17, % of the population 18 -24, % of population 60 and older, % of illiterate population at 15 years of age, average schooling, % of married population,% Catholic,% of homes with female head of household, % of economically active population,% of employed population,% of households with floor dirt, % of households with no assets,% of households with auto,% of households with electricity,% of homes with water,% of households with drainage and project type. Standard errors calculated via 300 resampling repetitions. The “\*” indicates coefficient is statistically significant at less than 5%.

**Table III.6.**  
**Evaluation with regards to relationship between neighbors, model with interactions**

	Relationship between neighbors		Social Capital Index	
<b>2009-2010</b>				
NP, v 0.02	0.006	(0.022)	0.007	(0.015)
	0.014	(0.022)		
NN3, R 0.02	0.001	(0.023)	0.006	(0.016)
	0.008	(0.025)		
NP, v 0.01	0.022	(0.025)	0.014	(0.016)
	0.010	(0.024)		
R 0.02	0.003	(0.021)	0.004	(0.015)
	0.011	(0.022)		
<b>2010-2011</b>				
NP, v 0.02	0.018	(0.026)	0.018	(0.013)
	-0.013	(0.022)		
NN3, R 0.02	0.018	(0.028)	0.024	(0.015)
	-0.005	(0.023)		
NP, v 0.01	0.026	(0.030)	0.031*	(0.016)
	0.009	(0.023)		
R 0.02	0.016	(0.025)	0.015	(0.013)
	-0.017	(0.022)		
<b>2009-2011</b>				
NP, v 0.02	0.038	(0.034)	0.039*	(0.015)
	0.026	(0.025)		
NN3, R 0.02	0.042	(0.034)	0.044*	(0.016)
	0.034	(0.024)		
NP, v 0.01	0.041	(0.037)	0.028	(0.018)
	0.014	(0.027)		
R 0.02	0.034	(0.033)	0.037*	(0.015)
	0.035	(0.023)		

Note: The relationship between neighbors in the first row includes Very united and Somewhat united. The second row only includes Very united. Each column contains two measures. The first measurement refers to the first two responses of the individual. The second considers success to be when the individual answers the first response. Model A variables are included, plus 18 additional interaction with variables for occupation, housing, the social lag index and stratum type. Standard errors calculated via 300 resampling repetitions. The “\*” indicates coefficient is statistically significant at less than 5%.

Standard errors calculated via 300 resampling repetitions. The “\*” indicates coefficient is statistically significant at less than 5%.