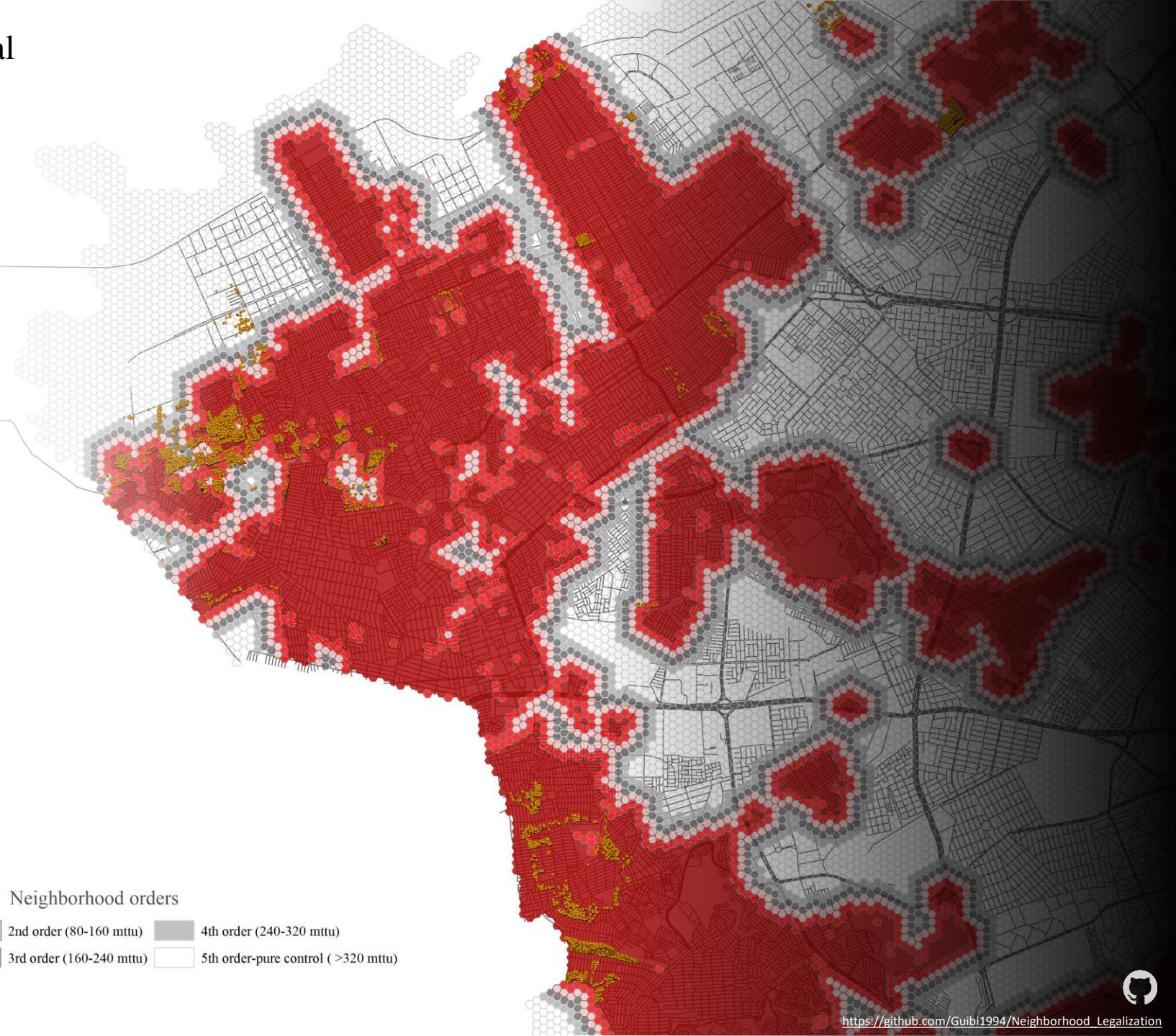


# Slum recognition effects on urban informal expansion:

An impact evaluation of the Neighborhood Legalization program in Bogotá, Colombia



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## Context:

- Urban expansion is one of the most important events in South America's recent history.
- In the last three decades Bogotá almost doubled (DANE, 1989, 2005 and 2018), and up today is the 46th most dense urban area in the world
- Habitat challenges: 3.8% of Bogota's household are in quantitative deficit while 10.2% are in qualitative deficit (DANE 2018).

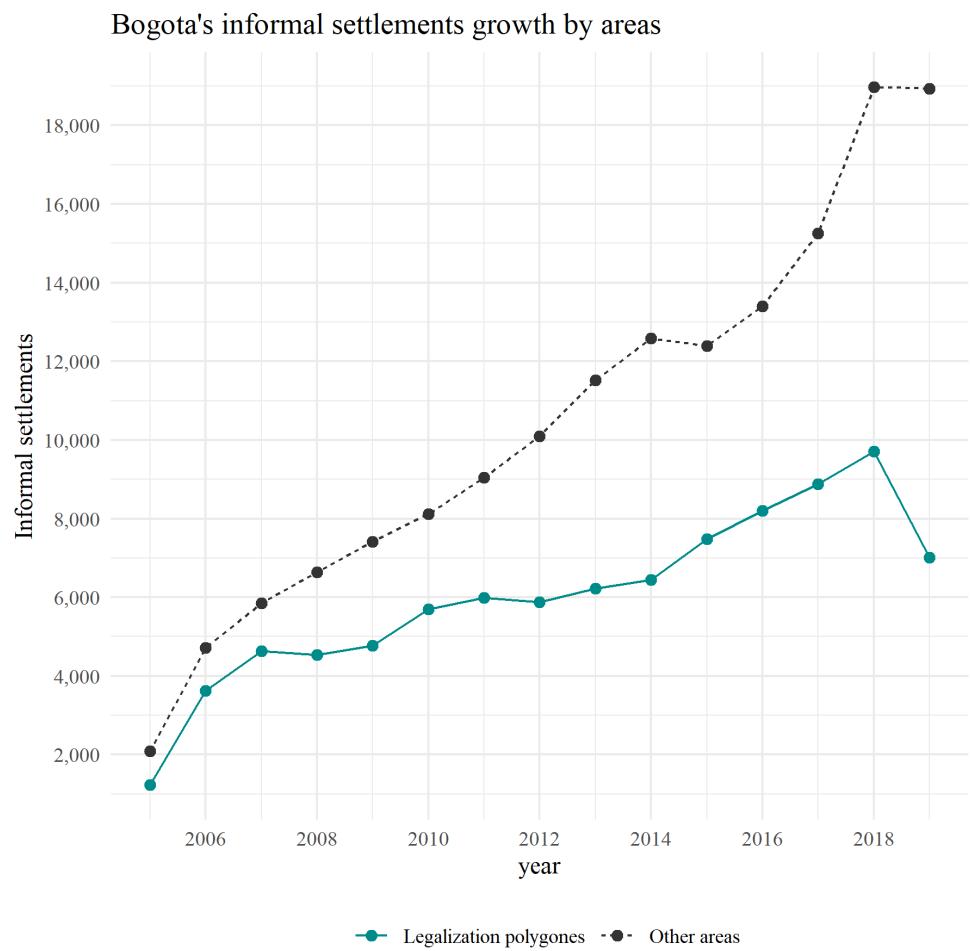


## Policy response:

- Law 388 of 1994 (Birth of the POTs – [Es] *Planes de Ordenamiento Territorial*): Urban plans which, through programs and norms, seek to order and re-direct formal and informal urban growth.
- To deal with slum's expansion, the POTs integrated the **neighborhood legalization program: recognizing illegal settlements**, so they can be later provided with public infrastructure and amenities.
- **Informal Settlement** (construction type/origin)     $\neq$     **Illegal Settlements** (legal status)

# Introduction

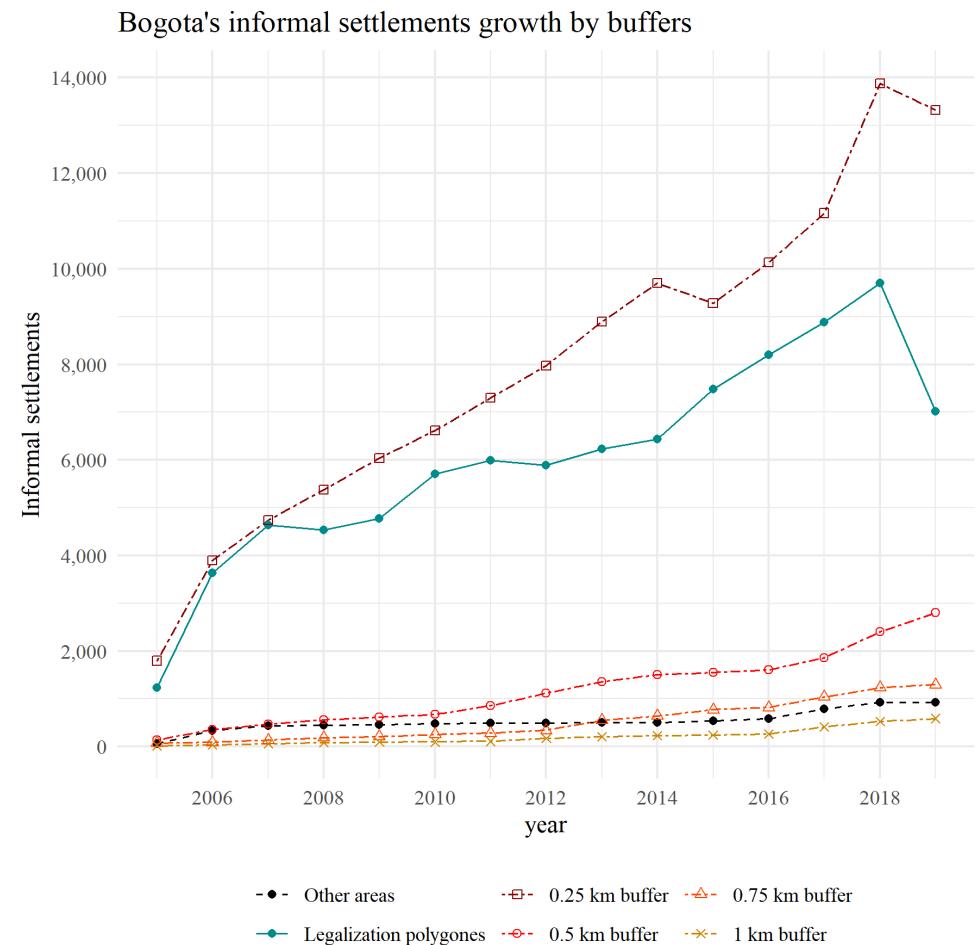
- Politicians and governments have advocated for stopping the legalization program (as well as other slum improvement-oriented policies) based on the belief that **neighborhood legalization program could foster or incentive illegal and informal growth.**
- This vision has gained support from construction companies which build new social housing projects.
- On the other hand, others claim that this kind of program not only do not foster informal expansion but also represent a cheaper solution to the habitat problem both for the government and low-income families.
- A quick first look at the data shows that the legalization of polygons seems to have had a lower informal expansion rate than the rest of the city.



# Introduction

- Nevertheless, if one observes closer, it seems that the areas closer to the legalization of polygons are the ones that have experienced the faster informal occupation expansion in the last 15 years.
- The **research question** then is *Have the neighborhood legalization program incentivized urban illegal expansion?*

H0 = Yes but depending on the intervention's geographic and economic context



## Slum intervention's effects:

Effects over public health: Bhan, N. (2013) ; Pérez-Casas, M. (2017); Henson, R. M., et al. (2020);

Effects over household economy and unemployment: Amis, P. (2001); Takeuchi, A., Cropper, M., & Bento, A. (2008)\*; Majale, M. (2008); Olthuis, K., Benni, et al. (2015); Bardhan, R.,et al. (2015)

Effects over land prices and construction: Nieto, C. A. B., et al (2017); Corredor Collazos, M. E. (2020)\*\*.

## Scientific gaps and opportunities:

- I. Most of studies focus on physical interventions rather than legal actions.
- II. The majority focus on positive outcomes (sometimes determinists ones), ignoring policies side effects.
- III. Most oversimplify the policies, making risky assumptions that put in doubt causal claims.
- IV. Almost no study analyses *effect heterogeneity* and it's sources
- V. Still, *impact evaluations* on slum management still scarce.



Neighborhood Legalization polygons with legal process info\* (1950-2019)



Neighborhood Improvement program polygons\* (2002-2019)



Resettlement Program points (2004-2019)



Informal constructions –SDH (2005-2019)



Formal constructions – ODC (2012-2019)



Census data (2005 and 2018)

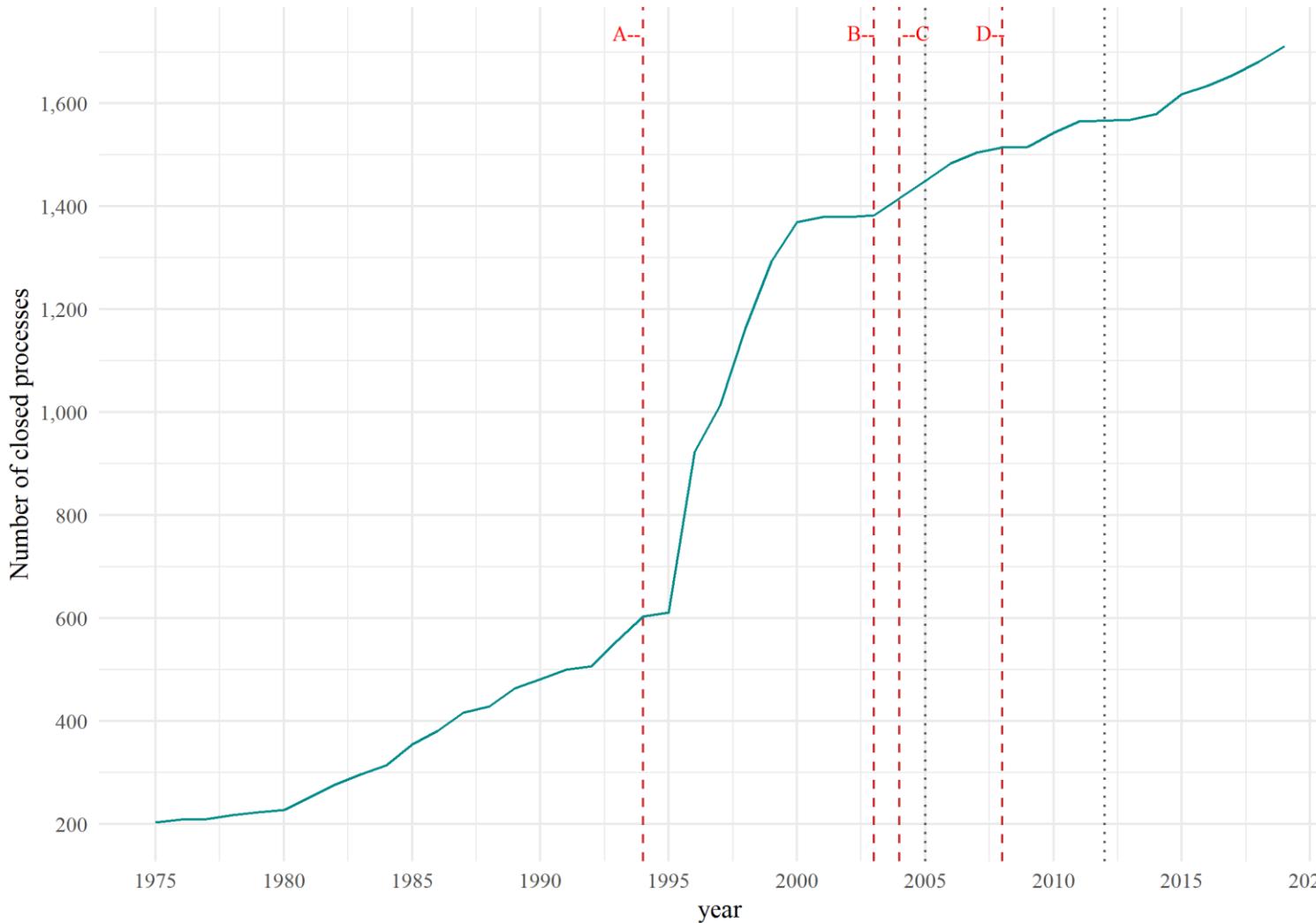
# Context



# Political context: fighting informally or denying it?

Cumulative number of neighborhood legalizations (1975-2019)

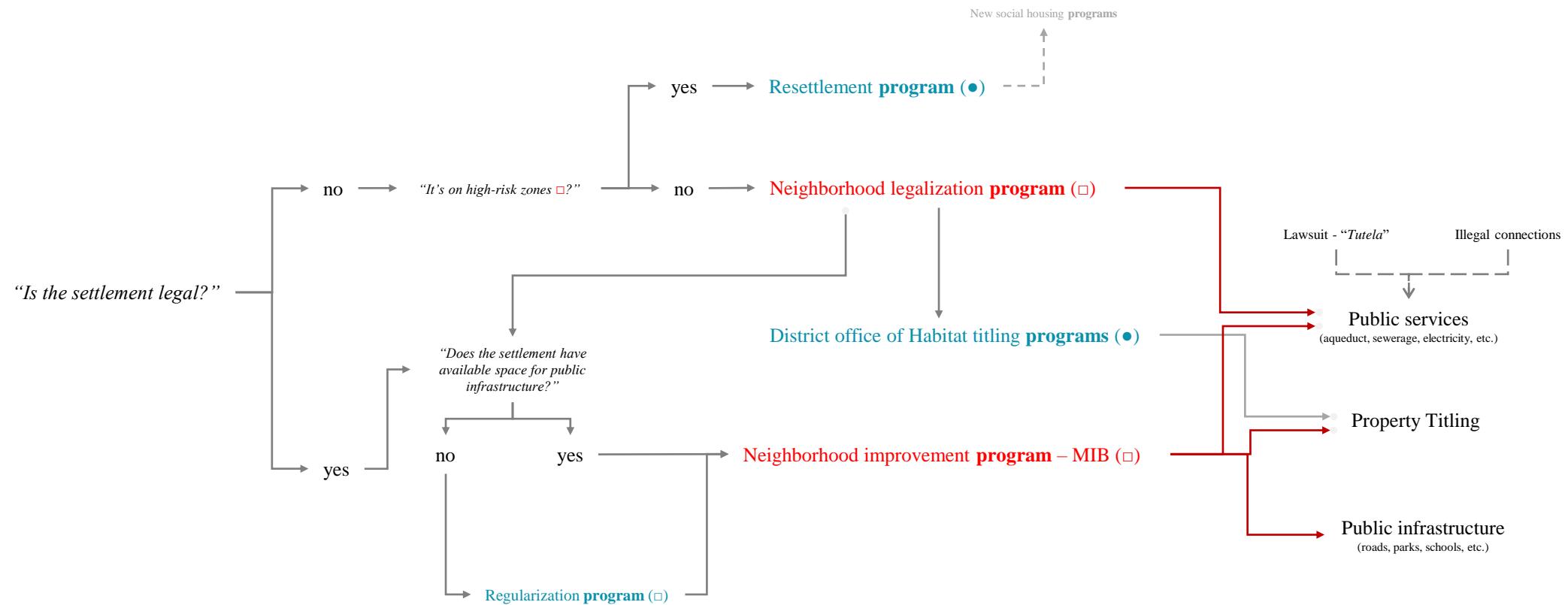
Bogotá, Colombia



## Historical milestones:

- A. **1994:** The Law 388 gave to all municipalities the order to formulate their first POT's.
- B. **2003:** President Alvaro Uribe Velez established in his *Developing Plan* that informal settlements which origin year were after 2003, could not be legalized nor receive any public investment. (VIS/VIP/Macro)
- C. **2004:** Bogotá finally (by decree) adopts its first POT (decree 190 of 2004).
- D. **2008:** The constitutional court declare the 2003 restriction against the constitution.

## Context: articulation with other programs



# Methodology



- **Challenge #1:** Unit of treatment's heterogenous geography
- **Challenge #2:** Spatial spill-overs (violations of SUTVA)
- **Challenge #3:** Some outcomes are observed just in restricted areas
- **Challenge #4:** Relevant differences across units
  - I. Differences in the relation with historical programs or interventions:
  - II. Differences exposure to current regulatory framework
  - III. Differences in demographic composition
- **Challenge #5:** External shocks (court intervention)
- **Challenge #6:** Absence of “*pure never-treated*” units and different treatment times
- **Challenge #7:** Difference in anticipation time

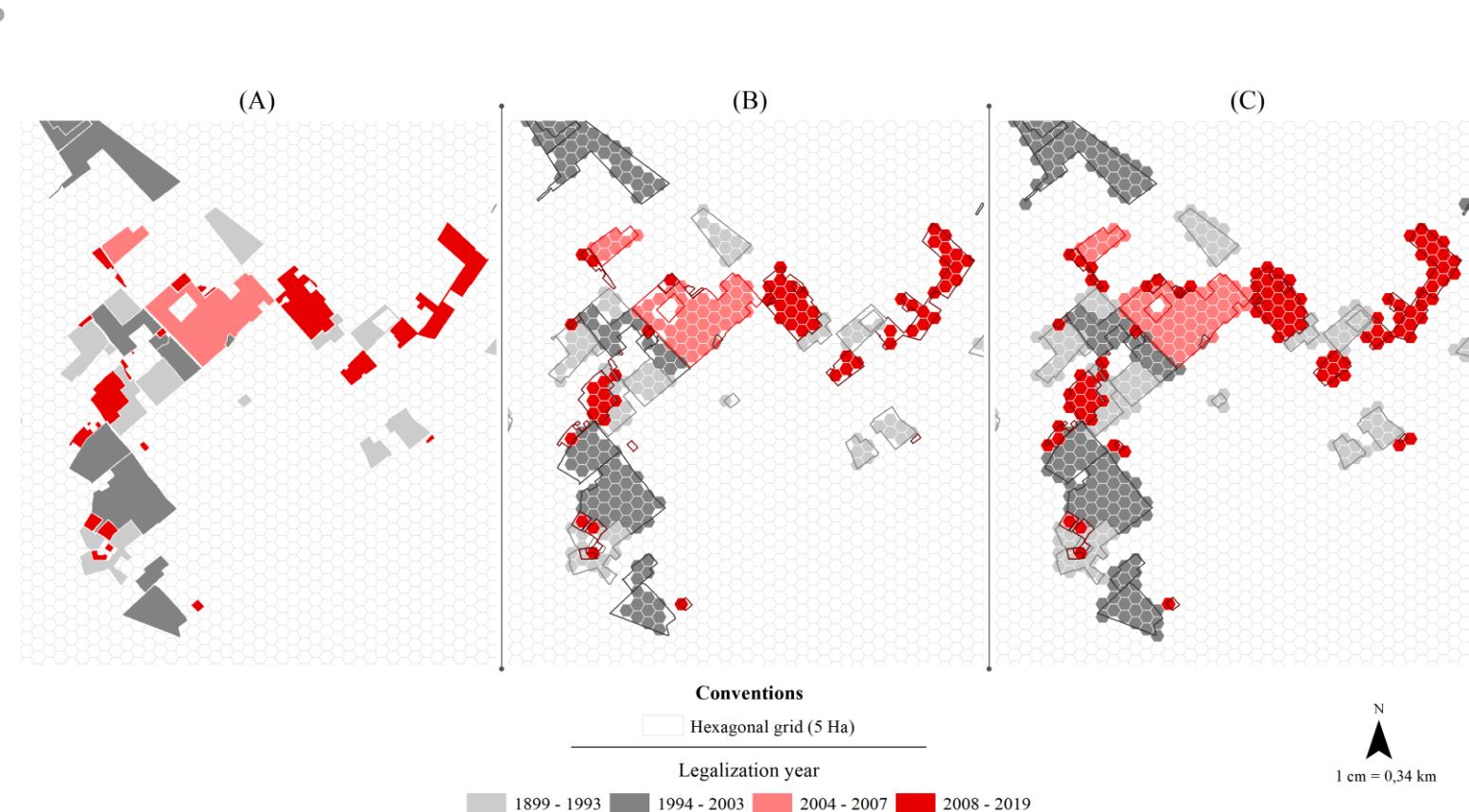
# Addressing challenge #1: Unit of treatment's heterogenous geography

## Standardizing unit of analysis

1. Legalization polygons were transformed into hexagons of 5 Ha each.
2. Treatment and controls are defined by nor by centroid intersection (B) but rather by closest centroid (C), to avoid treated unit's omission.

By doing this we guarantee:

1. A geographic standardized unit of analysis.
2. Representation of all treated areas
3. Standardization of never-treated units



# Addressing challenge #2: Spatial spill-overs

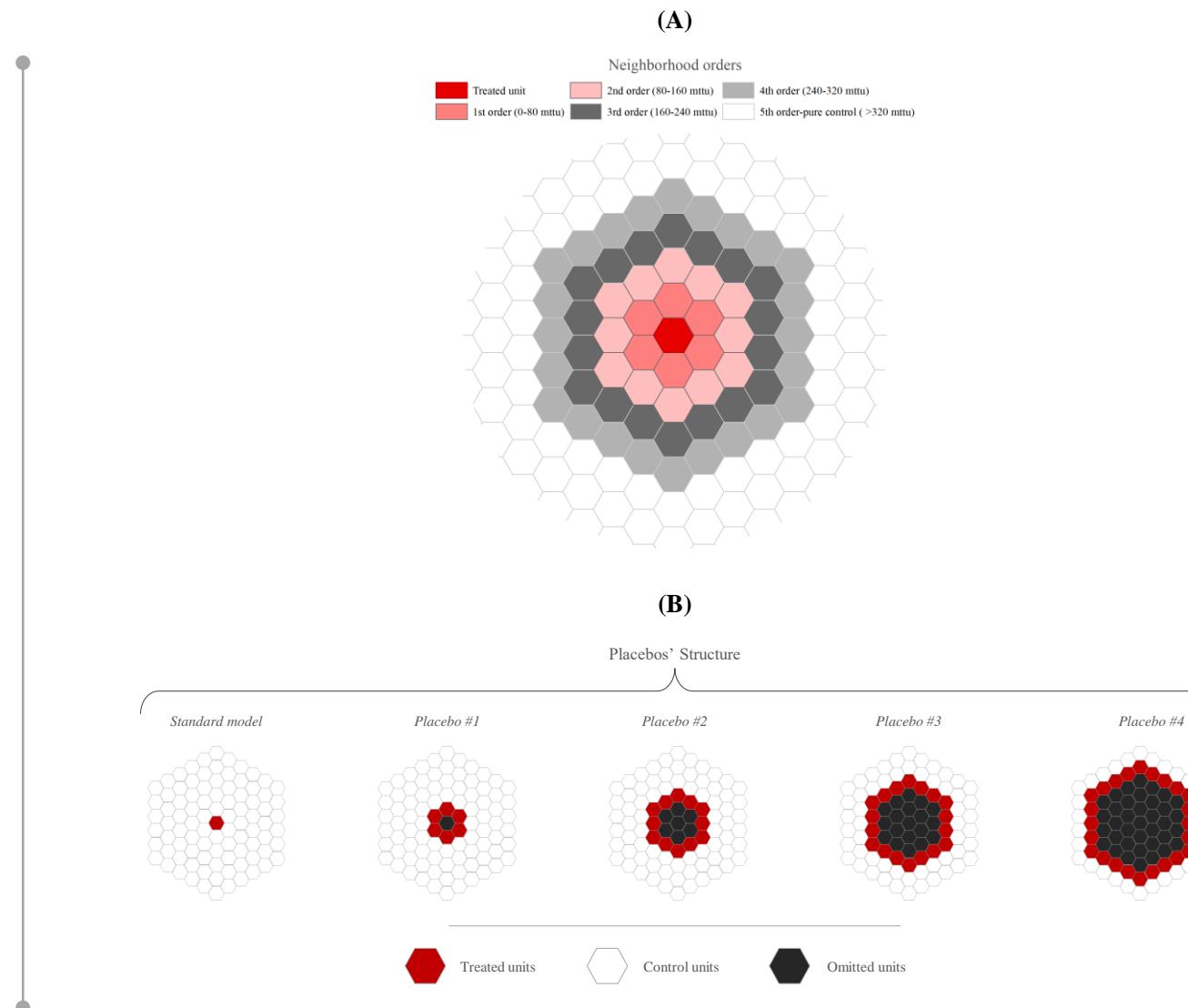
## Defining the range of contamination

To deal with possible violation of SUTVA we categorize control units into five neighborhood orders and employed two different strategies:

**A. Controlling comparation's units:** We run the model taking different combinations of neighborhood units.

- *i.e.* Treated VS 1<sup>st</sup> neighbors || Treated VS 2<sup>nd</sup> neighbors || ... Treated VS all Neighbors.

**B. Measuring spill-over effects:** We additionally run several placebos test, assuming neighbor control units to be treatment units instead.



# Addressing challenge #3: Restricted observations for key outcomes

## Keeping comparability

### **Considerations:**

- Our main outcomes are:
  1. Illegal occupations
  2. Evolution of the resettlement program
  3. Formal construction (cadastral bases' changes)
- Illegal occupation are just observed across monitoring polygons which changes over time and do not over all the city's surface.
- Then, just a little portion of tarter units are effectively observed in all periods of time (2005-2019) for this outcome.

### **Procedure:**

For comparability, we ran the analysis with the same restricted sample for the rest of the outcomes. Nevertheless, we also analyze the remaining outcomes with all the data.

Table 6: Legalization treatment groups by monitoring group

Treatment group	Monitoring frequency group			Total
	I. Always	II. Not always	III. Never	
<b>Pre-court intervention</b>				
2005	64 (11.1%)	61 (10.6%)	450 (78.3%)	575
2006	8 (6.3%)	16 (12.6%)	103 (81.1%)	127
2007	11 (6.5%)	30 (17.8%)	128 (75.7%)	169
2008	2 (6.7%)	4 (13.3%)	24 (80%)	30
<b>Post-court intervention</b>				
2009	-	-	2 (100%)	2
2010	-	2 (5.9%)	32 (94.1%)	34
2011	-	23 (22.3%)	80 (77.7%)	103
2013	-	-	14 (100%)	14
2014	-	-	17 (100%)	17
2015	17 (6.5%)	35 (13.4%)	210 (80.2%)	262
2016	1 (1.9%)	1 (1.9%)	51 (96.2%)	53
2017	-	12 (21.1%)	45 (78.9%)	57
2018	3 (4.6%)	9 (13.8%)	53 (81.5%)	65
2019	2 (2.2%)	12 (13.2%)	77 (84.6%)	91
Never treated	2696 (2.2%)	5911 (4.9%)	112629 (92.9%)	121236
Treated before 2005	323 (1.9%)	801 (4.8%)	15533 (93.3%)	16657

# Addressing challenge #4: Differences between units

## Selecting and transforming covariates

### Considerations:

- There are multiple sources of variation, both from current differences and historical dynamics.
- However, since the main models' sample is quite restricted, adding all relevant covariates could represent an important loss of degrees of freedom.

### Procedure

We reconstruct the most relevant covariates and perform a PCA analysis to reduce its dimensionality\*.

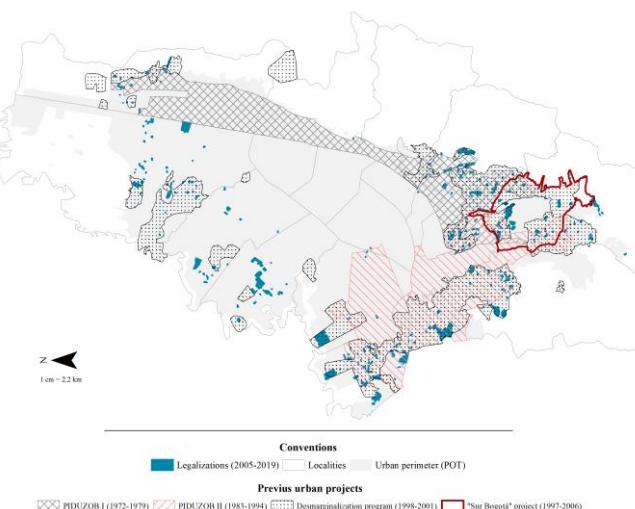


Table 3: T-test by neighborhood orders

Variable	Comparation between specific neighborhood orders					
	1st	2nd	3rd	4th	5th	All neighbors
<b>Socio-economic covariates</b>						
Population density (hab/km <sup>2</sup> )	3496.9 ***	6726 ***	9077.3 ***	10671.2 ***	17266 ***	15006.8 ***
Dis. to stratum 1	-665.8 ***	-874.3 ***	-1037 ***	-1164.2 ***	-2507.3 ***	-2154.7 ***
Dis. to stratum 2	-17.7	-142.1 ***	-256.2 ***	-350.2 ***	-2055.8 ***	-1640.9 ***
Dis. to stratum 3	393.9 ***	463.3 ***	463.2 ***	478.9 ***	-2647.6 ***	-1965.9 ***
Dis. to stratum 4	1077.1 ***	1437.2 ***	1622.5 ***	1808.2 ***	-1529.7 ***	-873.9 ***
Dis. to stratum 5	2083.9 ***	2618.9 ***	2935.2 ***	3216.2 ***	381.5 ***	881.7 ***
Dis. to stratum 6	2299.2 ***	2884.7 ***	3176.5 ***	3420 ***	462.9 ***	996.2 ***
<b>POT covariates</b>						
Dis. to expansion areas	-403.5 ***	-438.9 ***	-564.3 ***	-645.9 ***	-1759.7 ***	-1482 ***
Dis. to rural areas	718 ***	648.1 ***	692.5 ***	698.1 ***	2449.3 ***	2061.5 ***
Dis. to urban area	-27.7 ***	-43.6 ***	-64.8 ***	-83.5 ***	-1518.2 ***	-1195 ***
Dis. to protected areas	8.9	-36.5	-88 *	-126.4 **	-1122.4 ***	-886.7 ***
Dis. to consolidation areas-TU	91.6 ***	90.2 ***	68.6 ***	45.2 ***	-1824.9 ***	-1405.8 ***
Dis. to development areas-TU	-61.7 ***	-89.4 ***	-132.5 ***	-166.8 ***	-1486.5 ***	-1182.4 ***
Dis. to CI areas-TU	-207.8 ***	-401 ***	-548.4 ***	-672 ***	-2523.9 ***	-2062.7 ***
Dis. to renewal areas-TU	140.3 *	255.9 ***	302.1 ***	328.8 ***	-2707.9 ***	-2056.8 ***
Dis. to high risk zones	252 ***	100.8	42.8	-34.2	-297.3 ***	-208.4 ***
Dis. to environmental p. areas	-46 ***	-65.2 ***	-78.8 ***	-104.1 ***	-12.8	-25.5 **
<b>Pre-POT covariates</b>						
Dis. to PIDUZOM I	920.3 ***	930.7 ***	1006.8 ***	1029.5 ***	2.1	214.4 **
Dis. to PIDUZOM II	-2095.8 ***	-2597.7 ***	-2847.3 ***	-3086.4 ***	-4918.6 ***	-4407.9 ***
Dis. to Desmarginalization	-268.2 ***	-432.8 ***	-569.4 ***	-694.9 ***	-2504.9 ***	-2055.9 ***
Dis. to Sur-Bogotá project	-1636.7 ***	-2209.9 ***	-2408.4 ***	-2683.4 ***	-2585 ***	-2495.2 ***

Table 4: PCA cumulative variance over control variables' dimensions

Dimension	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
Socioeconomic (k = 7)	0.63	0.86	0.959	0.984	0.996	0.999	1	-	-	-
POT (k = 10)	0.498	0.674	0.823	0.906	0.955	0.976	0.987	0.994	0.998	1
Pre-POT (k = 4)	0.503	0.842	0.986	1	-	-	-	-	-	-
<b>Combinations</b>										
POT and Pre-POT (k = 14)	0.437	0.602	0.752	0.856	0.919	0.955	0.97	0.98	0.987	0.992
All together (k = 21)	0.469	0.641	0.757	0.849	0.895	0.927	0.953	0.965	0.973	0.98

**Note:** We observed significant difference between treated units and different sets of control groups, which could represent a relevant endogeneity problem between (i.e.) historical programs and the legalization program. Nevertheless, we argue that (i) historically and institutionally, there is no relation between previous programs and legalization occurred after 2005; (ii) if PT assumption holds, we would still be capturing the program's causal effects; and (iii) most differences are statistically significant but geographically depreciable ( $x < 1 \text{ km}$ ).

Estimating DID models base on [Callaway and Sant'Anna \(2021\)](#)

$$ATT_{g,t} = \left[ \left( \frac{G_g}{\mathbb{E}[G_g]} - \frac{\frac{p_g(X')C}{1-p_g(X')}}{\mathbb{E}\left[\frac{p_g(X')C}{1-p_g(X')}\right]} \right) * (Y'_t - Y'_{g-1} - m_{gt}(X')) \right]$$

$$m_{gt}(X') = \mathbb{E}[Y'_t - Y'_{g-1}|X', C = 1]$$



1. Allow for difference in treatment timing, focusing on not yet started units: avoiding forbidden comparision as in the classical two-way fixed effects approach.
2. The identification of treatment dynamic across time and treatment groups (group effects and event study effects), comes in handy when analyzing external shocks.
3. Covariates are integrated indirectly through PS and or a regression outcome approach, allowing for conditional parallel trends.
4. The approach also allows to test for policy's anticipation effects

# Results



# Legalization general effects

Table 11: Legalization general effects -always monitored sample

Variable	1st neighbours		2nd neighbours		3rd neighbours		4th neighbours		5th neighbours		All neighbours	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
<b>Informal Market</b>												
Ilegal occupations	1.03 (1.69)	0.07 (1.95)	1.41 (1.72)	0.01 (2.05)	2.29 (1.71)	0.35 (2.1)	2.77 (1.74)	2.79 (1.89)	2.51 (1.73)	2.54 (2.12)	1.99 (1.7)	0.37 (2.09)
RP. Identification (Households)	-0.49 (1.22)	0.1 (1.22)	-0.61 (1.23)	-0.36 (1.23)	-0.64 (1.23)	-0.71 (1.33)	-0.64 (1.23)	-0.71 (1.35)	-0.64 (1.23)	-0.71 (1.36)	-0.6 (1.23)	-0.1 (1.34)
RP. Identificaion (m2)	-23.6 (72.49)	16.1 (73.34)	-32.13 (73.67)	-15.23 (73.59)	-34.74 (73.78)	-38.2 (80.45)	-36.32 (73.65)	-37.93 (81.72)	-34.45 (73.98)	-37.94 (81.95)	-31.72 (73.8)	1.62 (80.6)
RP. Enrollments (Households)	0.18 (0.13)	0.31 (0.19)	0.13 (0.13)	0.19 (0.15)	0.11 (0.13)	0.14 (0.14)	0.12 (0.13)	0.13 (0.14)	0.12 (0.13)	0.18 (0.15)	0.13 (0.13)	0.29 (0.18)
RP. Enrollments (m2)	10.63 (7.49)	18.21 (11.74)	7.03 (7.42)	9.02 (8.35)	6.46 (7.33)	18.2 (20.04)	6.22 (7.17)	6.83 (8.3)	6.38 (7.36)	18.26 (15.71)	7.47 (7.24)	19.63* (11.23)
<b>Formal Market - Overall</b>												
Total lots	-2.71 (5.92)	-16.8 (22.15)	0.32 (4.77)	-8.32 (13.2)	5.71 (4.05)	1.2 (7.6)	8.15** (3.61)	7.84** (3.95)	7.02* (3.64)	7.63** (3.5)	3.67 (3.8)	-2.95 (6.46)
Total built area (m2)	109.62 (106.88)	50.85 (189.21)	129.46 (106.59)	64.81 (164.51)	187.54* (107.57)	135.4 (147.92)	229.49** (105.62)	230.26** (116.65)	207.96** (105.34)	239.61** (97.57)	172.39 (107.92)	117.49 (120.08)
Total buildings	2.53 (2.21)	1.29 (3.75)	3.53 (2.2)	2.02 (3.1)	5.21** (2.23)	3.43 (2.95)	5.83*** (2.15)	4.91** (2.44)	5.47** (2.16)	5.64*** (2.19)	4.48** (2.12)	2.95 (2.31)
Avg. Stories	0.15** (0.06)	0.17** (0.07)	0.24*** (0.06)	0.23*** (0.07)	0.27*** (0.06)	0.17** (0.08)	0.27*** (0.07)	0.24*** (0.08)	0.23*** (0.06)	0.26*** (0.08)	0.22*** (0.06)	0.18*** (0.07)
Total stories	3.27 (3.84)	2.86 (5.29)	4.47 (3.86)	3.92 (4.16)	7.41* (3.85)	5.28 (5.05)	8.46** (3.77)	7.26* (4.32)	8.01** (3.69)	8.23** (3.91)	6.33* (3.76)	4.85 (3.5)
<b>Formal Market - By land uses</b>												
Residential lots	1.18 (2.23)	-1.62 (5.62)	2.57 (2.08)	0.2 (3.67)	4.39** (2)	2.56 (2.81)	5.05*** (1.95)	4.15* (2.26)	4.61** (1.93)	4.78** (2.06)	3.51* (1.96)	1.48 (2.4)
Residential built area	86.53 (53.29)	81.06 (64.91)	106.93** (53.5)	77.68 (66.53)	135.36** (52.65)	83.55 (69.86)	152.58*** (53.8)	129* (60.06)	132.7** (52.22)	148.04** (59.86)	119.65** (52.65)	92.28* (55.85)
Residential buildings	2.1 (1.54)	2.14 (1.7)	2.74* (1.51)	2.22 (1.7)	3.65** (1.57)	2.47 (1.83)	3.9*** (1.5)	2.85 (1.8)	3.74** (1.54)	3.74** (1.69)	3.2** (1.54)	2.49 (1.58)
Comercial lots	-2.86 (1.78)	-7.57 (7)	-2.07 (1.2)	-5.01 (4.22)	-0.55 (0.9)	-2.09 (0.18)	0.22 (0.45)	0.31 (0.49)	0.09 (0.45)	0.16 (0.49)	-0.98 (0.51)	-3.05 (1.75)
Comercial built area	-25.09 (8.65)	-50.75 (36.55)	-25.99 (9.72)	-50.57 (32.31)	-10.73 (7.31)	-22.16 (19.55)	-3.39 (6.2)	-3.96 (3.57)	-3.79 (3.24)	-4.45 (3.95)	-12.85* (3.58)	-26.85 (11.45)
Comercial buildings	-0.56 (0.21)	-1.11 (0.81)	-0.42 (0.22)	-0.97 (0.58)	-0.13 (0.19)	-0.5 (0.47)	0.03 (0.1)	0.06 (0.1)	-0.01 (0.1)	0.01 (0.1)	-0.21 (0.1)	-0.57 (0.24)
Offices lots	-0.03 (0.04)	-0.01 (0.01)	-0.08 (0.05)	-0.01 (0.02)	-0.03 (0.03)	0 (0.01)	0 (0.01)	0 (0.01)	0 (0)	0 (0.01)	-0.03 (0.01)	0 (0.01)
Offices built area	-0.63 (0.69)	-0.16 (0.16)	-1.17 (0.59)	-0.24 (0.28)	-1.17 (2.04)	-0.24 (0.26)	-0.29 (0.43)	-0.05 (0.08)	-0.51 (0.4)	0.48 (0.55)	-0.73 (0.26)	-0.14 (0.11)
Offices buildings	-0.01 (0.01)	0 (0)	-0.02 (0.01)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-0.01 (0)	0 (0)
Industiral lots	0.76 (1.21)	0.83 (1.18)	0.8 (1.21)	0.85 (1.18)	0.81 (1.21)	0.79 (1.28)	0.86 (1.21)	0.94 (1.33)	0.85 (1.21)	0.85 (1.34)	0.82 (1.21)	0.81 (1.18)
Industiral built area	9.03 (15.04)	10.53 (14.63)	10.47 (14.99)	11.18 (14.38)	9.88 (14.98)	5.59 (15.5)	11.26 (14.96)	11.61 (16.55)	11.13 (14.99)	5.23 (17.15)	10.42 (14.98)	9.06 (14.42)
Industiral buildings	0.4 (0.61)	0.42 (0.59)	0.41 (0.61)	0.43 (0.59)	0.41 (0.6)	0.38 (0.64)	0.43 (0.6)	0.47 (0.66)	0.43 (0.61)	0.38 (0.67)	0.42 (0.61)	0.4 (0.59)
Warehouses lots	-2.01 (1.12)	-3.46 (4.07)	-1.66 (1.27)	-1.72 (2.34)	-1.36 (1.02)	-1.31 (2.32)	-1.31 (0.72)	0.49 (0.79)	0.15 (0.72)	-0.68 (0.77)	-0.68 (0.73)	-1.3 (1.04)
Warehouses built area	-13.17 (12.72)	-8.01 (21.94)	-18.85 (14.67)	-1.49 (15.45)	-3.75 (13.62)	-3.55 (23.65)	-3.55 (12.98)	5.32 (15.38)	3.89 (12.63)	5.18 (8.4)	-5.18 (12.56)	-0.39 (13.82)
Warehouses buildings	-0.46 (0.2)	-0.38 (0.45)	-0.35 (0.25)	-0.18 (0.26)	-0.08 (0.24)	-0.27 (0.49)	0.03 (0.12)	0.07 (0.12)	-0.01 (0.12)	-0.02 (0.13)	-0.17 (0.13)	-0.2 (0.17)
Facilities lots	0.47 (0.98)	-1.99 (3.69)	0.84 (0.78)	-0.27 (2.02)	1.24* (0.65)	1.34* (0.7)	1.21* (0.64)	1.37* (0.64)	1.05 (0.66)	1.31* (0.67)	0.91 (0.61)	0.24 (0.59)
Facilities built area	30.57 (33.43)	20 (43.66)	32.43 (33.12)	29.08 (37.43)	36.86 (33.01)	40.96 (36.24)	35.68 (33.46)	42.19 (36.84)	33.29 (32.83)	41.72 (35.98)	33.05 (32.95)	30.72 (34.88)
Facilities buildings	0.42 (0.31)	0.16 (0.48)	0.47 (0.31)	0.35 (0.35)	0.5 (0.31)	0.56* (0.33)	0.5* (0.3)	0.57* (0.35)	0.46 (0.3)	0.55 (0.34)	0.46 (0.31)	0.39 (0.31)
Empty lots	0 (0.09)	0 (0.04)	-0.01 (0.07)	0 (0.05)	-0.03 (0.05)	-	-	-	-	-	0 (0.03)	-0.02 (0.02)
Empty built area	0 (0.1)	0 (0.04)	0 (0.07)	0 (0.05)	-	-	-	-	-	-	0 (0.02)	0 (0.02)
Empty buildings	0 (0)	0 (0)	0 (0.01)	0 (0)	-	-	-	-	-	-	0 (0)	0 (0)
Other lots	-0.22 (0.59)	-2.98 (2.7)	-0.09 (0.48)	-2.35 (1.89)	0.25 (0.38)	-0.08 (0.9)	0.51 (0.36)	0.59 (0.38)	0.27 (0.35)	0.31 (0.42)	0.12 (0.37)	-1.11 (0.82)
Other built area	22.49** (10.33)	-1.8 (28.53)	25.68** (10.58)	-3.79 (28.51)	24.25** (11.31)	28.26 (17.23)	37.21*** (9.69)	39.53*** (10.94)	31.24*** (9.89)	39.41*** (12.2)	28.06*** (9.98)	12.83 (15.86)
Other buildings	0.64*** (0.25)	0.06 (0.64)	0.7*** (0.25)	0.17 (0.55)	0.85*** (0.25)	0.79** (0.36)	0.94*** (0.24)	0.91*** (0.3)	0.85*** (0.25)	0.97*** (0.27)	0.79*** (0.25)	0.43 (0.36)
PCA controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Standard errors in parentheses. \*\* is significant at the 10% level, \*\*\* is significant at the 5% level, \*\*\*\* is significant at the 1% level

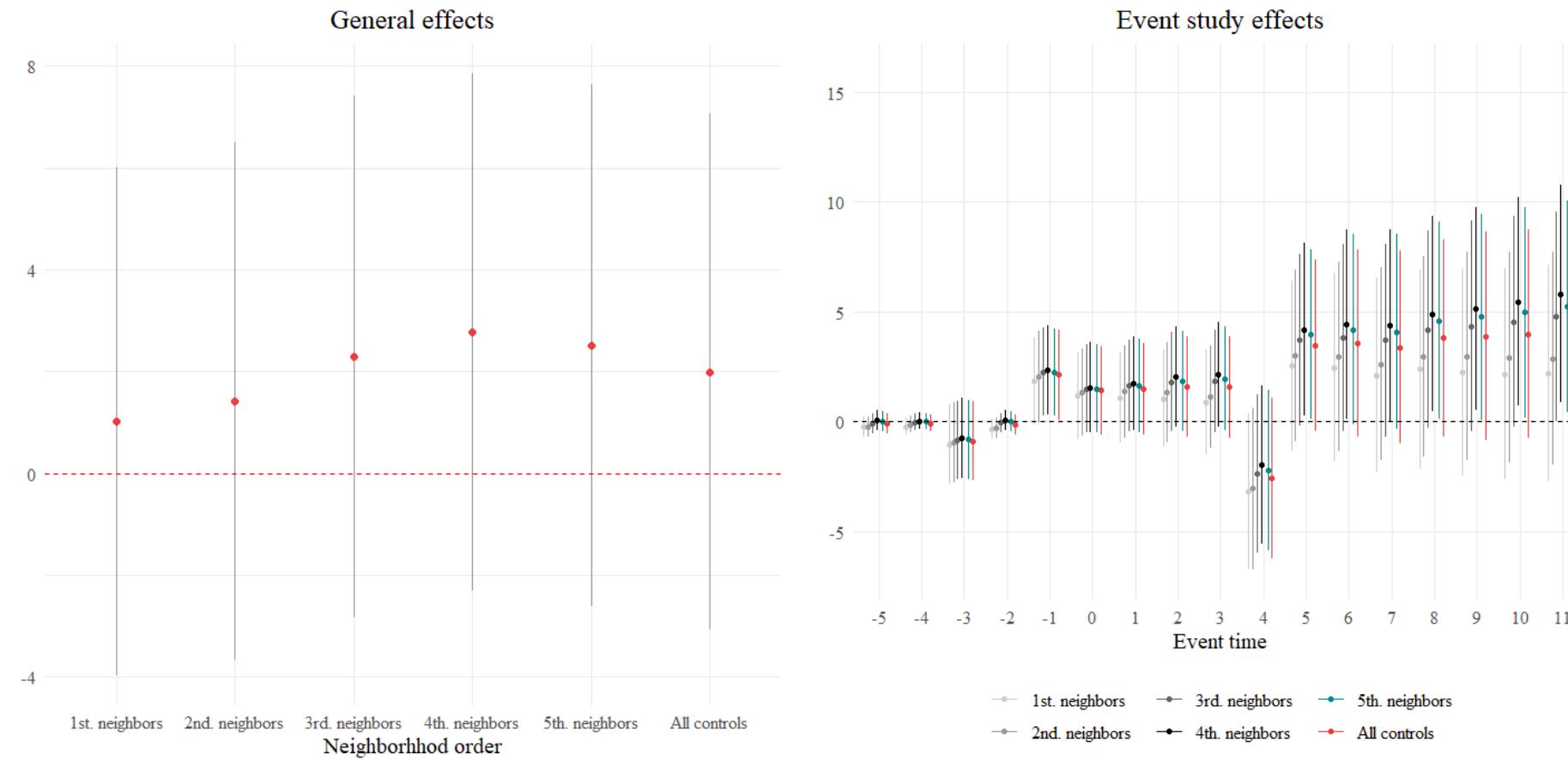
# MIB general effects

Table 12: MIB general effects -always monitored sample

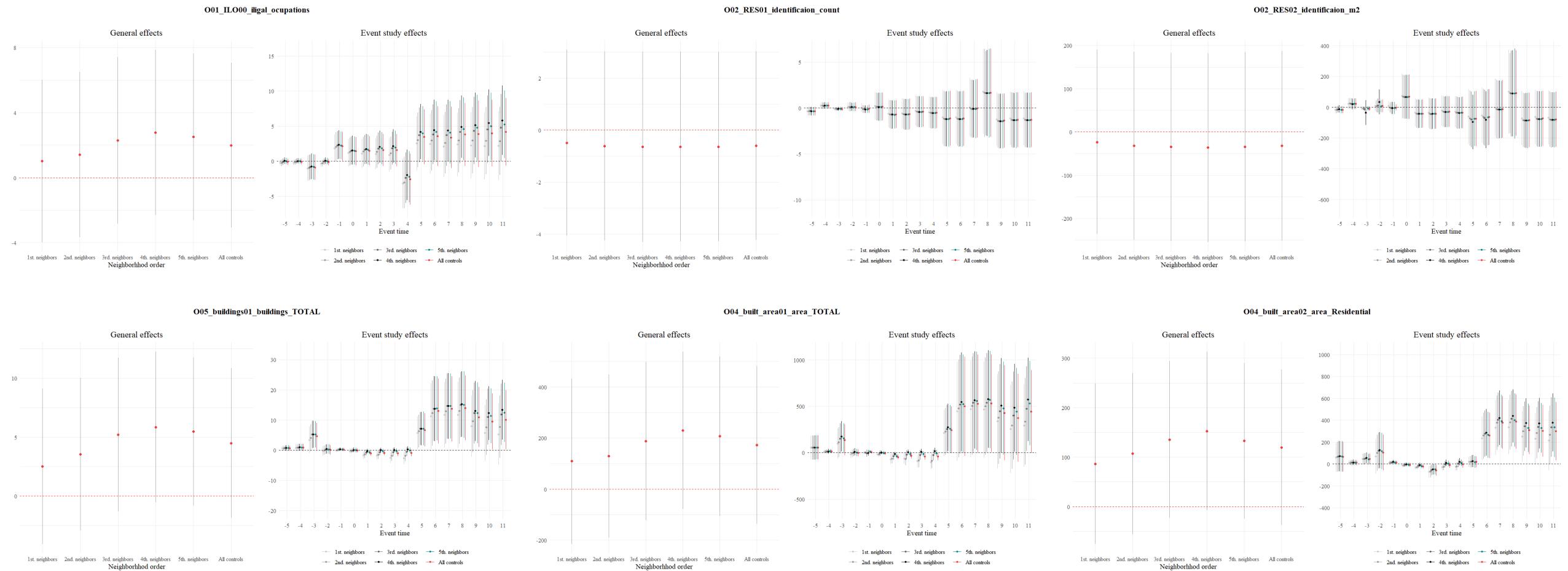
Variable	1st neighbours		2nd neighbours		3rd neighbours		4th neighbours		5th neighbours		All neighbours	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
<b>Informal Market</b>												
Illegal occupations	-0.02 (0.43)	0.03 (0.58)	0.22 (0.52)	1.52*** (0.57)	0.85 (0.61)	1.33** (0.57)	1.01* (0.61)	1.49** (0.58)	0.99* (0.6)	1.47** (0.38)	0.28 (0.38)	-0.15 (0.62)
RP. Identification (Households)	-0.16 (0.16)	-0.17 (0.16)	-0.19 (0.22)	-0.25 (0.21)	-0.21 (0.21)	-0.31 (0.26)	-0.22 (0.23)	-0.32 (0.25)	-0.21 (0.24)	-0.32 (0.25)	-0.14 (0.16)	-0.14 (0.16)
RP. Identificaion (m2)	-7.75 (11.22)	-7.95 (11.08)	-8.94 (14)	-13.19 (14.61)	-10.03 (16.12)	-16.56 (17.29)	-10.69 (15.9)	-18.52 (17.79)	-10.05 (16.03)	-16.84 (17.78)	-6.49 (9.92)	-6.98 (10.15)
RP. Enrollment (Households)	0.1*** (0.02)	0.06** (0.03)	0.12*** (0.03)	0.1* (0.05)	0.13*** (0.03)	0.08 (0.05)	0.14*** (0.04)	0.09 (0.07)	0.09*** (0.03)	0.09 (0.07)	0.06*** (0.02)	0.07** (0.03)
RP. Enrollment (m2)	9.02*** (2.11)	5.1** (2.19)	10.81*** (2.63)	9.43** (4.28)	11.92*** (3.04)	7.29* (3.79)	13.24*** (3.27)	8.73* (4.69)	8.04*** (2.34)	8.04* (4.69)	5.07*** (1.48)	5.88** (2.44)
<b>Formal Market - Overall</b>												
Total lots	-8.93 (3.86)	-11.88 (7.26)	-4.93 (3.21)	-9.02 (9.39)	-2.38 (3.35)	-20.26 (16.01)	-2.56 (3.67)	-25.25 (19.6)	3.35** (1.68)	-16.62 (14.94)	-0.86 (1.53)	-3.77 (2.35)
Total built area (m2)	-14.78 (48.6)	-25.68 (66.16)	37.98 (55.42)	36.02 (97.62)	70.58 (60.42)	-98.2 (148.14)	63.76 (60.96)	-152.81 (174.93)	189.84*** (51.26)	-114.54 (147.36)	95.81** (38.07)	22.16 (56.9)
Total buildings	-0.32 (1.12)	-0.04 (1.41)	1.83 (1.3)	-0.16 (2.24)	2.59* (1.34)	-2.54 (3.12)	2.2 (1.39)	-4.1 (3.74)	5.19*** (1.2)	-2.94 (3)	2.93*** (0.93)	0.88 (0.95)
Avg. Stories	0.1* (0.06)	0.01 (0.06)	0.23*** (0.06)	0.16** (0.08)	0.23*** (0.07)	0.11 (0.08)	0.18*** (0.07)	0.05 (0.08)	0.34*** (0.07)	-0.01 (0.07)	0.26*** (0.05)	-0.04 (0.06)
Total stories	-1.12 (1.67)	0.5 (1.91)	2.06 (1.93)	-1.13 (3.53)	3.29* (1.93)	-3.57 (3.9)	2.78 (4.61)	-5.58 (1.73)	7.32*** (3.83)	-4.09 (1.36)	4.01*** (1.44)	1.59 (1.44)
<b>Formal Market - By land uses</b>												
Residential lots	-0.8 (1.26)	-0.57 (1.69)	1.88 (2.14)	-0.05 (1.25)	2.72** (3.07)	-2.26 (1.25)	2.38* (1.29)	-3.74 (3.6)	5.2*** (1.11)	-2.53 (2.94)	2.74*** (0.87)	0.87 (0.92)
Residential built area	67.3* (35.57)	97.73** (38.02)	127.19*** (42.64)	101.66** (50.98)	146.79*** (45.66)	59.96 (61.93)	136.37*** (45.61)	34.83 (67.63)	214.91*** (44.24)	28.27 (67.2)	139.78*** (32.15)	100.37*** (31.5)
Residential buildings	1.33 (0.87)	1.86* (0.95)	3.3*** (1.05)	1.51 (1.41)	3.68*** (1.13)	0.83 (1.42)	3.3*** (1.12)	-0.07 (1.55)	5.55*** (1.1)	-0.09 (1.5)	3.62*** (0.79)	1.92** (0.79)
Comercial lots	-2.96 (1.19)	-3.54 (2.1)	-2.14 (0.85)	-1.99 (1.96)	-1.26 (0.73)	-4.28 (3.19)	-1.05 (0.74)	-5.09 (3.82)	-0.2 (0.41)	-3.29 (2.87)	-1.24 (0.42)	-1.4 (0.61)
Comercial built area	-21.08 (8.14)	-21.08 (12.46)	-17.77 (9.04)	-6.69 (17.84)	-8.05 (9.33)	-31.48 (24.5)	-5.59 (29.23)	-38.3 (30.16)	2.3 (8.77)	-22.49 (22.47)	-9.8 (5.72)	-6.53 (6.32)
Comercial buildings	-0.56 (0.2)	-0.51 (0.27)	-0.37 (0.18)	-0.2 (0.34)	-0.18 (0.18)	-0.68 (0.53)	-0.14 (0.18)	-0.81 (0.64)	0.05 (0.13)	-0.51 (0.47)	-0.2 (0.1)	-0.21 (0.12)
Offices lots	-0.06 (0.04)	-0.01 (0.01)	-0.01 (0.04)	-0.01 (0.01)	-0.06 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.01)	-0.03 (0.02)	-0.03 (0.01)	-0.05 (0.01)	0.01 (0.01)
Offices built area	-3.77 (2.73)	-1.14 (1.19)	-4.93 (3.44)	0.28 (1.43)	-5.86 (4.17)	0.68 (1.45)	-5.61 (4.87)	1.12 (2.13)	-2.77 (1.66)	-2.26 (1.57)	-2.09 (0.86)	0.68 (0.55)
Offices buildings	-0.02 (0.01)	0 (0)	-0.03 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.01 (0)	-0.01 (0.01)	-0.01 (0)	-0.01*** (0)	0
Industiral lots	-0.14 (0.04)	-0.1 (0.05)	-0.1 (0.04)	-0.1 (0.06)	-0.08 (0.05)	-0.11 (0.09)	-0.11 (0.06)	-0.07 (0.08)	-0.1 (0.02)	-0.03 (0.04)	-0.05 (0.01)	-0.06*** (0.03)
Industiral built area	-3.14 (0.96)	-1.88 (1.09)	-1.82 (0.67)	-1.69 (0.92)	-2.07 (0.81)	-2.59 (1.32)	-1.56 (0.81)	-2.24 (1.23)	-0.62 (0.3)	-1.57 (0.85)	-1.31** (0.31)	-1.38 (0.68)
Industiral buildings	-0.06 (0.02)	-0.04 (0.02)	-0.05 (0.02)	-0.04 (0.03)	-0.04 (0.02)	-0.05 (0.03)	-0.04 (0.03)	-0.05 (0.03)	-0.01 (0.02)	-0.03 (0.02)	-0.03*** (0.01)	-0.03 (0.01)
Warehouses lots	-2.98* (0.88)	-3.88 (1.76)	-2.83 (0.96)	-3.14 (2.82)	-2.27 (1.06)	-6.98 (5.11)	-2.22 (1.13)	-8.44 (6.37)	-1 (0.4)	-5.57 (4.72)	-1.48*** (0.32)	-1.88 (0.67)
Warehouses built area	-31.49* (8.81)	-77.48 (41.17)	-40* (11.26)	-20.41 (24.58)	-35.32 (12.48)	-60.77 (42.37)	-36.31 (13.76)	-71.08 (52.59)	-15.58 (6.44)	-53.07 (41.09)	-20.59** (4.97)	-66.03 (41.29)
Warehouses buildings	-0.61* (0.17)	-0.77 (0.32)	-0.57 (0.18)	-0.5 (0.47)	-0.43 (0.19)	-1.2 (0.86)	-0.44 (0.2)	-1.45 (1.05)	-0.2 (0.1)	-0.98 (0.79)	-0.3** (0.08)	-0.52 (0.23)
Facilities lots	-1.16 (0.74)	-2.04 (1.21)	-0.94 (0.47)	-2.04 (1.45)	-0.85 (0.5)	-3.59 (2.6)	-0.97 (0.57)	-4.29 (3.24)	-0.5 (3.24)	-2.87 (2.37)	-0.51 (0.24)	-0.7 (0.35)
Facilities built area	-7.45 (6.31)	-10.08 (8.45)	-5.3 (7.38)	-14.21 (13.03)	-1.9 (8.14)	-27.11 (21.95)	-4.06 (8.45)	-33.78 (27.01)	-0.41 (7.51)	-23.85 (21.7)	-2.75 (4.86)	-1.18 (5.27)
Facilities buildings	-0.16 (0.1)	-0.27 (0.17)	-0.12 (0.1)	-0.33 (0.24)	-0.12 (0.11)	-0.62 (0.44)	-0.14 (0.12)	-0.74 (0.54)	-0.06 (0.09)	-0.52 (0.41)	-0.06 (0.06)	-0.09 (0.07)
Empty lots	0.03 (0.05)	0.03 (0.05)	0.04 (0.06)	0.04 (0.07)	- (0.07)	- (0.07)	- (0.07)	- (0.07)	- (0.07)	- (0.07)	0.06 (0.05)	0.06 (0.05)
Empty built area	0.55 (0.92)	0.52 (0.93)	0.27 (0.4)	0.27 (0.4)	- (0.4)	- (0.4)	- (0.4)	- (0.4)	- (0.4)	- (0.4)	0.74 (0.85)	0.64 (0.83)
Empty buildings	0.01 (0.02)	0.01 (0.02)	0.02 (0.03)	0.02 (0.03)	- (0.03)	- (0.03)	- (0.03)	- (0.03)	- (0.03)	- (0.03)	0.03 (0.03)	0.02 (0.02)
Other lots	-0.87 (0.44)	-1.79 (0.91)	-0.75 (0.46)	-1.76 (1.36)	-0.58 (0.51)	-3.03 (2.32)	-0.58 (2.9)	-3.58 (2.07)	-0.1 (2.15)	-2.28 (0.18)	-0.33 (0.18)	-0.67 (0.33)
Other built area	-15.71 (13.14)	-12.28 (13.19)	-19.67 (16.56)	-23.18 (18.21)	-23 (18.47)	-36.88 (24.56)	-19.47 (17.83)	-43.36 (29.32)	-7.99 (19.35)	-39.58 (25.22)	-8.18 (12.72)	-4.42 (10.64)
Other buildings	-0.26 (0.32)	-0.31 (0.32)	-0.36 (0.4)	-0.61 (0.39)	-0.3 (0.45)	-0.81 (0.51)	-0.32 (0.45)	-0.97 (0.6)	-0.13 (0.48)	-0.81 (0.51)	-0.13 (0.33)	-0.22 (0.27)
PCA controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

## Example of general and event study plots

O01\_ILO00\_illegal\_occupations



# Example of general and event study plots



# Example of Placebo plots

