# Slum recognition effects on urban informal expansion:

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

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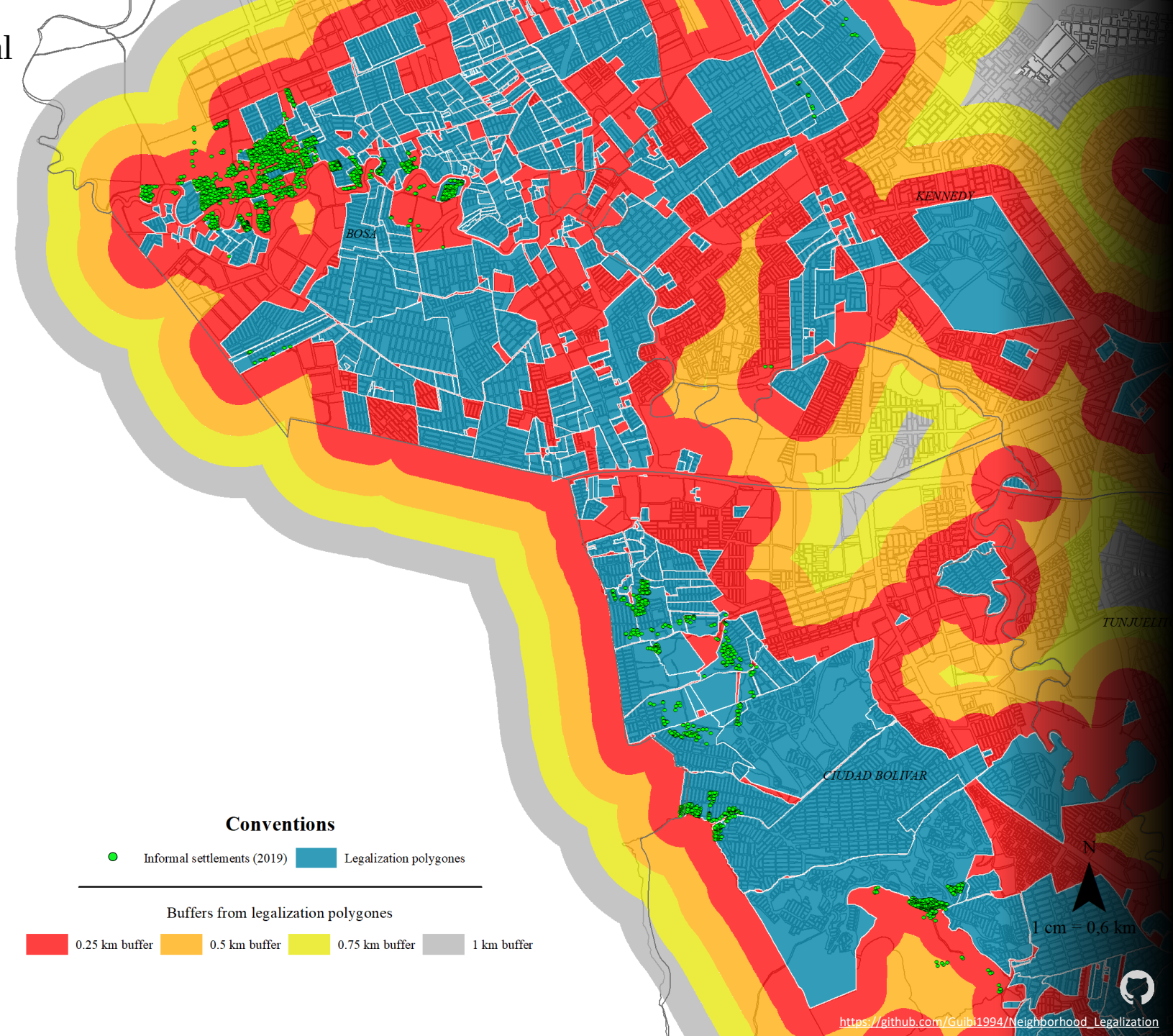



https://github.com/Guibi1994/Neighborhood_Legalization

**Context:**

- Urban expansion is one of the most important events in South America's recent history.

- In the las 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 Terrotiral*): 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 letter  could later be provided with public infrastructure and amenities.

- Informal Settlement (construction type/origin) ≠ Illegal Settlements (legal status)

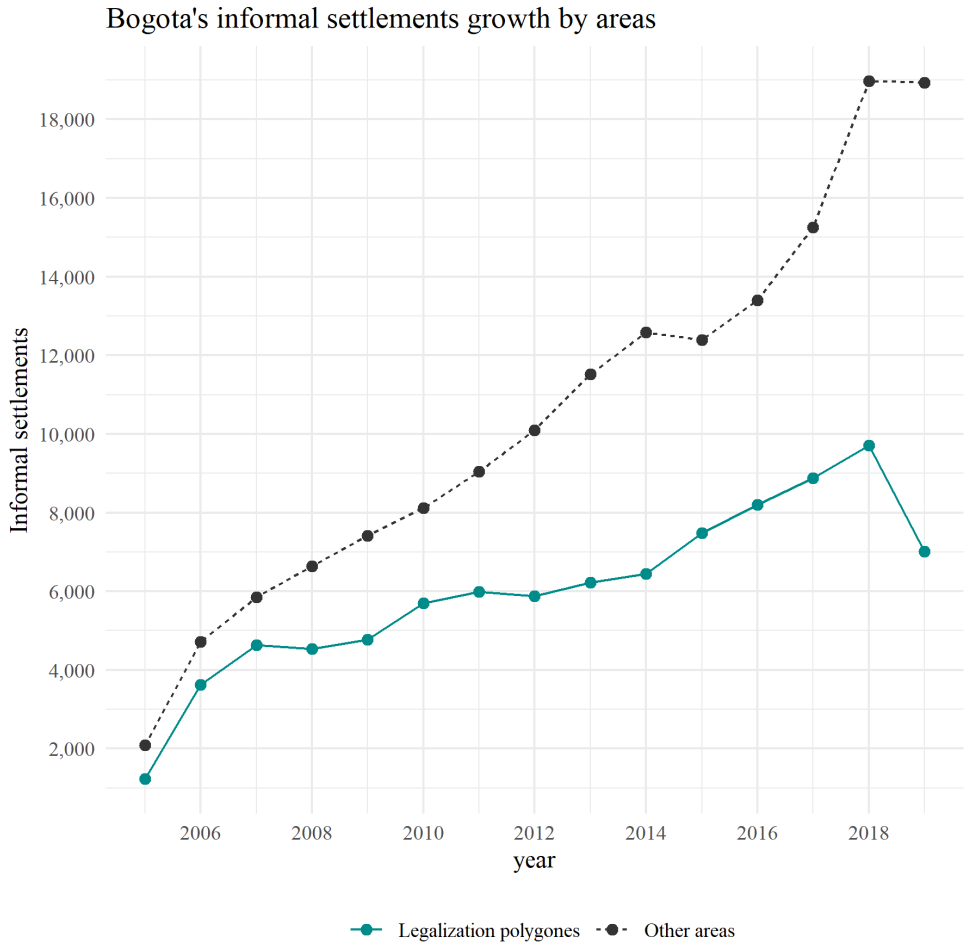
# Introduction

- 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, other have 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.

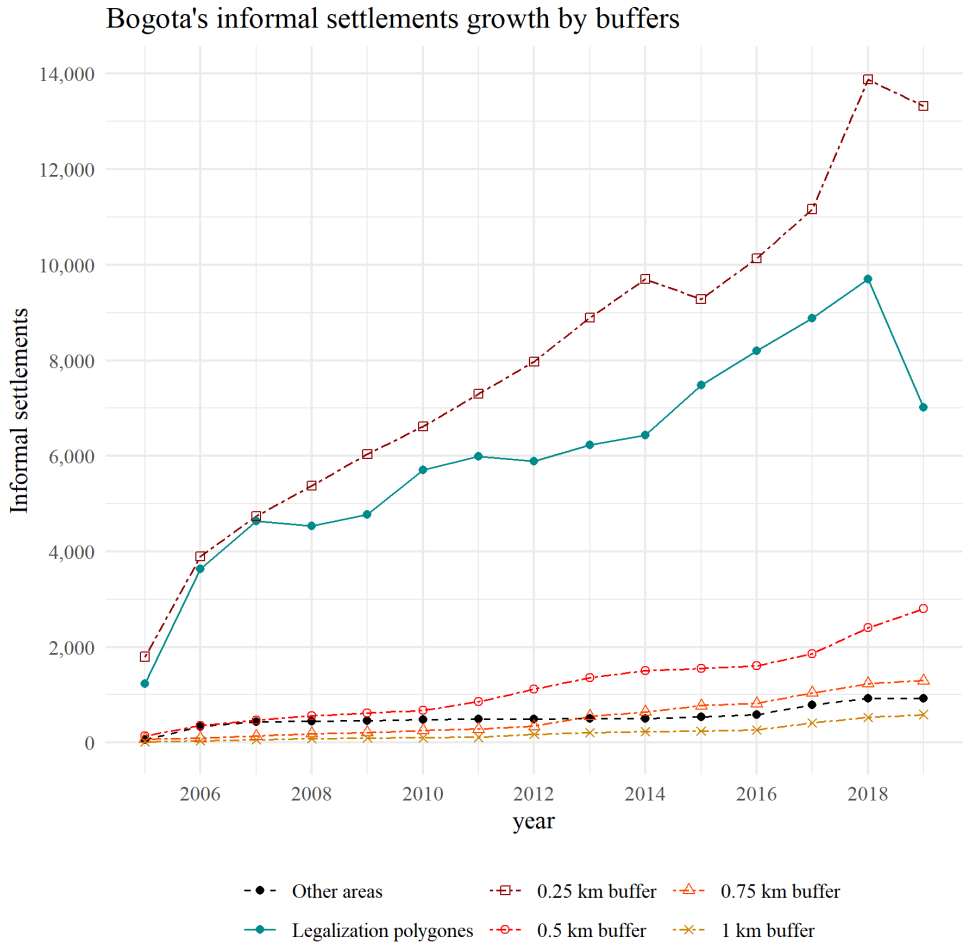


# Introduction

- 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.

# Data

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

Neighborhood Improvement program polygons* (2002-2019)

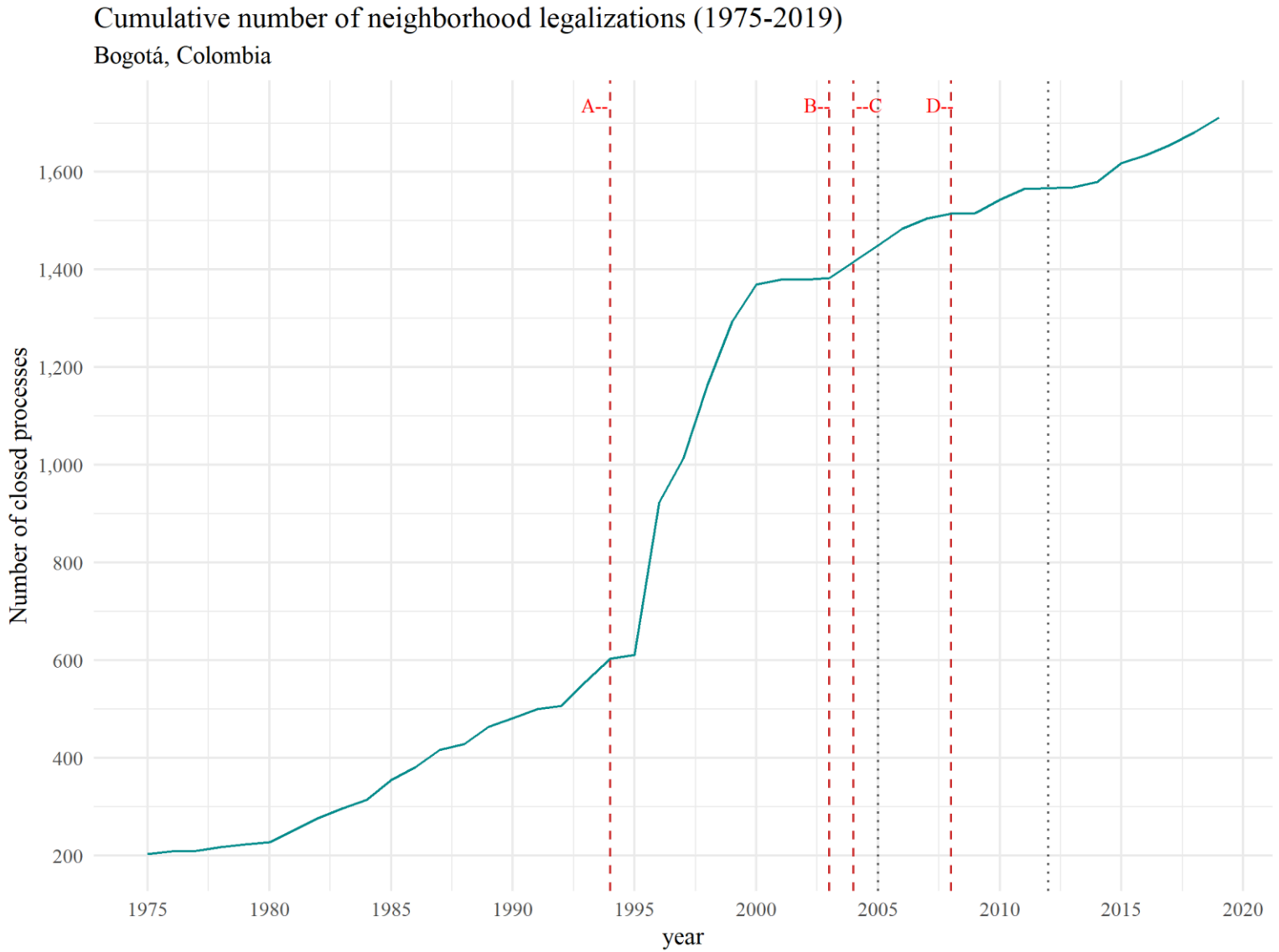
Resettlement Program points (2004-2019)

Informal constructions –SDH (2005-2019)

Formal constructions – ODC (2012-2019)

Census data (2005 and 2018)

# Context: the legalization program




Historical milestones:

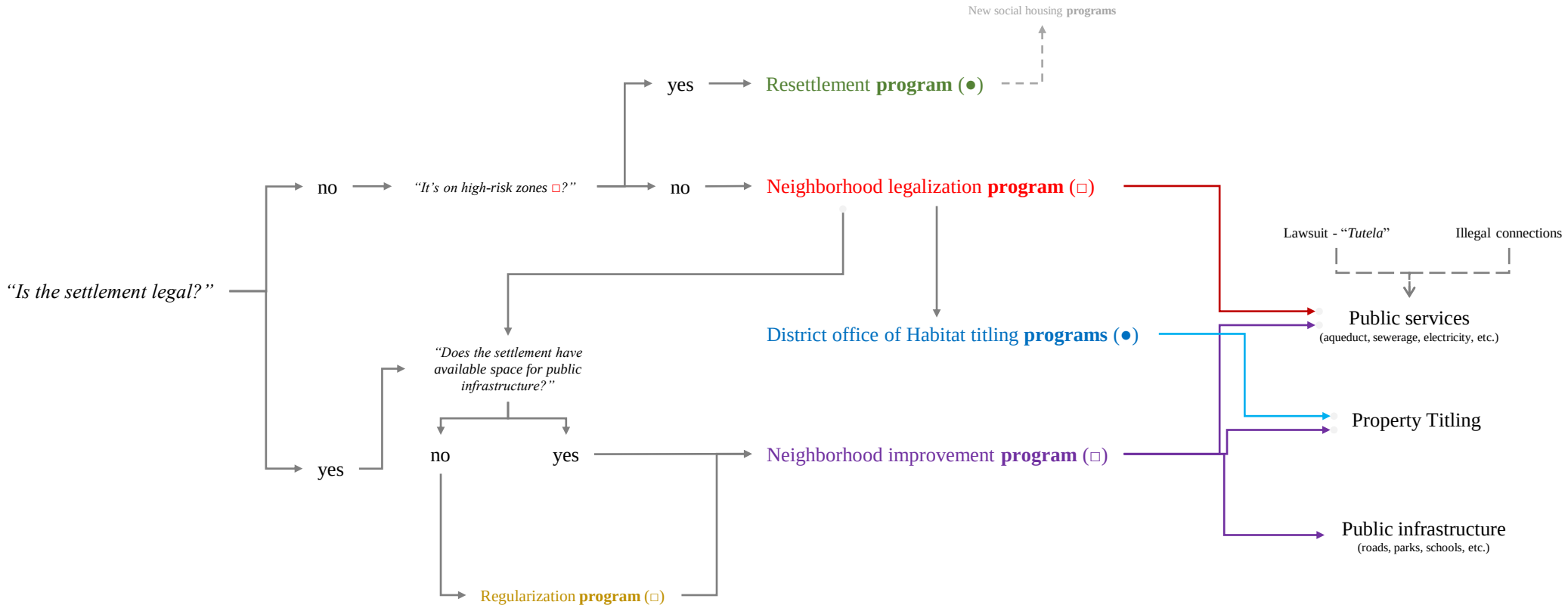
A. **1994:** The Law 388 gave to all municipalities the order to formulate their first POT's.

B. **2003:** President Alvaro Uribe Velez stablished 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



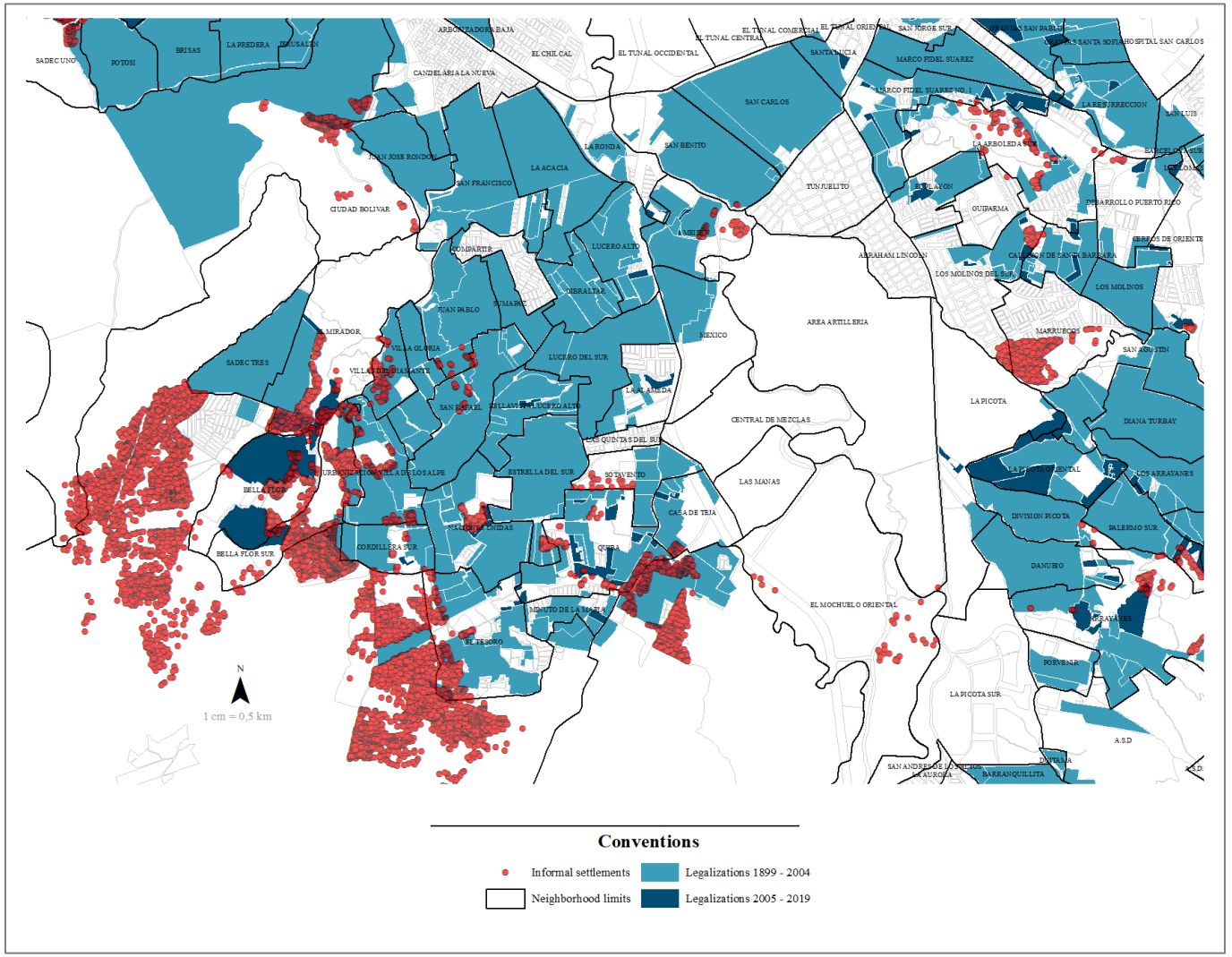
# Empirical restrictions

**Data restrictions:**

- Only illegal occupation information after 2005
- Unit of analysis's administrative complexity

**Statistical concerns:**

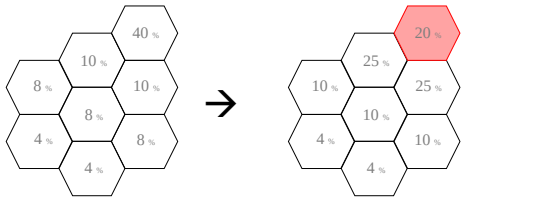
- Absence of "*never treated units*"
- Treatment anticipation
- Spatial spill overs (SUTVA)
- Endogeneity between treatment and outcome
- Spatial partial overlap with other similar programs
- Exogenous general shocks



# Empirical strategy

## I. Probabilistic approach

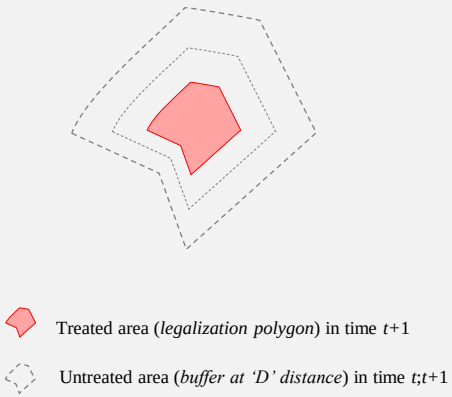
$Y_i = \Pr(IO_I = 1)$*




1. Unit of analysis is a standardized gomphacil unit.
2. Treatment and controls are defined by intersection between hexagons centroids and legalization polygons
3. Probability of each period is either binary, or define by a probabilistic value form a supervise classification model per year
4. *Exposure level* are defined by contiguity and distance between centroids.

## II. Continuous approach

$Y_i = Relative\ IO\ density_i$




1. Unit of analysis is the legalization polygon and its predefined buffers.
2. The outcome variable is either the number of informal ocupations (*IO*) or the relative density ($IO_i/area_i$)
3. *Exposure level* are categorically defined by each buffer

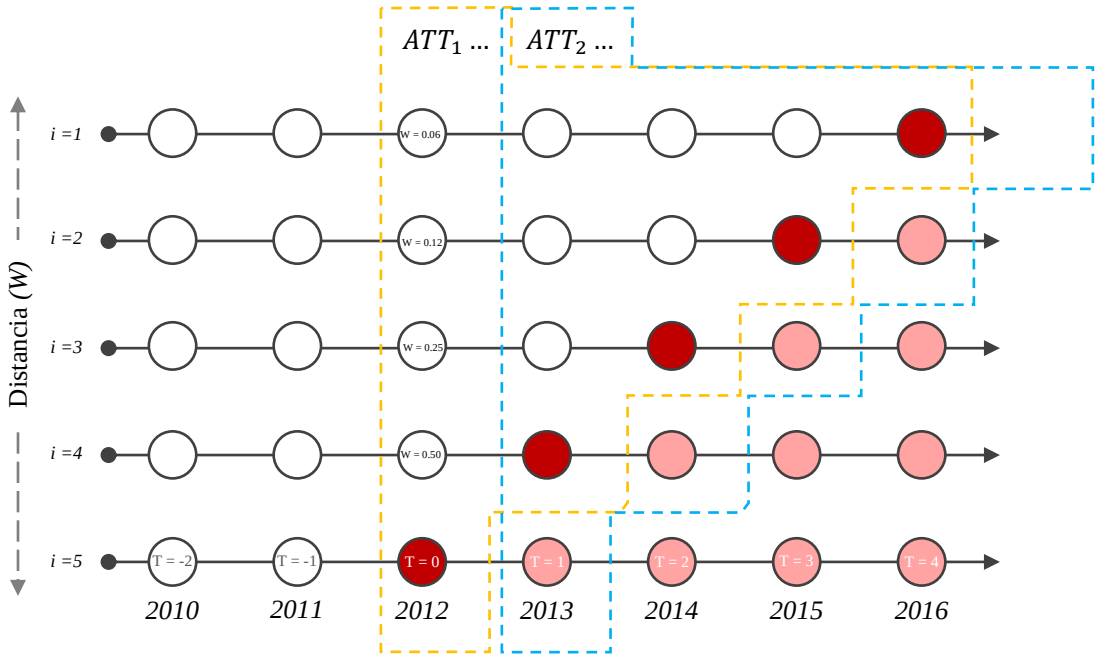
## *Dif Dif* with multiple time periods and spatial spill overs.

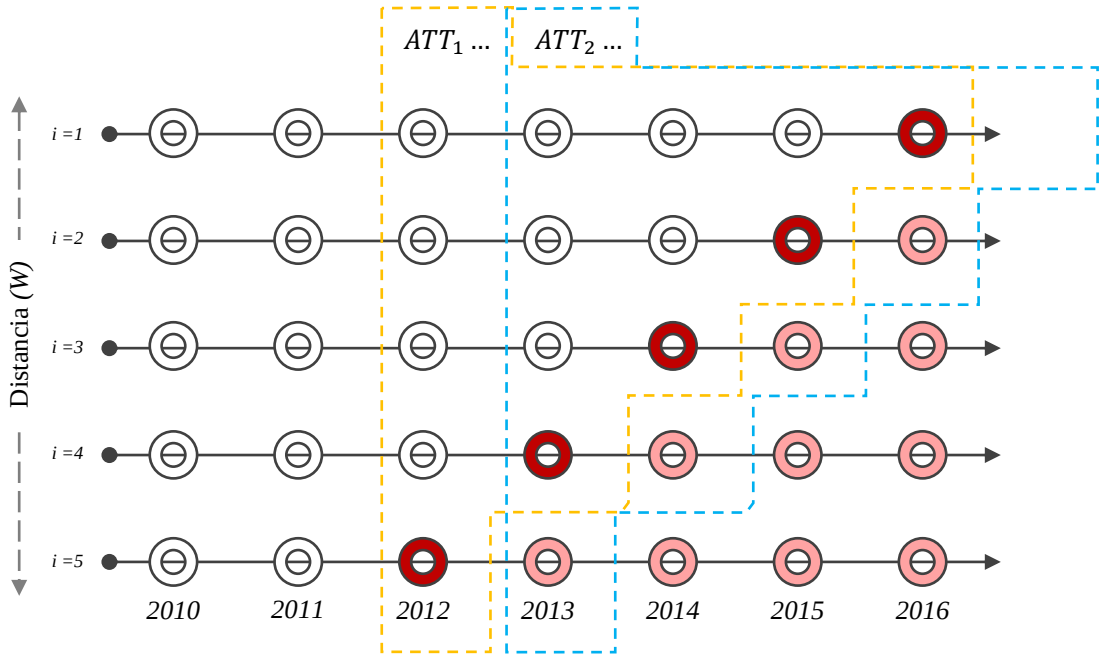
$$Y_{ig} = \beta(G_{gt} * T_{gt} * D_k) + \ldots + e_i \mid X_i'$$

- "$G_{gt}$" is a cohort defined by the treatment time (or pretreatment time) as defined by Callaway and Sant' Anna 2021.
- "T" is a pos-treatment dummy
- "$D_k$" is a cohort defined by *exposure level* as defined by Butss 2021.
- Where "$D_k = \infty$" defines *direct effect* of treatment over cohort "*g*" and "$D_k < \infty$" defines the *total effect* of treatment for the cohort.
- And finally, *X'* is a group of exogenous variables that could condition the effect.

*$0 \leq \Pr(IO_i) \leq 1$

# Empirical strategy



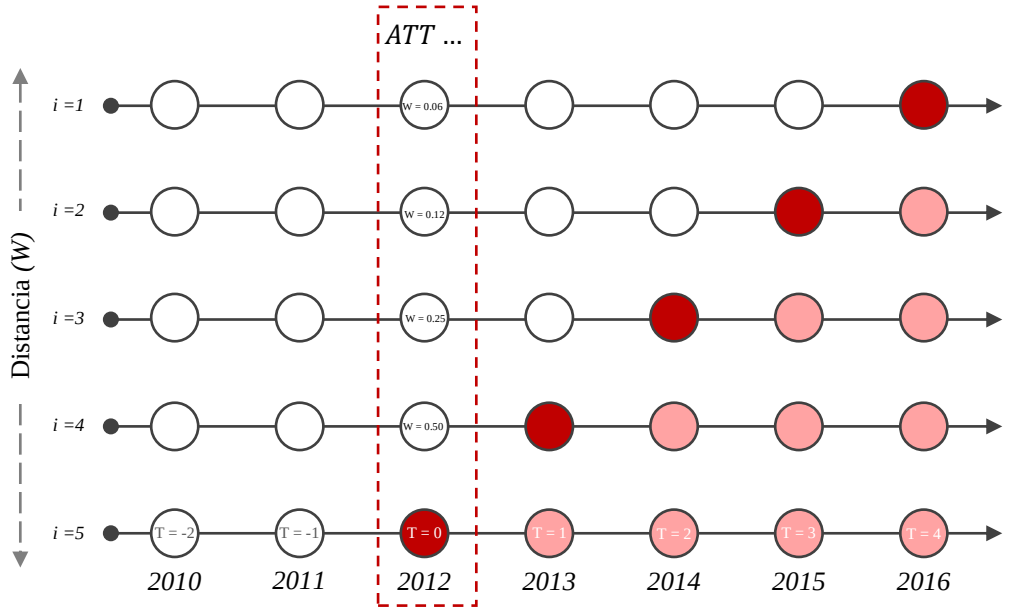

Año previo a ser legalizado (C = 1)

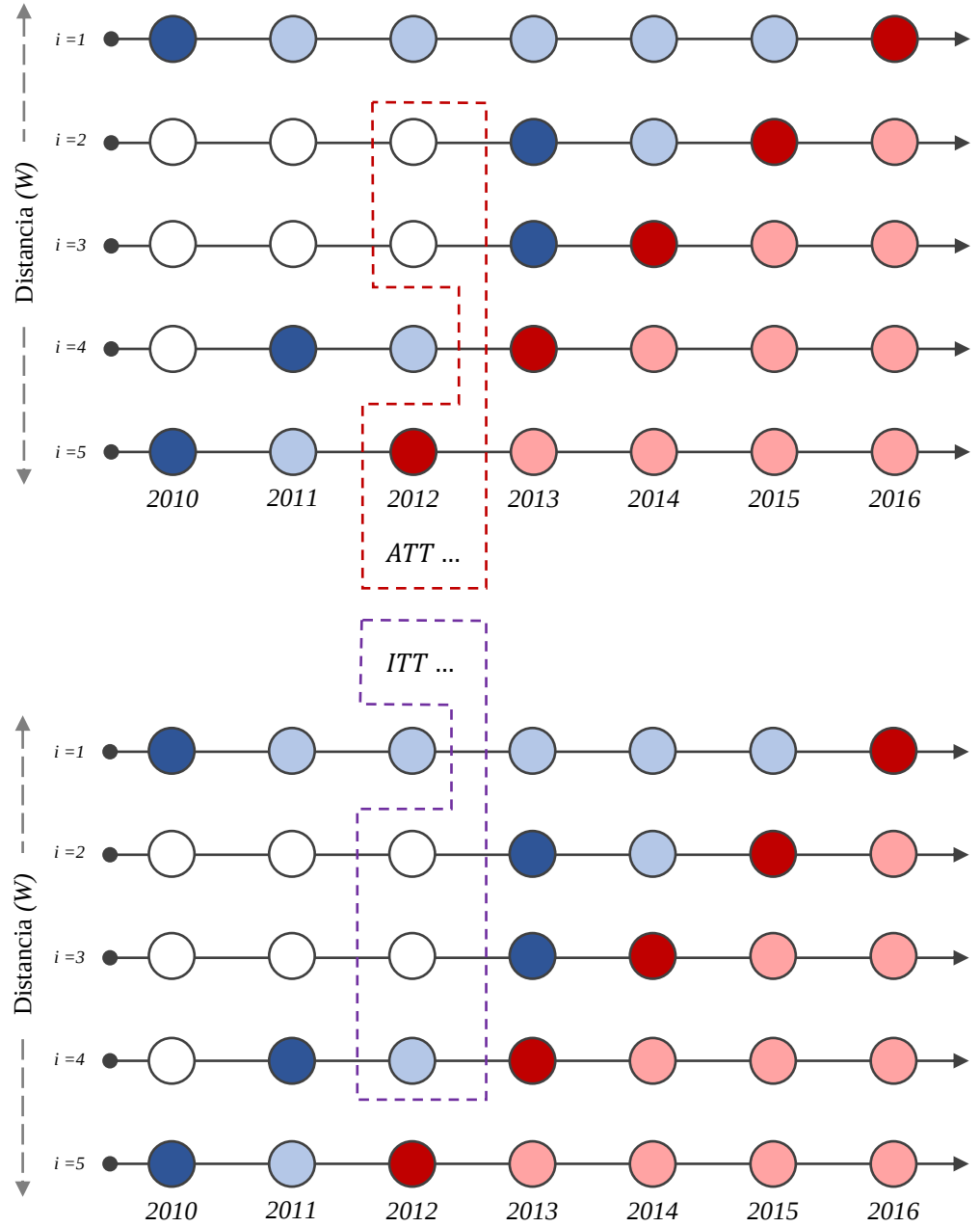
Año de legalización (T = 1 / T = 0)

Año después de legalizado (T = 1 / T = 1+t)

Buffer de *x* radio

# Empirical strategy




Año previo a ser legalizado (C = 1)

Año de inicio del proceso de legalización

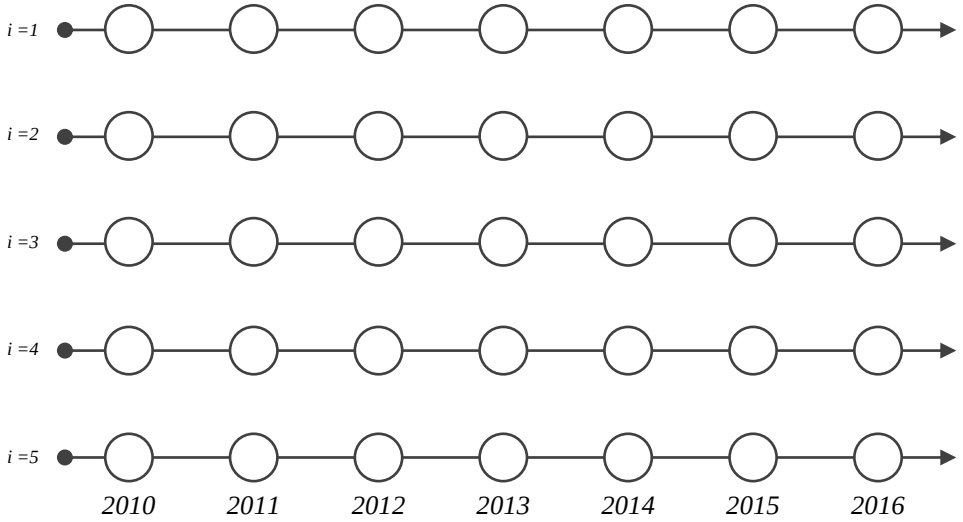
Año de legalización (T = 1 / T = 0)

Año entre el aviso y la ejecución

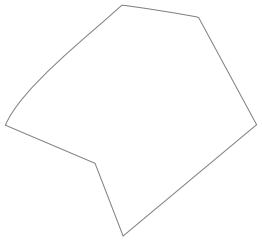
Año después de legalizado (T = 1 / T = 1+t)

# Results

- Violación de SUTVA, geográfica y macro-teporalmente
- Anticipación del tratamiento
- No hay unidades “never-tretead”
- Perdida del poder de comparación con el tiempo
- Sin información de dependientes y covariables de la mayor parte del programa
- Endogeneidad entre el tratamiento y la variable de efecto
- Relación entre las variables dependientes principales y otros programas similares
- Cambio en las condiciones del tratamiento (agua como derecho)
- Sesgos de error de medición







Polígono de legalización aun no legalizado

Legalizado